7th World Conference on Photovoltaic Energy Conversion (WCPEC-7).

Printable Program

June 10-15, 2018

Waikoloa, Hawaii

Sunday, June 10, 2018

8:30 – 12:00 PM	King 2,3
AM5: Thin Film PV: CdTe, Cu(InGa)Se and a-Si/nc-Si	

Chair(s): Angus Rockett

8:30 – 12:00 PM	Queen 5,6
AM4: Physics and Technology of Si Solar Cells	

Chair(s): Ron Sinton

8:30 – 12:00 PM	Kona 4
AM2: Advanced Solar Cell Characterization	

Chair(s): Martin Schubert

8:30 – 12:00 PM	Kona 5
AM3: Understanding the Success of PV in the Big Picture	

Chair(s): Sarah Kurtz

8:30 – 12:00 PM	Queens 4
AM1: Fundamentals of Photovoltaics	

Chair(s): N.J. Ekins-Daukes

1:30 – 5:00 PM	King 2,3
PM5: Solar Cell and Module Characterization	

Chair(s): Gerald Siefer

1:30 – 5:00 PM	Queen 5,6
PM4: Perovskite Solar Cells	

Chair(s): Sam Stranks

1:30 – 5:00 PM	Kona 4
PM2: III-V Based Tandem Solar Cells □ High Efficiency, Low Cost?	

Chair(s): Frank Dimroth

1:30 – 5:00 PM	Kona 5
PM3: Performance and Reliability of Solar Cells	

Chair(s): Muhammad A. Alam

1:30 – 5:00 PM	Queens 4
PM1: Utility-scale PV Plants and Grid Integration Capability	

Chair(s): Daniel Riley

Monday, June 11, 2018

8:15 – 8:20 AM	Monarchy Plenary
Highlights and Announcements	

8:20 – 8:45 AM	Monarchy Plenary
Current Challenges In Space Photovoltaic Power Generation	

Chair(s): Geoff Bradshaw

8:20 Current Challenges In Space Photovoltaic Power Generation
Paul R. Sharps, Dan Aiken, Zach Bittner, Benjamin Cho, Samantha Cruz, Daniel Derkacs, Navid Fatemi, Alexander Haas, John Hart, Chris Kerestes, Clay McPheeters, Nate Miller, Pravin Patel, Michael Riley, Alex Stavrides, Jeff Steinfeldt
SolAero Technology Corp, Albuquerque, NM, United States

8:45 – 9:10 AM	Monarchy Plenary
Hydrogen Induced Degradation	

Chair(s): Sarah Kurtz

8:45 Hydrogen Induced Degradation: Professor Wenham'S Perspective
Alison Ciesla nee Wenham
UNSW

9:10 – 9:35 AM	Monarchy Plenary
Challenges and Opportunities in Cell and Module I-V Testing	

Chair(s): Gerald Siefer

9:10 Challenges And Opportunities In Cell And Module I-V Testing
Ron Sinton
Sinton Instruments, Boulder, CO USA

9:35 – 10:00 AM	Monarchy Plenary
2018 IEEE EDS Celebrated Member Ceremony	

Chair(s): Alex Freundlich

10:00 – 10:30 AM	Grand Promenade
Coffee Break	

10:30 – 12:00 PM	Monarchy Plenary
Opening Keynote	

Chair(s): Alex Freundlich

11:05 Keynote 2: Global Co-Operation In Photovoltaic Through The International Solar Alliance
Juzer Vazi
National Centre for Photovlotaic Research and Education,Indian Institute of Technology Bombay, Mumbai, India

12:00 – 1:30 PM	Grand Promenade

Lunch on Your Own

1:30 – 3:00 PM	Kona 5

Advanced Light Management and Spectral Shaping

Chair(s): Peichen Yu

Best Student Presentation Award Finalist

1:30 **19.9%-Efficient Ultrathin Gaas Solar Cells With Nanostructured Back Mirror For Multi-Resonant Absorption And Enhanced Luminescence Extraction**

Hung-Ling Chen[1], Andrea Cattoni[1], Romaric De L路inau[1,3], Alexandre Walker[2], Oliver Hoehn[2], David Lackner[2], Gerald Siefer[2], Nicolas Vandamme[1,3], Julie Goffard[1,3], Beno羨 Behaghel[1], Christophe Dupuis[1], Nathalie Bardou[1], Frank Dimroth[2], St路hane Collin[1,3]

[1]Centre for Nanoscience and Nanotechnology (C2N), Palaiseau, France, [2]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany, [3]Institut Photovolta･ue d棚le-de-France (IPVF), Antony, France

1:45 **Towards Nano-Patterned Perovskite Layers For Enhanced Absorption In Solar Cells**

Raphael Schmager[1], Tobias Abzieher[2], Philipp Brenner[2], Artyom Assadillayev[1], Don J. Lee[1,3], Somayeh Moghadamzadeh[2], Ihteaz M. Hossain[1], Ulrich Lemmer[1,2], Bryce S. Richards[1,2], Ulrich W. Paetzold[1,2]

[1]Institute of Microstructure Technology, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, [2]Light Technology Institute, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, [3]Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon , South Korea

2:00 **Light Absorption Enhancement In Thin-Film Multiple Quantum Wells Solar Cells Fabricated By Epitaxial Lift-Off Technique**

Kentaroh Watanabe[1], Tatsuya Nakata[2], Naoya Miyashita[1], Hassanet Sodabanlu[1], Maxime Giteau[2], Yoshiaki Nakano[1,2], Yoshitaka Okada[1,2], Masakazu Sugiyama[1,2]

[1]RCAST, Univ. of Tokyo, Tokyo, Japan, [2]School of Eng., Univ. of Tokyo, Tokyo, Japan

Best Student Presentation Award Finalist

2:15 **Spectrally Matched Quantum Dot Photoluminescence In Gaas-Si Tandem Luminescent Solar Concentrators**

David R. Needell, Colton R. Bukowsky, Sunita Darbe, Haley Bauser, Ognjen Ilic, Harry A. Atwater

California Institute of Technology, Pasadena, CA, United States

2:30 **Large Area Nanostructure Integration For Broad-Spectrum, Omnidirectional Antireflection Improvements On Polymer Packaged, Mechanically Flexible, Epitaxial Lift-Off Iii-V Solar Arrays**

Gabriel Cossio[1], Andre Wibowo[2], Sudersena R Tatavarti[2], Kimberly Sablon[3], Edward T Yu[1]

[1]University of Texas at Austin, Austin, TX, United States, [2]Microlink Devices Inc, Niles, IL, United States, [3]Microlink Devices Inc, Niles, IL, United States, [4]US Army Research Laboratory, Adelphi, MD, United States

2:45 **Transparent, Conductive And Lightweight Superstrates For Perovskite Solar Cells And Modules**

Rebecca Saive[1,2], Sophia Coplin[1], Hyunseong L Kim[1], Chris H van de Stadt[1,2], Michael D Kelzenberg[1], Harry A Atwater[1]

[1]California Institute of Technology, Pasadena, CA, United States, [2]University of Twente, Enschede, Netherlands

1:30 – 3:00 PM	Queen 5,6
Absorber Preparation	

Chair(s): Daniel Lincot

Best Student Presentation Award Finalist

2:00 Study Of Gallium Front Grading At Low Deposition Temperature On Polyimide Subtrates And Impacts On The Solar Cell Properties

Valentin Achard[1,2], Matteo Balestrieri[2], Marie Jubault[1,2], Thibaud Hildebrandt[1,2], Laurent Lombez[2,3], Daniel Lincot[2,3], Fr鱵駻ique Donsanti[1,2]

[1]EDF R&D, Palaiseau, France, [2]Institut Photovolta・ue d'Ile de France, Palaiseau, France, [3]CNRS, Palaiseau, France

Best Student Presentation Award Finalist

2:15 Lift-Off Technology Using Water Soluble Mgte Layer For High-Efficiency Cdte And Mgxcd1-Xte Solar Cells

Calli M. Campbell[1,2], Cheng-Ying Tsai[1,3], Jia Ding[1,3], Bartlomiej Seredynski[4], Wojciech Pacuski[4], Yong-Hang Zhang[1,3]

[1]Center for Photonics Innovation, Arizona State University, Tempe, AZ, United States, [2]School for Engineering of Matter, Transport and Energy, Arizona State University, Tempe, AZ, United States, [3]School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ, United States, [4]4Faculty of Physics, University of Warsaw, Warsaw, Poland

2:30 Css Antimony Selenide Film Morphology And High Efficiency Pv Devices

Oliver S. Hutter, Laurie J. Phillips, Peter J. Yates, Jon Major, Ken Durose

University of Liverpool, Liverpool, United Kingdom

2:45 Light-Weight Flexible Cigs Solar Cell With Colors By Lift-Off Process

Taizo Masuda[1], Sho Hirai[2], Mikiya Inoue[2], Jakapan Chantana[2], Yuki Kudo[1], Takashi Minemoto[2]

[1]Toyota motor corporation, Susono, Japan, [2]Ritsumeikan University, Kusatsu, Japan

1:30 – 3:00 PM	Queens 4
Advances in III-V Solar Cells	

Chair(s): Ned Ekins-Daukes

1:30 Six-Junction Imm Solar Cell For High Concentration

Myles A. Steiner, Kevin L. Schulte, Ryan M. France, William E. McMahon, Emmett E. Perl, Nikhil Jain, Daniel J. Friedman, John F. Geisz

NREL, Golden, CO, United States

1:45 Developments For Wafer-Bonded Four-Junction Solar Cell Based On Gasb

Felix Predan[1], David Lackner[1], Eduard Oliva[1], Andras Kovacs[2], Wolfgang Jaeger[3], Frank Dimroth[1]

[1]Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, [2]Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons, Juelich, Germany, [3]Christian-Albrechts-University of Kiel, Kiel, Germany

2:00 Recent Progress In Epitaxial Lift-Off Solar Cells

Alexander Kirk, Drew Cardwell, Joshua Wood, Andree Wibowo, Kamran Forghani, David Rowell, Noren Pan, Mark Osowski

MicroLink Devices, Niles, IL, United States

2:15 Multijunction Solar Cells With Graded Buffer Bragg Reflectors

Ryan M. France[1], Pilar Espinet-Gonzalez[2], Nicholas J. Ekins-Daukes[3], Myles A. Steiner[1], John F. Geisz[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]California Institute of Technology, Pasadena, CA, United States, [3]University of New South Wales, Sydney, Australia

2:30 Internal Resistive Barriers Related To Zn Diffusion During The Growth Of Inverted Metamorphic Multi-Junction Solar Cells

Kevin L Schulte, Myles A Steiner, Matthew R Young, John F Geisz

National Renewable Energy Laboratory, Golden, CO, United States

2:45 Inverted Growth Of Lattice-Matched Multijunction Solar Cells With 1.0 Ev Gainnassb Subcell

Naoya Miyashita[1], Yilun He[2], Takaaki Agui[3], Hiroyuki Juso[3], Tatsuya Takamoto[3], Yoshitaka Okada[1,2]

[1]Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, Tokyo, Japan, [2]School of Engineering, The University of Tokyo, Tokyo, Japan, [3]SHARP Corporation, Nara, Japan

1:30 – 3:00 PM	Monarchy

Optical Coatings, Passivation and Light Management

Chair(s): Zachary Holman

1:30 Thin Nanocrystalline Silicon Layers For Silicon Heterojuntion Solar Cells

Jan Haschke, Rapha• Monnard, Mathieu Boccard, Christophe Ballif

Photovoltaics and Thin-Film Electronics Laboratory (PV-lab), Institute of Microengineering, Ecole Polytechnique F鐡駸ale de Lausanne, Neuch穣el, Switzerland

1:45 Plasma Texturing Of Silicon Wafers And Finished Solar Cells For Mass Production

Dominik Lausch[1,2], Jens Hirsch[1,2], Norbert Bernhard[2]

[1]Fraunhofer CSP, Halle Saale, Germany, [2]Hochschule Anhalt, K hen, Germany

2:00 Black Silicon Realized By Reactive Ion Etching (Icp) Without Platen Power

Rasmus S. Davidsen, Adriana P. S疣chez Nery, Beniamino Iandolo, Ole Hansen

Technical University of Denmark – Department of Micro- and Nanotechnology, Kgs. Lyngby, Denmark

2:15 Light Trapping In Bifacial Solar Modules Using Effectively Transparent Contacts (Etcs)

Rebecca Saive[1,2], Thomas C R Russell[1], Harry Atwater[1]

[1]California Institute of Technology, Pasadena, CA, United States, [2]University of Twente, Enschede, Netherlands

2:30 Control Of Texture Size Of Crystalline Silicon Solar Cells By Mixing Glass Micro-Particles With Conventional Alkaline Texturing Solution

Cong Thanh Nguyen, Keisuke Ohdaira, Hideki Matsumura

Japan Advanced Institute of Science and Technology (JAIST), Nomi, Ishikawa 923-1292, Japan

2:45 Realization Of Siox/Sinx Stacks As Multi Anti-Reflection Coatings And Selectively Copper-Plating Mask For Silicon Heterojunction Solar Cell With 23.5% Efficiency

Jian Yu[1,2], Jie Zhou[1], Jiantao Bian[1], Jianhua Shi[1], Liping Zhang[1], Fanying Meng[1], Zhengxin Liu[1]

[1]Shanghai Institute of Microsystem and Information Technology (SIMIT), Shanghai, China, [2]Institute of Photovoltaics, Southwest Petroleum University, Chengdu, China

1:30 – 3:00 PM	Kona 4
Crystaline Material Characterization	

Chair(s): Martin Schubert

1:30 Impact Of The Impurity Concentration On Modulating Charge State Occupation In Silicon

Ran Chen[1], Alison Ciesla[1], Daniel Chen[1], Catherine Chan[1], Phill Hamer[2], Brett Hallam[1], Stuart Wenham[1]

[1]The University of New South Wales, Sydney, Australia, [2]The University of Oxford, Oxford, United Kingdom

1:45 Nanoscale Investigation Of Grain Boundary Characteristics Of Single-Crystalline-Like Gaas Films And Solar Cells On Flexible Metal Substrates

Pavel Dutta[1], Jonathan Poplawsky[2], Harvey Guthrey[3], Monika Rathi[1], Devendra Khatiwada[1], Sicong Sun[1], Yao Yao[1], Bo Yu[1], Eduard Galstyan[1], Venkat Selvamanickam[1]

[1]Department of Mechanical Engineering, Advanced Manufacturing Institute, Texas Center for Superconductivity, University of Houston, Houston , TX, United States, [2]Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States

2:00 Influence Of Multicrystalline Silicon Ingot Properties On The Fill Factor Of Perc Solar Cells

Rhett Evans[1], Mattias Juhl[1], Daniel Chung[1], Bernhard Mitchell[1], Pietro Altermatt[2], Thorsten Trupke[1]

[1]UNSW, Sydney, Australia, [2]State Key Laboratory of PV Science and Technology, Trina Solar, Changzhou, China

2:15 Coupling Gd-Oes And Xps Profiling To Perform Advanced Physico-Chemical Characterizations Of Iii-V Layers For Photovoltaic Applications

Ana・ Loubat[1,2], Sol鈩e B馗hu[1,2], Muriel Bouttemy[1,2], C駉ine Eypert[3], Sofia Gaiaschi[3], Mathieu Fr馮naux[1,2], Damien Aureau[1,2], Jackie Vigneron[1,2], Nathalie Simon[1,2], Patrick Chapon[3], Anne-Marie Gon軋lves[1,2], Arnaud Etcheberry[1,2]

[1]IPVF, Institut Photovolta・ue d榯le-de-France, Palaiseau, France, [2]ILV, Institut Lavoisier de Versailles, Versailles, France, [3]HORIBA Scientific, Palaiseau, France

2:30 High Speed Infrared Probe For Doped Layers Characterization: Experiment And Ray Tracing Study

Johnson Wong[1], Divya Ananthanarayanan[2]

[1]Aurora Solar Technologies, Vancouver, BC, Canada, [2]Solar Energy Research Institute of Singapore, Singapore, Singapore

2:45 Reassessment Of Minority Carrier Traps In Silicon During &Ldquo;Quasi-Steady-State&Rdquo; Photoconductance Measurements

Yan Zhu[1], Mattias Juhl[1], Gianluca Coletti[1,2], Ziv Hameiri[1]

[1]University of New South Wales, Sydney, Australia, [2]Energy Research Centre of the Netherlands, LE Petten, Netherlands

1:30 – 3:00 PM	King 1
Advances in Perovskite Devices	

Chair(s): Sarah Wieghold

1:30 The Promise Of All-Perovskite Tandem Solar Cells

Tomas Leijtens[1], Rohit Prasanna[1], Giles Eperon[2], Kevin Bush[1], Michael McGehee[1]

[1]Stanford University, Stanford, CA, United States, [2]University of Washington, Seattle, WA, United States

2:00 Perovskite Quantum Dots. A New Absorber For Perovskite-Perovskite Tandem Solar Cells

Jeffrey A Christians, Ashley R Marshall, Qian Zhao, Paul Ndione, Erin M Sanehira, Joseph M Luther

National Renewable Energy Laboratory, Golden, CO, United States

2:15 Light-Management Mechanisms Of Optimized Micro-Textured Foils In Perovskite Solar Cells

Benjamin Lipovsek, Janez Krc, Marko Topic

University of Ljubljana, Faculty of Electrical Engineering, Ljubljana, Slovenia

2:30 Single-Walled Carbon Nanotubes As Hole-Transport Material On Metal Halide Perovskite Absorbers Yielding High Open-Circuit Voltages

Severin, N. Habisreutinger[1,3], Nakita, K. Noel[2], Robin, J. Nicholas[3], Henry, J. Snaith[3], Jeffrey, L. Blackburn[1]

[1]Chemistry & Nanoscience Center, National Renewable Energy Laboratory, Golden, CO, United States, [2]Department of Electrical Engineering, Princeton University, Princeton, NJ, United States, [3]Clarendon Laboratory, Department of Physics, University of Oxford, Oxford, United Kingdom

2:45 Fundamental Efficiency Limit Of Lead Iodide Perovskite Solar Cells

Luis M Pazos-Outon, T. Patrick Xiao, Eli Yablonovitch

University of California, Berkeley, Berkeley, CA, United States

1:30 – 3:00 PM	King 2,3
Field Studies	

Chair(s): Anil Kottantharayil

1:30 Degradation Analysis Of Hundreds Of Pv Systems: Differences In Residential And Commercial Installations

Michael G. Deceglie[1], Dirk C. Jordan[1], Ambarish Nag[1], Adam Shinn[2], Chris Deline[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]kWh Analytics, San Francisco, CA, United States

2:00 Assessing The Trends In Module Field Failures

John H Wohlgemuth

PowerMark Corporation, Union Hall, VA, United States

2:15 Behavior Of Failed Pv Modules Under Standard Test Condition And Under Actual Operation Conditions

Takumi Takashima

National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

2:30 On-Site Electroluminescence Study Of Field-Aged Pv Modules

Rajiv Dubey, Shashwata Chattopadhyay, Sachin Zachariah, Sugguna Rambabu, Hemant K Singh, Anil Kottantharayil, Brij M. Arora, K. L. Narasimhan, Narendra Shiradkar, Juzer Vasi

National Centre for Photovoltaic Research and Education, Indian Institute of Technology Bombay, Mumbai, India

2:45 Pv Systems In Warm And Sunny Climates: Performance Assessment Of Commercially Available Solar Photovoltaic Technologies Under Different Climatic Conditions In The Brazilian Energy Mix

Lucas Rafael do Nascimento, Mar匀ia Braga, Ruany Dolla, Rafael Antunes Campos, Ricardo R・her

Universidade Federal de Santa Catarina (UFSC), Florian olis-SC, Brazil

3:00 – 3:30 PM	Grand Promenade
Coffee Break	

3:30 – 5:00 PM	Poster 1
Absorber Preparation 1	

Chair(s): Yanfa Yan

A1 Synthesis And Characterization Of Cise Thin Film Absorber Layer By Using Hybrid Method
Ashok Adhikari, Jorge Sergio Narro-Rios, Velumani Subramaniam
AV. INSTITUTO POLITECNICO NACIONAL, mexico city, Mexico

A2 Tailoring V_{Oc} With Indium And Alkali Fluorides In Cu(In,Ga)Se_2 Solar Cells Deposited At Low Temperature On Polyimide
Matteo Balestrieri[1], Valentin Achard[2,1], Thibaud Hildebrandt[2,1], Laurent Lombez[3,1], Marie Jubault[2,1], Sol鈩e Bechu[1,4], Muriel Bouttemy[4], Arnaud Etcheberry[4], Daniel Lincot[3,1], Frederique Donsanti[2,1]
[1]IPVF, Institut Photovolta･ue d'Ile de France, Palaiseau, France, [2]EDF R&D, IPVF, Palaiseau, France, [3]CNRS, IPVF, Palaiseau, France, [4]ILV, UMR 8180 CNRS-UVSQ, Versailles, France

A3 Influence Of Chalcogen Atmosphere During Kf-Post Deposition Treatment On Cu(In,Ga) Se2 Layers And Device Characteristics
Nicolas Barreau[1], Ludovic Arzel[1], Sylvie Harel[1], Thomas Lepetit[1], Pawel Zabierowski[2]
[1]IMN-CNRS, Nantes, France, [2]WUT, Warsaw, Poland

A4 Rbf-Pdt Induced Sodium Displacement In Cu(In, Ga)Se_2 Absorbers Grown Under High Substrate Temperatures
Tobias Bertram[1], Jakob Lauche[1], Tim Kodalle[1], Hasan A. Yetkin[1,2], Marc D. Heinemann[1], Rutger Schlatmann[1,3], Christian A. Kaufmann[1]
[1]Helmholtz-Zentrum f･ Materialien und Energie, Berlin, Germany, [2]Technical University Berlin, Berlin, Germany, [3]Hochschule f･ Technik und Wirtschaft, Berlin, Germany

A5 Innovative Fabrication Process Of Wide Band Gap Cigs Solar Cells Using Metal Electrodeposition And H_2S Reactive Annealing
Karima Bouras[1], Romain Bodeux[2], Damien Coutancier[3], Aur駉ien Duchatelet[2], Daniel Lincot[1,3]
[1]Institut Photovoltaique d'Ile de France, Paris, France, [2]EDF, PARIS, France, [3]CNRS, PARIS, France

A6 Se Profiles In Cst Films Formed By Annealing Cdte/Cdse Bi-Layers
Shamara P. Collins[1], Chih A. Hsu[1], Vasilios Palekis[1], Ali Abbas[2], Walls John[2], Christos Ferekides[1]
[1]University of South Florida, Tampa, FL, United States, [2]Centre for Renewable Energy Systems Technology, Loughborough University, Leicestershire, United Kingdom

A7 The Fox And The Hound: Na Doping And Ga Gradients In Cigs
Diego Colombara[1,2]
[1]International Iberian Nanotechnology Laboratory, Braga, Portugal, [2]University of Luxembourg, Belvaux, Luxembourg

A8 Doping Cdte Absorber Cells Using Group V Elements
Adam H. Danielson[1], Amit H. Munshi[1], Anna Kindvall[1], Santosh Kumar Swain[2], Kurt L. Barth[1], Kelvin Lynn[2], Walajabad S. Sampath[1]
[1]Colorado State University, Fort Collins, CO, United States, [2]Washington State University, Pullman, WA, United States

A9 Comparison Of Potassium-Functionalized Cu_2Znsns_4 Nanoparticles Annealed In Different Reactive Sulfide Atmospheres
Sara Engberg[1], Stela Canulescu[1], Niels Christian Schj t[2], J gen Schou[1]
[1]DTU Fotonik, Roskilde, Denmark, [2]Haldor Tops , Lyngby, Denmark

A10

Defect Tolerance In As-Deposited Selenium-Alloyed Cadmium Telluride Solar Cells
Thomas A. M. Fiducia[1], Amit H. Munshi[2], Kurt Barth[2], Daniela Proprentner[3], Geoffrey West[3], Walajabad S. Sampath[2], Michael Walls[1]
[1]Loughborough University, Loughborough, United Kingdom, [2]Colorado State University, Fort Collins, CO, United States, [3]University of Warwick, Coventry, United Kingdom

B1 Sub-Area 2.1: Absorber Preparation And Material Properties The Formation And Impact Of Sodium Rich Secondary Phases In The Absorber Layer Of Cu(In,Ga)Se2 Based Solar Cells
Benjamin J Hickey, Huu-Ha Loi, Rouin Farshchi
Miasole Hi-Tech Corp, Santa Clara, CA, United States

B2 The Effect Of Thickness And Annealing Temperature On The Performance Of Acztsse With Higher Ag Content.
Wei-Chih Huang, Chung-Hao Cai, Bo-Wei Li, Shu-Ming Liao, Chih-Huang Lai
National Tsing Hua University, Hsinchu, Taiwan

B3 Influence Of Alkali-Treatment In Earth-Abundant Cu2Znsn(S,Se)4 Thin Film Solar Cells
Hae-Sun Kim[1,2], Woo-Lim Jeong[1,2], Dong-Seon Lee[1,2]
[1]School of Electrical Engineering and Computer Science, Gwangju Institute of Science and Technology (GIST), Gwangju, South Korea, [2]Research Institute for Solar and Sustainable Energies (RISE), Gwangju, South Korea

B4 Effect Of Post-Annealing On The Solar Cell Performance Of Cu2Znsns4 Thin Film Prepared By Sulfurization Of Stacked Metal Precursor With H2S Gas
Jung Hun Lee[1,2], Heon Jin Choi[2], Won Mok Kim[1], Jeung Hyun Jeong[1], Jong Keuk Park[1]
[1]Korea Institute of Science and Technology , Seoul, South Korea, [2]Yonsei University, Seoul, South Korea

B5 All-Electrodeposited P-Cu_2Znsns_4/N-In_2S_3 Heterojunction Formation For Solar Cell Applications
Maqsood Ali Mughal[1], Alhaytham Alqudsi[1], Pratap Rao[1]
[1]Worcester Polytechnic Institute, Worcester, MA, United States, [2]Worcester Polytechnic Institute, Worcester, MA, United States, [3]Worcester Polytechnic Institute, Worcester, MA, United States

B6 Advanced Co-Sublimation Of Low Bandgap Cdsexte1-X Alloy To Achieve Higher Short-Circuit Current
Amit H Munshi[1], Adam H. Danielson[1], Kurt L. Barth[1], Guillaume G駱inas[2], Jean-Nicolas Beaudry[2], Walajabad S. Sampath[1]
[1]Colorado State University, Fort Collins, CO, United States, [2]5N Plus Inc., Montreal, QC, Canada

B7 Mocvd Deposition Of Group V Doped Cdte In Sublimated Cdte And Cdsete Devices
Amit H. Munshi[1], Adam H. Danielson[1], Drew E. Swanson[1], Jennifer Drayton[2], Giray Kartopu[3], Kurt L. Barth[1], Stuart Irvine[3], Walajabad S. Sampath[1]
[1]Department of Mechanical Engineering, Colorado State University, Fort Collins, CO, United States, [2]Department of Physics, Colorado State University, Fort Collins, CO, United States, [3]Swansea University, St. Asaph, United Kingdom

B8 Doping Properties Of Cadmium-Rich Arsenic-Doped Cdte For Application Of Single Crystal Solar Cell
Akira Nagaoka[1,2], Yoshitaro Nose[1], Darius Kuciauskas[3], Michael A. Scarpulla[2]
[1]Kyoto University, Kyoto, Japan, [2]University of Utah, Salt Lake City, UT, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States

B9 Selenium And Sulphur Replacement Dynamics In Cztsse And Czgsse Kesterite Materials
Markus Neuwirth[1], Thierry Kohl[2,3], Guy Brammertz[2,3], Jessica de Wild[2,3], Marc Meuris[2,3], Jef Poortmans[2,4,5], Bart Vermang[2,3], Heinz Kalt[1], Michael Hetterich[1,6]
[1]Institute of Applied Physics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, [2]Institute for Material Research (IMO), Hasselt University (partner in Solliance & EnergyVille), Agoralaan gebouw H, Diepenbeek, Belgium, [3]IMEC division IMOMEC (partner in Solliance & EnergyVille), Wetenschapspark 1, Diepenbeek, Belgium, [4]IMEC (partner in Solliance & EnergyVille), Kapeldreef 75, Leuven, Belgium, [5]Department of Electrical Engineering, KU

Leuven, Kasteelpark Arenberg 10, Heverlee, Belgium, [6]Light Technology Institute, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

B10 Submission Category: Chalcogenide Thin Film Solar Cells Abstract Title: Post-Deposition Recrystallization Of Chloridetreated $Cu(In_XGa_{(1-X)})Se_2$ Thin-Film Solar Cells

Elizabeth C Palmiotti[1], Sina Soltanmohammad[1], Angus A Rockett[1], Grace Rajan[2], Shankar Karki[2], Ben Belfore[2], Sylvain X Marsillac[2]

[1]Colorado School of Mines, Golden, CO, United States, [2]Old Dominion University, Norfolk, VA, United States

B11 Transparent Wide-Gap Chalcopyrite Cugase2 Thin-Film Photovoltaics With Noble Dot-Patterned Mo P-Electrode

Soichiro Shibasaki[1], Naoyuki Nakagawa[1], Sara Yoshio[1], Yuya Honishi[2], Kazushige Yamamoto[1]

[1]Toshiba Corp. Research & Development Center, Kawasaki, Japan, [2]Toshiba Energy Systems & Solutions Corp., Kawasaki, Japan

B12 Optimization Of Cu(In,Ga)(Se,S)2 Absorbers Obtained From Atmospheric Selenium-Sulfur Annealing Of Electrodeposited Precursors On 30X30 Cm2

Mirjam Theelen[1], Arjan Hovestad[1], Marcel Simor[1], Maarten van der Vleuten[1], Henk Steijvers[1], Karine van der Werf[2], Dong Zhang[2], Maarten D enk春per[2], Hans Linden[1]

[1]TNO Solliance, Eindhoven, Netherlands, [2]ECN Solliance, Eindhoven, Netherlands

B14 Dramatic Recrystallization During $Cdcl_2$ Treatment Of Evaporated Cdte Thin Films

Joshua R. Winger[1], Barrett S. Falbaum[1], Mike A. Scarpulla[1 2]

[1]Materials Science and Engineering, University of Utah, Salt Lake City, UT, United States, [2]Electrical and Computer Engineering, University of Utah, Salt Lake City, UT, United States

3:30 – 5:00 PM	Poster 2
Low-Cost III-V and Hybrid Tandems	

Chair(s): Kevin Schulte

B15 Iii-V Multi-Junction Solar Cells On Si Substrates With A Voided Ge Interface Layer: A Modeling Study

Meghan N. Beattie[1], Youcef A. Bioud[2], Abderraouf Boucherif[2], Dominique Drouin[2], Richard Ar鐨[2], Christopher E. Valdivia[1], Karin Hinzer[1]

[1]SUNLAB, Centre for Research in Photonics, University of Ottawa, Ottawa, ON, Canada, [2]Laboratoire Nanotechnologies Nanosyst鑄es (LN2) □ CNRS UMI-3463, Institut Interdisciplinaire d棚nnovation Technologique (3IT), Universit□ de Sherbrooke, Sherbrooke, QC, Canada

B16 Thermal Stability Of Iii-V Materials Printed To Low Cost Handles

Mitchell F. Bennett[1,2], Matthew P. Lumb[1,2], Kenneth J. Schmieder[2], Shawn Mack[2], Michael K. Yakes[2], Brent Fisher[3], Robert J. Walters[4]

[1]The George Washington University, Washington, DC, United States, [2]US Naval Research Laboratory, Washington, DC, United States, [3]Formerly of Semprius Inc., Durham, NC, United States, [4]Formerly of US Naval Research Laboratory, Washington, DC, United States

B17 Optical And Compositional Engineering Of Wide Band Gap Perovskites With Improved Stability To Photoinduced Phase Segregation For Efficient Monolithic Perovskite/Silicon Tandem Solar Cells

Kevin A Bush[1], Axel F Palmstrom[1], Zhengshan J Yu[2], Kyle Frohna[1], Salman Manzoor[2], Asad Ali[2], Waqar Ali[2], Rohit Prasanna[1], Rachel E Beal[1], Tomas Leijtens[1], Stacey F Bent[1], Zachary Holman[2], Michael D McGehee[1]

[1]Stanford University, Stanford, CA, United States, [2]Arizona State University, Tempe, AZ, United States

B18 High Quality Epitaxial Germanium On Si (110) Using Liquid Phase Epitaxy For Low-Cost Iii-V Solar Cells

Saloni Chaurasia, Srinivasan Raghavan, Sushobhan Avasthi

Indian Institute of Science, Bangalore, India

B19 Passivating Polycrystalline $Ga_{0.37}In_{0.63}P$ &Mdash; An Emerging 1.7Ev Bandgap Top Cell Candidate

Abhinav Chikhalkar, Chaomin Zhang, Nikolai Faleev, Christiana Honsberg, Richard R. King

Arizona State University, Tempe, AZ, United States

B20 Novel Approach For The Bonding Of Iii-V On Silicon Tandem Solar Cells With A Transparent Conductive Adhesive

Ulrike Heitmann, Sven Kluska, Jonas Bartsch, Hubert Hauser, Alexey Ivanov, Stefan Janz

Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

C1 Direct, Tco-, And Monolayer-Mediated Semiconductor Wafer Bonding In Non-Cleanroom Environment For Photovoltaic Applications

Ryoichi Inoue, Takenori Naito, Soichiro Hirata, Nagito Takehara, Katsuaki Tanabe

Kyoto University, Kyoto City Nishikyo, Japan

C2 Lattice-Matched Wide Bandgap Iii-V Dilute Nitride Bulk And Quantum Engineered Top Cell /Si Tandems

Khim Kharel, Alexandre Freundlich

University of Houston, Houston, TX, United States

C3 Improvement Of High Efficiency Gainp/Gaas Double Junction Solar Cell On Si Substrate Assisted By The Electron Beam Treatment

Hyo Jin Kim[1], Seokjin Kang[1], Hyun Haeng Lee[1], Seong Min Kim[1], Yong Whan Kim[2]

[1]Photonic Energy Research Center, Korea Photonics Technology Institute, Gwangju, Korea, [2]Photonic Energy Research Center, Korea Photonics Technology Institute, Gwangju, Korea, [3]Photonic Energy Research Center, Korea Photonics Technology Institute, Gwangju, Korea, [4]Photonic Energy Research Center, Korea Photonics Technology Institute, Gwangju, Korea, [5]Research and Development Team, Infovion Incorporation, Seoul, Korea

C4 Xrd Pole Figure Analysis Of In2Se3 Zinc-Blende Like (Zbl) Van Der Waals Template For Epitaxial Gaas Lift Off

Nobuaki Kojima, Yu-Cian Wang, Kei Kawakatsu, Yoshio Ohshita, Masafumi Yamaguchi

Toyota Technological Institute, Nagoya, Japan

C5 Low-Temperature Epitaxial Growth Of Ge On Si, Towards A Cost-Effective Substrate For Iii-V Solar Cells

Ziheng Liu, Xiaojing Hao, Anita Ho-Baillie, Martin A. Green

UNSW, Sydney, Australia

C6 Optical Modeling Of Wide-Bandgap Perovskite Top Cells And Perovskite/Silicon Tandems

Salman Manzoor[1], Jakob Haeusele[1,2], Zhengshan J. Yu[1], Kevin A. Bush[3], Axel F. Palmstrom[3], Stacey F. Bent[3], Michael D. McGehee[3], Zachary C. Holman[1]

[1]Arizona State University, Tempe, AZ, United States, [2]University of Konstanz, Konstanz, Germany, [3]Stanford University, Stanford, CA, United States

C7 Growth Of Gaas On Polycrystalline Germanium Substrates Prepared Via Aluminum-Induced Crystallization

Elisabeth L. McClure[1], Stephen J. Polly[1], Abhinav Chikhalkar[2], Richard R. King[2], Seth M. Hubbard[1]

[1]Rochester Institute of Technology, Rochester, NY, United States, [2]Arizona State University, Tempe, AZ, United States

C8 Numerical Analysis Of Bifacial Silicon-Based Tandem Devices: Shifts In The Optimum Top-Cell Bandgap With Varying Albedo

Arthur Onno, Zachary Holman

Arizona State University, Tempe, AZ, United States

C9 Arsenic-Modified Si(100) Surfaces For Iii-V-On-Si Tandem Solar Cells

Agnieszka Paszuk[1], Oliver Supplie[1], Manali Nandy[1], Sebastian Brueckner[1], Anja Dobrich[1], Peter Kleinschmidt[1], Boram Kim[2], Yoshiaki Nakano[2], Masakazu Sugiyama[2], Thomas Hannappel[1]

[1]Ilmenau University of Technology, Ilmenau, Germany, [2]The University of Tokyo, Tokyo, Japan

C10 Toward Higher Efficiency Of Low-Cost Flexible Single-Crystal-Like Gaas Thin Film Solar Cells On Metal Tapes

Sara Pouladi, Monika Rathi, Pavel Dutta, Seung Kyu Oh, Devendra Khatiwada, Yao Yao, Ying Gao, Sicong Sun, Yongkuan Li, Mojtaba Asadirad, Shahab Shervin, Jie Chen, Venkat Selvamanickam, Jae-Hyoun Ryou

Department of Mechanical Engineering, University of Houston, Houston, TX, United States

C11 2-J Gaas Solar Cells On Epi-Ready Flexible Metal Substrates

Monika Rathi[1], Devendra Khatiwada[1], Pavel Dutta[1], Carlos Favela[1], Yao Yao[1], Sicong Sun[1], Sara Paloudi[1], Phil Ahrenkiel[2], Jae-Hyun Ryou[1], Venkat Selvamanickam[1]

[1]Department of Mechanical Engineering, Advanced Superconductor Manufacturing Institute, Texas Center for Superconductivity, University of Houston, Houston, TX, United States, [2]South Dakota School of Mines and Technology, Rapid City, TX, United States

C12 Energy-Conversion Properties Of Si/Gaas Mesowires Containing Fewer Threading Dislocations

Jason A Rohr[1], Georges Siddiqi[1], Sheng Li[1], Christopher Chen[2], Shaul Aloni[2], Shu Hu[1]

[1]Yale University, New Haven, CT, United States, [2]Molecular Foundry, Berkeley, CA, United States

C13 Gainp Solar Cells By Hydride Vapor Phase Epitaxy With Reduced Dark Current

Kevin L Schulte, John Simon, Matthew R Young, Aaron J Ptak

National Renewable Energy Laboratory, Golden, CO, United States

C14 Influence Of Light Concentration On Performance Of Thin Film Gaas Solar Cells On Flexible Metal Substrates

Kumaran Selva[1], Devendra Khatiwada[2], Monika Rathi[2], Pavel Dutta[2]

[1]Clear Lake High School, Houston, TX, United States, [2]University of Houston, Houston, TX, United States

C15 Impacts Of V/Iii Ratio On The Quality And Performance Of Gaas P-N Solar Cells By Ultrafast Movpe

Hassanet Sodabanlu[1], Akinori Ubukata[2], Kentaroh Watanabe[1], Takeyoshi Sugaya[3], Yoshiaki Nakano[4], Masakazu Sugiyama[1,4]

[1]Research Center for Advanced Science and Technology, the University of Tokyo, Tokyo, Japan, [2]Taiyo Nippon Sanso Corporation, Ibaraki, Japan, [3]National Institute of Advanced Industrial Science and Technology , Ibaraki, Japan, [4]School of Engineering, the University of Tokyo, Tokyo, Japan

C16 Smart Stacked Ingap/Gaas/Gaas//Si Quadruple-Junction Solar Cells

Takeyoshi Sugaya[1], Takeshi Tayagaki[1], Taketo Aihara[1], Kikuo Makita[1], Ryuji Oshima[1], Hidenori Mizuno[1], Takashi Nakamoto[1, 2], Yoshinobu Okano[2]

[1]National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan, [2]Tokyo City University, Tokyo, Japan

C17 Silicon Bottom Sub-Cell Optimization For Wafer-Bonded Iii-V On Si Multi-Junction Solar Cells

Laura Vauche, Elias Veinberg-Vidal, Thibaut Desrues, Adeline Lanterne, Marianne Coig, Frederic Milesi, Christophe Lecouvey, Christophe Morales, Christophe Jany, Karim Medjoubi, Pierre Mur

Univ. Grenoble Alpes, CEA, LETI, LITEN, INES, Grenoble, France

C18 Low-Temperature Grown Gallium Arsenide On Silicon By Using Migration-Enhanced Epitaxy

Yu-Cian Wang, Akio Yamamoto, Nobuaki Kojima, Yoshio Ohshida, Masafumi Yamaguchi

Toyota Technological Institute, Nagoya, Japan

C19 Enabling Low-Cost Iii-V/Si Integration Through Nucleation Of Gap On V-Grooved Si Substrates

Emily L. Warren[1], Emily A. Makoutz[1], Theresa Saenz[1], Maya Martirossyan[1], Amanda Matheson[2], Anica Neumann[1], Andrew G. Norman[1], Adele C. Tamboli[1], Jeramy D. Zimmerman[2], William E. McMahon[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Colorado School of Mines, Golden, CO, United States

C20 Broadband Reflectance Reduction For Wafer Bonded Iii-V//Si Tandem Cell Using Polydimethylsiloxane – Replicated Surface Texturing

Chuqi Yi[1], Fa-jun Ma[1], Hidenori Mizuno[2], Kikuo Makita[2], Takeyoshi Sugaya[2], Hidetaka Takato[2], Stephen Bremner[1], Anita Ho-Baillie[1]

[1]UNSW, Sydney, Australia, [2]National Institute of Advanced Industrial Science and Technology, Fukushima, Japan

D1 Effect Of Silicon Front Surface Doping Profile On Gap/Si Hetero-Structure For Iii-V/Gap/Si Multi-Junction Solar Cells

Chuqi Yi[1], Fa-jun Ma[1], Hamid Mehrvarz[1], Daniel Lepkowski[2], Jacob Boyer[2], Daniel Chmielewski[2], John Carlin[2], Steven Ringel[2], Tyler Grassman[2], Anita Ho-Baillie[1], Stephen Bremner[1]

[1]UNSW, Sydney, Australia, [2]Ohio State University, Columbus, OH, United States

D2 A Lattice-Matched Ganp/Si Three-Terminal Tandem Solar Cell

Yongjie Zou, Chaomin Zhang, Christiana Honsberg, Dragica Vasileska, Richard King, Stephen Goodnick

School of Electrical, Computer, and Energy Engineering, Arizona State University, Tempe, AZ, United States

D3 Alloy Loss Mitigation Through Barrier Layers During Cdcl2 Processing Of Cd0.60Zn0.40Te And Cd0.87Mg0.13Te

Carey L. Reich[1,3], Drew E. Swanson[1,2,3], Tushar Shimpi[1], Arthur Onno[2], Wyatt K. Metzger[3], Walajabad S. Sampath[1], Zachary C. Holman[2]

[1]Department of Mechanical Engineering, Colorado State University, Fort Collins, CO, United States, [2]School of Electrical, Computer, and Energy Engineering, Arizona State University, Tempe, AZ, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States

3:30 – 5:00 PM	Poster 3
Silicon Material: Feedstock, Wafers and Films	

Chair(s): Fiacre Rougieux

D4 Corrugation Architecture Enabled Ultra-Flexible Mono-Crystalline Silicon Solar Cells Via Plasma Etching And Laser Ablation

Rabab R. Bahabry[1,2], Adrian C. Sepulveda[2], Arwa T. Kutbee[2,3], Sohail F. Shaikh[2], Muhammad M. Hussain[2]

[1]Department of Physics, University of Jeddah, Al Faisaliah Campus, Jeddah 21589-80200, Saudi Arabia, [2]MMH Labs, Computer Electrical Mathematical Science and Engineering Division, King Abdullah University of Science and Technology (KAUST, Thuwal 23955-6900, Saudi Arabia, [3]Department of Physics, King Abdulaziz University (KAU), Jeddah 21589-80200, Saudi Arabia

D5 Experimental Investigation Of The Optimal Ingot Resistivity For Both The Cell Performances And The Temperature Coefficients For Different Cell Architectures

Charly Berthod[1], Sissel Tind S dergaard[1], Jan Ove Odden[2]

[1]University of Agder, Grimstad, Norway, [2]Elkem Solar AS, Kristiansand, Norway

D6 Hydrogen Related Bulk Defects In Float Zone Silicon Investigated Using A Shielded Hydrogen Plasma

Gabrielle Bourret-Sicotte[1], Phillip G Hamer[1,2], David Tweddle[1], Ruy S Bonilla[1], Peter R Wilshaw[1]

[1]The University of Oxford, Oxford, United Kingdom, [2]The University of New South Wales, Sydney, Australia

D7 Effect Of Wafer Position In Ingot On The Light And Elevated Temperature Induced Degradation (Letid) Of Multicrystalline Silicon

Daniel Chung[1], Catherine Chan[1], Bernhard Mitchell[1], Pietro P. Altermatt[2], Thorsten Trupke[1], Malcolm Abbott[1]

[1]School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Sydney, Australia, [2]State Key Laboratory of PV Science and Technology, Trina Solar, Changzhou, China

D8 Mitigating Optical Losses In Crystalline Silicon Thin-Film Solar Cells On Glass

David Eisenhauer, Bernd Rech, Christiane Becker

Helmholtz-Zentrum Berlin fuer Materialien und Energie GmbH, Berlin, Germany

D9 Silicon Heterojunction Solar Cells On Quasi-Mono Wafers

Jan Haschke[1], Maulid M. Kivambe[2], J g Horzel[3], Amir A. Abdallah[2], Brahim A・sa[2], Nouar Tabet[2], Matthieu Despeisse[3], Mathieu Boccard[1], Christophe Ballif[1,3]

[1]Photovoltaics and Thin-Film Electronics Laboratory (PV-lab), Institute of Microengineering, Ecole Polytechnique F鯨駻ale de Lausanne, Neuch穰el, Switzerland, [2]Qatar Environment and Energy Research Institute (QEERI), Hamad bin Khalifa University, Qatar Foundation, Doha, Qatar, [3]Swiss Center for Electronics and Microtechnology (CSEM), Neuch穰el, Switzerland

D10 Improvement Of An Intrinsic Silicon Nanoparticle Film By Press Treatment For Use In A P-I-N Solar Cell

Eiji Ichihara[1], Shinya Kato[1], Ryushiro Akaishi[2], Kazuhiro Gotoh[2], Yasuyoshi Kurokawa[2], Naoki Kishi[1], Tetsuo Soga[1]

[1]Nagoya Institute of Technology, Nagoya, Japan, [2]Nagoya University, Nagoya, Japan

D11 Evaluating Root Cause: The Distinct Roles Of Hydrogen And Firing In Activating Light- And Elevated-Temperature Induced Degradation

Mallory A. Jensen[1], Annika Zuschlag[2], Daniel Skorka[2], Sarah Wieghold[1], Ashley E. Morishige[1], Giso Hahn[2], Tonio Buonassisi[1]

[1]Massachusetts Institute of Technology, Cambridge, MA, United States, [2]University of Konstanz, Konstanz, Germany

D12 Production Of Low-Cost Silicon Films Via Molten Salt Electrodeposition

Li Ji[1,2], Xingli Zou[2], Jianbang Ge[2], Allen Bard[2], Edward Yu[1]

[1]Microelectronics Research Center, Department of Electrical and Computer Engineering, The

University of Texas at Austin, Austin, TX, United States, [2]Center for Electrochemistry,The University of Texas at Austin, Ausstin, TX, United States

D13 An Open Source Based Repository For Defects In Silicon

Mattias K. Juhl[1], Friedemann D. Heinz[2], Gianluca Coletti[3], Daniel Macdonald[4], Fiacre E. Rougieux[4], Florian Schindler[2], Tim Niewelt[2], Martin C. Schubert[2]

[1]UNSW, Sydney, Australia, [2]Fraunhofer ISE, Freiburg, Germany, [3]Energy Research Centre of the Netherlands, Petten, Netherlands, [4]The Australian National University, Canberra, Australia

D14 Improvement On Electrical Property Of Silicon Nanoparticle Film Prepared Via Hot Press Treatment

Shinya Kato, Shinsuke Kumagai, Caixeta Bonfim Gabriel, Eiji Ichihara, Naoki Kishi, Tetsuo Soga

Nagoya Institute of Technology, Nagoya, Japan

D15 Investigation Of Transparent Electrodes And Transparent/Opaque A-Si:H Solar Cells For Indoor Photovoltaics

Gayoung Kim[1,2], Myunghun Shin[3], Jung Wook Lim[1,2]

[1]Electronics and Telecommunications Research Institute, Daejeon, Korea, [2]University of Science and Technology, Daejeon, Korea, [3]Korea Aerospace University, Goyang-city, Korea

D16 Impact Of Rapid Firing Thermal Process To Meta-Stable Defects: Preformation Of The Letid And The Suppression Of B-O Defects

Moonyong Kim[1], Stuart Wenham[1], Veysil Unsur[2], Abasifreke Ebong[2], Brett Hallam[1]

[1]University of New South Wales, Sydney, Australia, [2]University of North Carolina at Charlotte, Charlotte, NC, United States

D17 Machine Learning For Automated Etch Pit Counting On As-Sliced Surface Of Multicrystalline Silicon

Takuto Kojima[1], Kohei Onishi[1], Atsushi Ogura[1], Kenji Fukui[2], Manabu Komoda[2], Junichi Atobe[2]

[1]Meiji University, Kawasaki, Japan, [2]Kyocera Corporation, Higashiomi, Japan

D18 Green Black Silicon Texturing For Multi-Crystalline Silicon Wafer

Chung-Wen Lan[1], Pei-Yu Sun[1], Pi-Chen Tsai[1], Hsiao-Ping Hsu[1], A. Sutejo[1], A. Yang[2]

[1]National Taiwan University, Taipei, Taiwan, [2]Solartech Energy Corp., Hsinchu County, Taiwan

D20 Infrared Blocking And Bifacial Transparent A-Si:H Solar Cells

Jung Wook Lim[1,2], Gayoung Kim[1,2], Myunghun Shin[3]

[1]Electronics and Telecommunications Research Institute, Daejeon, Korea, [2]University of Science and Technology, Daejeon, Korea, [3]Korea Aerospace University, Goyang, Korea

E1 Amorphous Si Tandem Solar Cells With Siox / Microcrystalline Si Heterojunction

Salvatore A. Lombardo[1], Cosimo Gerardi[2], Andrea Scuto[1], Marina Foti[3], Giuseppe Condorelli[2], Andrea Canino[2], Anna Battaglia[2]

[1]CNR-IMM, Catania, Italy, [2]EGP / 3SUN, Catania, Italy, [3]STMicroelectronics, Catania, Italy

E3 Improving The Interface Passivation Of Si Hj Solar Cells By Interrupted Deposition Of Thin A-Si:H Film

Ugochukwu J. Nsofor[1,2], Anishkumar Soman[1], Ujjwal Das[2], Steven Hegedus[1,2]

[1]Department of Electrical and Computer Engineering, University of Delaware, Newark, DE, United States, [2]Institute of Energy Conversion, University of Delaware, Newark, DE, United States

E4 Evaluation Of Lifetime Degradation Caused By Oxygen Precipitation Combined With Metal Contamination In Cz-Si For Solar Cells

Kouhei Onishi[1], Takuto Kojima[1], Kousuke Kinoshita[1], Yoshio Oshita[2], Atsushi Ogura[1]

[1]Meiji University, Kawasaki, Japan, [2]Toyota Technological Institute, Nagoya, Japan

E5 Two Terminal Si Based Tandem Junction Solar Cells For A High Efficiency

Jinjoo Park[1], Sangho Kim[2], Pham duy Phong[1], Kyongsu Lee[3], Byoungkuk Kim[3], Junsin Yi[1]

[1]College of Information and Communication Engineering, Sungkyunkwan University, Suwon, Korea, [2]Department of Energy Science, Sungkyunkwan University, Suwon, Korea, [3]Kyungdong Photovoltaic Energy Co., Ltd, Changwon, Korea

E6 Investigating The Role Of Hydrogen In Letid In Multicrystalline Silicon

Utkarshaa Varshney, Malcolm D. Abbott, Shaoyang Liu, Chandany Sen, Daniel Chen, Moonyong Kim, David N.R. Payne, Stuart R. Wenham, Bram Hoex, Catherine Chan

University of New South Wales, Sydney, Australia

E7 High Quality Cz Mono Wafers For High Efficiency Solar Cells

YICHUN(YC) WANG, Rui Zhou, Tian Xie

LONGi Green Energy Technology Corp., Ltd, Xi'an, China

E8 Effect Of Co2/Sih4 Flow Rate Ratio On P-Type Hydrogenated Microcrystalline Silicon Oxide For Semi-Transparent Thin Film Silicon Solar Cell

Jo-Hwa Yang[1], Myunghun Shin[2], Jung-Dae Kwon[1]

[1]Korea Institute of Materials Science, Changwon, South Korea, [2]Korea Aerospace University, Goyang, South Korea

E9 Reduction Of Light Induced Degradation By P-Type C-Si Wafer Quality Control In Industrial Perc Production

Chang Youn Yoo, Jong Youb Lim, Jisun Kim, Keunkee Hong, Eunjoo Lee, Dong Seop Kim

Shinsung E&G, Gyeonggi-do, South Korea

E10 Understanding The Interface Properties Of Tunneling Ald Aluminum Oxide Layers Applied On Crystalline Silicon Solar Cells

Kortan ∃ğ▪ma, Kristopher O. Davis, Winston V. Schoenfeld

, , FL, United States

3:30 – 5:00 PM	Poster 4
Cells/Devices	

Chair(s): Yoshihiro Hishikawa

E11 A Methodology To Obtain System-Specific Thermal Response Coefficients For Use In Pvsyst

Mike Anderson, Ben Bourne

SunPower, Richmond, CA, United States

E12 Toward The Standardization Of The Car-Roof Pv □ Challenge To The 3-D Sunshine Modeling And Rating Of The 3-D Continuously Curved Pv Panel

Kenji Araki[1], Yasuyuki Ota[2], Kensuke Nishioka[2], Hiromi Tobita[3], Liang Ji[4], George Kelly[5], Masafumi Yamaguchi[1]

[1]Toyota Technological Institute, Nagoya, Japan, [2]University of Miyazaki, Miyazaki, Japan, [3]Japan Electrical Safety and Environmental Technology, Tokyo, Japan, [4]UL, Northbrook, IL, United States, [5]Sunset Technology, Mount Airy, NC, United States

E13 A Comparative Evaluation Of Figures Of Merit Of Different Technology Pv Modules In Kolkata---------- An Approach Based On Solar Geometry

Sudipta Basu Pal[1], Rahul Kumar[2], Konika Das Bhattacharya[1], Dipankar Mukherjee[2], Hiranmay saha[3], Partha Chaudhuri[3]

[1]Electrical Engineering Dept,Indian Institute of Engineering Science and Technology, Shibpur, HOWRAH, India, [2]Electronics And Telecommunication Engineering,Indian Institute of Engineering Science and Technology, Shibpur, HOWRAH, India, [3]Centre of Excellence for Green Energy and Sensor Systems,IIEST,Shibpur, HOWRAH, India

E14 Inspecting Series Resistance Effects And Bypass Diode Failure Using Contactless Outdoor Photoluminescence Imaging

Raghavi Bhoopathy, Oliver Kunz, Mattias Juhl, Thorsten Trupke, Ziv Hameiri

University of New South Wales, Kensington, Australia

E15 Approximating The Determination Of The Spectral Responsivity Of Solar Cells

Karsten Bothe[1], David Hinken[1], Tobias Gandy[1], Ingo Ahrens[1], Carsten Schinke[1,2]

[1]1Institute for Solar Energy Research Hamelin (ISFH), Emmerthal, Germany, [2]Leibniz Universit舩 Hannover, Hannover, Germany

F3 An Improved Oblique Asymptote Method For Parameters Identification Of Pv Panels

Wei Chen[1], Idris Li Hong Lim[1]

[1]University of Glasgow, Glasgow, United Kingdom, [2]University of Glasgow, Singapore, United Kingdom

E16 Towards True Contactless Outdoor Luminescence Of Silicon Photovoltaic Modules With Inhomogeneous Small Area Excitation Source

Bernd Doll[1,2,3], Jakob Kornhas[1], Johannes Hepp[1,2,3], Claudia Buerhop[1], Christian Camus[1,3], Jens Hauch[1], Christoph J. Brabec[1,3]

[1]Bavarian Center for Apllied Energy Research, Erlangen, Germany, [2]Graduate School in Advanced Optical Technologies, Erlangen, Germany, [3]Materials for Electronics and Energy Technology, Friedrich-Alexander-Universit舩 Erlangen-N・nberg, Erlangen, Germany

E17 Photoluminescence Imaging Induced By Laser Line Scan: A Study For Outdoor Field Inspections

Gisele A. dos Reis Benatto[1], Mingjun Chi[1], Beniamino Iandolo[2], Rasmus S. Davidsen[2], Nicholas Riedel[1], Adrian A. Santamaria Lancia[1], Ole Jensen[1], Sune Thorsteinsson[1], Peter B. Poulsen[1]

[1]Department of Photonics Engineering, Technical University of Denmark, Roskilde, Denmark, [2]Department of Micro- and Nanotechnology, Technical University of Denmark, Lyngby, Denmark

E18 Outdoor Electroluminescence Acquisition Using A Movable Testbed

Gisele A. dos Reis Benatto[1], Nicholas Riedel[1], Adrian A. Santamaria Lancia[1], Sune Thorsteinsson[1], Peter B. Poulsen[1], Claire Mantel[1], S en Forchhammer[1], Anders Thorseth[1], Carsten Dam-Hansen[1], Kenn H. B. Frederiksen[2], Jan Vedde[3], Michael Larsen[4], Henrik Voss[4],

Harsh Parikh[5], Sergiu Spataru[5], Dezso Sera[5]

[1]Department of Photonics Engineering, Technical University of Denmark, Roskilde, Denmark, [2]Kenergy, Horsens, Denmark, [3]SiCon Silicon & PV consulting, Birker , Denmark, [4]Sky-Watch A/S, Nordjylland, Denmark, [5]Aalborg University, Aalborg, Denmark

E19 Evaluations Of Wind Effect On Pv Module By Non-Uniform Mechanical Loads System And Mean-Surface Pressure Pattern

Shu-Tsung Hsu, Chin Lien

ITRI, Hsinchu, Taiwan

E20 Submission Category : Characterization Techniques For Pv Modules And Systems Title: Evaluation Of Pv Module Outdoor Degradation Rate By Means Of I-V Curve Fitting With De And Linear Interpolation Method

Yoshiro Izumi, Yuzuru Ueda

Tokyo University of Science, Tokyo, Japan

F1 *In-Situ* Determination Of Moisture Diffusion Properties Of Pv Module Encapsulants Using Digital Humidity Sensors

Marko Jankovec[1], Eleonora Annigoni[2], Christophe Ballif[2,3], Marko Topič[1]

[1]University of Ljubljana, Faculty of Electrical Engineering, Laboratory of Photovoltaics and Optoelectronics, Ljubljana, Slovenia, [2]Ecole Polytechnique F鋓駸ale de Lausanne (EPFL), Institute of Microengineering (IMT), Photovoltaics and Thin Film Electronics Laboratory, Neuch穣el, Switzerland, [3]CSEM, PV-center, Neuch穣el, Switzerland

F2 Feature Extraction, Supervised And Unsupervised Machine Learning Classification Of Pv Cell Electroluminescence Images

Ahmad Maroof Karimi[1,3], Justin S. Fada[1], JiQi Liu[1,2], Jennifer L. Braid[1,2], Mehmet Koyuturk[3], Roger H. French[1,2]

[1]SDLE, Case Western Reserve University, Cleveland, OH, United States, [2]Department of Material Science Engineering, Case Western Reserve University, Cleveland, OH, United States, [3]Department of Electrical Engineering and Computer Science, Case Western Reserve University, Cleveland, OH, United States

F4 Evaluation Emerging Pv Performance Rating Under Indoor Lighting Simulator

Yean-San Long, En-Yun Wang, Teng-Chun Wu, Chin Lien

1Center for Measurement Standards, Industrial Technology Research Institute, Hsinchu, Taiwan

F5 Intelligent Solar Cell Carrier (Isc&Sup2;) For Solar Cell Calibration Standards

Colin J Mann, Don Walker, John C Nocerino, Justin H Lee

The Aerospace Corporation, El Segundo, CA, United States

F6 Correcting For Perspective Distortion In Electroluminescence Images Of Photovoltaic Panels

Claire Mantel[1], Sergiu Spataru[2], Harsh Parikh[2], Dezso Sera[2], Gisele A. dos Reis Benatto[1], Nicholas Riedel[1], Sune Thorsteinsson[1], Peter B. Poulsen[1], S en Forchhammer[1]

[1]Technical University of Denmark, Lyngby, Denmark, [2]Aalborg University, Aalborg, Denmark

F7 Efficiency Improvement Of Photovoltaic Cells By Cooling Using Peltier Effect

Octavio N疔era Ruiz[1], Irving Uriel Mart匡ez Gamboa[1], Sergio Sellschopp S疣chez[1,2], Guillermo Santana Rodr刕uez[3], Germ疣 Escalante Notario[2], Carlos 扜lvarez Mac傚s[1,2]

[1]Instituto Tecnol ico de la Laguna, Tecnologico Nacional de M騨ico, Torre , Mexico, [2]Unidad Especializada en Energ傚s Renovables (UEER), Tecnol ico Nacional de M騨ico., Torre , Mexico, [3]Instituto de Investigaciones en Materiales, Universidad Nacional Aut oma de M騨ico., Ciudad de M騨ico, Mexico

F8 Solar Simulator Uniformity Characterization Using A Spectroradiometer

John C Nocerino, Don Walker, Simon H Liu

The Aerospace Corporation, El Segundo, CA, United States

F9 Determination Of Empirical Coefficients And ΔT For Sandia Thermal Model: Dependence On Backsheet Type

Jaewon Oh, Ashwini Pavgi, Govindasamy Tamizhmani

Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States

F10 Enhancement Of Electroluminescence (EI) Image Measurements For Failure Quantification Methods

Harsh R. Parikh[1], Sergiu Spataru[1], Dezso Sera[1], Giselle A. Dos Reis Benatto[2], Nicholas Rediel[2], Peter B. Poulsen[2], Claire Mantel[2]

[1]1, Aalborg, Denmark, [2]2, Roskilde, Denmark

F11 Differences In Field Performance Of Cdte And Si, A Global Assessment

Ian Marius Peters[1], Haohui Liu[2], Thomas Reindl[2], Tonio Buonassisi[1]

[1]Massachusetts Institute of Technology, Cambridge, MA, United States, [2]Solar Energy Research Institute of Singapore, Singapore, Singapore, [3]Solar Energy Research Institute of Singapore, Singapore, Singapore, [4]Massachusetts Institute of Technology, Cambridge, MA, United States

F12 Electroluminescence Based Metrics To Assess The Impact Of Cracks On Photovoltaic Module Performance

Eric J. Schneller[1,2], Rafaela Frota[1], Andrew M. Gabor[3], Jason Lincoln[1,2], Hubert Seigneur[1,2], Kristopher O. Davis[1,2]

[1]University of Central Florida, Cocoa, FL, United States, [2]Florida Solar Energy Center, Orlando, FL, United States, [3]BrightSpot Automation, Westford, MA, United States

F13 Energy Yield Performance Of Monofacial, Bifacial And Thin-Film Pv Modules

Markus Schweiger, Johanna Bonilla, Werner Herrmann

TUV Rheinland Energy GmbH, Cologne, Germany

F14 Single Framework Characterization For Predicted And Actual Performance For Photovoltaic Power Plants

Stephen Voss, Nathan Zorndorf, Matthew Brocklehurst

Power Factors, Larkspur, CA, United States

F15 Detailed Modeling Recombination In Pid-Affected N-Type Mono-Crystalline Silicon Solar Module

Pan Zhao[1], Xiaobao Ju[2], Xiaoli Cheng[3], Chuanke Chen[3], He Wang[3], Hong Yang[3], Hongtao Li[4], Yinghua Dong[4]

[1]SPIC Xi'an Solar Power Co., Ltd, Xi'an, China, [2]Xi'an Huanghe Photovoltaic Technology Co., Ltd, Xi'an, China, [3]Xi誕n Jiaotong University, Xi'an, China, [4]China Electric Power Research Institute, Xi'an, China

3:30 – 5:00 PM	Poster 5

Perovskite Materials and Devices

Chair(s): Bert Conings

F16 Active Materials And Interfaces For Stable Perovskite Solar Cells

Antonio Abate

Helmholtz-Center Berlin, Berlin, Germany

F17 Cesium Lead Halide Perovskite Quantum Dot Deposition On Gaas Substrates By Dip Coating

Jefril M Amboy[1,3], Bernice Mae F Yu Jeco[1,2], Haibin Wang[1], Takumi Kinoshita[1], Zacharie Jehl Li-Kao[1], Yasushi Shoji[1], Nazmul Ahsan[1,2], Takaya Kubo[1,2], Yoshitaka Okada[1,2]

[1]Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, Tokyo, Japan, [2]Department of Advanced Interdisciplinary Studies, The University of Tokyo, Tokyo, Japan, [3]Graduate School of Engineering, Mapua University, Manila, Philippines

F18 Investigations Of Nanopyramid Coatings On Perovskite Solar Cell For Performance Enhancement Purpose

Linda Y. Chen[1,2], Maan M. Alkaisi[1,2]

[1]Electrical and Computer Engineering, University of Cantebury, Christchurch, New Zealand, [2]The MacDiarmid Institute for Advanced Materials and Nanotechnology, Wellington, New Zealand

F19 Profiling Light Absorption Enhancement In Textured Perovskite Solar Cells Based On Two-Dimensional Priodic Tio_2 Nanobump

Ming Chen[1], Frank Liu[1,2]

[1] Shaanxi Normal University, Xi'an, China, [2]Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, China

F20 Improved Performance Of Perovskite Solar Cells Using Solvent Engineering Of Triple Solvents

Lai-Su Gau[1], Chen-Wei You[2], Chie Gau[3]

[1]National Taiwan University, Taipei, Taiwan, [2]National Cheng Kung University, Tainan, Taiwan, [3]National Cheng Kung University, Tainan, Taiwan

G1 Enhanced Performance Of Perovskite Solar Cells With Crystallization Of Active Layer By Dripping Of Mixed Nonsolvents

Lai-Su Gau[1], Rui-Xin Huang[2], Chie Gau[3]

[1]National Taiwan University, Taipei, Taiwan, [2]National Cheng Kung University, Tainan, Taiwan, [3]National Cheng Kung University, Tainan, Taiwan

G2 Solution Processing Of $Ch_3Nh_3Pbi_3$ In Hfe Solvents.

Mehedhi Hasan[1], Aureliano Perez[2], Swaminathan Venkatesan[2], Dmitry Lyashenko[1], Jason Slinker[3], Alex Zakhidov[1,2]

[1]MSEC, Texas State University, San Marcos, TX, United States, [2]Physics, Texas State University, San Marcos, TX, United States, [3]Physics, University of Texas at Dallas, Richardson, TX, United States

G3 Exploring The Recombination Mechanism Induced By Carrier Transport Layers On Perovskite Solar Cells

Dhruba B. KHADKA[1,2], Yasuhiro SHIRAI[1], Masatoshi YANAGIDA[1], Kenjiro MIYANO[1]

[1]National Institute of Materials Science (NIMS), Tsukuba, Japan, [2]International Center for Young Scientists (ICYS), Tsukuba, Japan

G4 Layer By Layer Deposition Of $Cspbi_3$ Perovskite: Device Optimization And Characterization

Ranjith Kottokkaran, Harshavardhan A Gaonkar, Istiaque Hossain, Max Noack, Vikram L Dalal

Iowa State University, Ames, IA, United States

G5 3D Imaging Compositional Map In One-Step Growth Of $Ch_3Nh_3Pbi_3$ With Cadmium Addition

Nicole A. Kotulak[1], Zahrah S. Almutawah[2], Suneth C. Watthage[2], Adam Phillips[2], Dewei Zhao[2],

Keith Knipling[1], Phillip P. Jenkins[1], Robert J. Walters[1], Yanfa Yan[2], Michael J. Heben[2], Woojun Yoon[1]
[1]US Naval Research Laboratory, Washington, DC, United States, [2]University of Toledo, Toledo, OH, United States

G6 Gallium (Iii) Acetylacetonate As Additive In Highly Performance Perovskite Solar Cells

Wenzhe Li[1], Cuiling Zhang[2], Chong Liu[1], Jiandong Fan[1], Yaohua Mai[1], Ruud I. E. Schropp[3]
[1]Jinan University, Guangzhou City, China, [2]Hebei University, Baoding City, China, [3]Utrecht University, Utrecht City, Netherlands

G8 First Principles Study Of Intrinsic And Extrinsic Point Defects In Lead-Based Hybrid Perovskites

Arun Kumar Mannodi Kanakkithodi[1], Ji-Sang Park[1], Duyen H. Cao[2], Nari Jeon[2], Alex F. Martinson[2], Maria K.Y. Chan[1]
[1]Center for Nanoscale Materials, Argonne National Laboratory, Argonne, IL, United States, [2]Materials Science Division, Argonne National Laboratory, Argonne, IL, United States

G9 Zero-Dimensional Perovskite-Like $(Ch_3Nh_3)_3Bi_2I_9$ Thin Films For Photovoltaics

Calum McDonald[1], Chengsheng Ni[2], Micka・ Lozac檀[1], Davide Mariotti[3], Vladimir 革rček[1]
[1]AIST, Tsukuba, Japan, [2]University of St Andrews, St Andrews, United Kingdom, [3]Ulster University, Belfast, United Kingdom

G10 Importance Of Modification Of Perovskite/Transport-Layer Interfaces For Efficient And Hysteresis-Free Planar-Perovskite Solar Cell

Prasanti Nandikolla, Sushobhan Avasthi
Center for Nano Science and Engineering, Bangalore, India

G11 Cryo-Controlled Nucleation Method For High-Efficiency Perovskite Solar Cells

Annie Ng[1,2], Zhiwei Ren[2], Shen Qian[2], Sin Hang Cheung[3], Aleksandra B. Djuri喚ć[4], Shu Kong Su[3], Gang Li[2], Charles Surya[5]
[1]Department of Electrical and Computer Engineering, School of Engineering, Nazarbayev University, Astana, Kazakhstan, [2]Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong, Hong Kong, [3]Department of Physics, Hong Kong Baptist University, Hong Kong, Hong Kong, [4]Department of Physics, The University of Hong Kong, Hong Kong, Hong Kong, [5]School of Engineering, Nazarbayev University, Astana, Kazakhstan

G12 Application Of Experimentally Determined Acoustic Impedance Ratio For Homogeneous Co-Evaporation Of Perovskite Absorbers

Raphael Niepelt[1], Sascha J. Wolter[1], Marta Tatarzyn[1], Marvin Diederich[1], Verena Steckenreiter[1], Tobias Wietler[1], Robby Peibst[1,2], Sarah Kajari-Schr er[1]
[1]Institute for Solar Energy Research Hamelin (ISFH), Emmerthal, Germany, [2]Institute of Electronic Materials and Devices, Leibniz Universit舩 Hannover, Hannover, Germany

G13 Highly Efficient Planar Perovskite Solar Cells Exploiting A Compact Tio2/Anatase Tio2 Single Crystalline Nanoparticles Electron Transport Bilayer

Md Shahiduzzaman[1,2], Hiroto Ashikawa[3], Mizuki Kuniyoshia[1], Tetsuya Kaneko[3], Shinjiro Umezu[4], Tetsuhiro Katsumata[1], Satoru Iwamori[3], Tetsuya Taima[2], Masato Kakihana[5], Masao Isomura[3], Koji Tomita[1]
[1]Department of Chemistry, Faculty of Science, Tokai University, Kanagawa, Japan, [2]Institute for Frontier Science Initiative (InFiniti), Kanazawa University, Kanazawa, Japan, [3]Graduate School of Engineering, Tokai University, Kanagawa, Japan, [4]Department of Modern Mechanical Engineering, Waseda University, Tokyo, Japan, [5]Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, Japan

G14 Vapor Induced Recrystallization Of Methylammonium Tin Iodide Perovskite For Enhanced Stability

Akash Singh , Sushobhan Avasthi
Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore, India

G15 Formamidinium + Cesium Lead Triiodide Perovskite Thin Films: Optical Properties And Devices

Biwas Subedi, Lei Guan, Yue Yu, Krian Ghimire, Prakash Uprety, Yanfa Yan, Nickolas Jacob

Podraza

University of Toledo, Toledo, OH, United States

G16 On The Defect Tolerance Of Lead–Halide Perovskites &Ndash; The Example Of Bismuth Impurities

Wolfgang Tress

EPFL, Lausanne, Switzerland

G17 Magnetic Field Driven Larger Grain Growth For Perovskite Film With Enhanced Photovoltaic Performance

Haoxu Wang, Jie Lei, Fei Gao, Zhou Yang, Dong Yang, Jiexuan Jiang, Juan Li, Xihong Hu, Shengzhong (Frank)Liu

Shaanxi Key Laboratory for Advanced Energy Devices, Shaanxi Engineering Laboratory for Advanced Energy Technology, School of Materials Science and Engineering, Shaanxi Normal University, Xi誕n 710119, China, Xi'an, China

G18 Development Of Perovskite Solar Cell Using Graphene As A Hole Transport Layer And A Blocking Layer

Sho Watanabe, Ryousuke Ishikawa, Hiroki Nishida, Takahiro Nomoto, Nozomu Tsuboi

Niigata University, Niigata, Japan

G19 Morphological Planarization Of Perovskite Absorbers Using A Phenyl–C61–Butyric Acid Methyl Ester

Saemon Yoon[1], Tae–Jun Ha[2], Dong–Won Kang[1]

[1]Chung–Ang University, Seoul, South Korea, [2]Kwangwoon University, Seoul, South Korea

G20 3D–2D–0D Interface Profiling For Record Efficiency Cspbbri$_2$ Perovskite Solar Cells

Jingru Zhang, Dongliang Bai , Zhiwen Jin, Hui Bian, Kang Wang, Shengzhong Liu

Shaanxi Engineering Lab for Advanced Energy Technology School of Materials Science & Engineering, S, Xi誕n, China

H1 Progress In Realizing Efficient Four–Terminal And Two–Terminal All–Perovskite Tandem Solar Cells

Dewei Zhao[1], Changlei Wang[1], Cong Chen[1], Zhaoning Song[1], Kai Zhu[2], Yanfa Yan[1]

[1]Department of Physics and Astronomy and Wright Center for Photovoltaics Innovation and Commercialization, The University of Toledo, Toledo, OH, United States, [2]Chemistry and Nanoscience Center, National Renewable Energy Laboratory, Golden, CO, United States

H2 Sputtered Zno Films As Electron Transport Layers For Efficient Planar Perovskite Solar Cells

Wenjing Zhao, Dapeng Wang, Shengzhong (Frank) Liu

School of Materials Science & Engineering, Shaanxi Normal University, Xi誕n, China

3:30 – 5:00 PM	Poster 6
PV Module, BIPV, Power Electronic, Energy Storage and Management	

Chair(s): Radovan Kopecek

H3 Inverter Grid Tie – Three-Phase Voltage Inverter In Reconfigurable Hardware For Photovoltaic Systems With Power Management

Carlos Magno Ara任o

PWM Automation and Protection, Sao Paulo, Brazil

H4 A Grid Connected Single Phase Transformerless Buck-Boost Based Inverter Which Can Control Two Solar Pv Arrays Simultaneously

Subhendu Dutta, Kishore Chatterjee

Indian Institute of Technology Bombay, Mumbai, India

H5 Evaluating Electrical Outputs Of A Pv-T System In Jordan

Issa Etier[1], Salem Nijmeh[2], Mohammed Shdiefat[2], Omar Al-Obaidy[2]

[1]Department of Electrical Engineering, The Hashemite university, Zarqa, Jordan, [2]Department of Mechanical Engineering, The Hashemite University, Zarqa, Jordan

H6 Dsm Innovative Endurance Backsheet Outdoor Validation In Hot And Humid Climate

Milica Mrcarica[1], Peter Tummers[2], Kurt van Durme[1], Prem Pathak[3], Imco Goudswaard[1], Annet Hoek[1]

[1]DSM Innovation Center, Geleen, Netherlands, [2]DSM Material Science Center, Geleen, Netherlands, [3]DSM Engineering Plastics, Pune, India

H7 Sub-Area 8.2: System Design, Optimization And Performance Energy Yield Of Bifacial Module Technologies And Yield Estimation Methods By Rule Of Thumb

Andre Richter

H8 Reducing Electricity Consumption With Photovoltaic Modules System Application By Using Hybrid System

Rocky Alfanz[1,2], Andreas Agus Widodo[2]

[1]Kumamoto University, Kumamoto, Japan, [2]University of Sultan Ageng Tirtayasa, Serang, Indonesia

H9 Duramat: The Durable Module Materials Consortium

Teresa M. Barnes[1], Margaret Gordon[2], David Ginley[1], Mark Hartney[3], Anubhav Jain[4], Kevin Leung[2], Michael F. Toney[3], Peter Hacke[1], Bruce King[2], Michael Woodhouse[1]

[1]NREL, Golden, CO, United States, [2]Sandia, Albuquerque, NM, United States, [3]SLAC, Palo Alto, CA, United States, [4]LBNL, Berkeley, CA, United States

H10 Advanced Encapsulation Technology For Reduced Costs, High Durability And Significantly Improved Manufacturability

Kurt L. Barth, James Morgante, W. S. Sampath, Tushar Shimpi, Larry Maple

Colorado State University, Next Generation PV Center, Fort Collins , CO, United States

H11 Recycling And Reuse Potential Of Nice Pv-Modules 2.5.0.0

Roland Einhaus[1], Fr鹹駸ic Madon [1], Julien Degoulange[1], Karsten Wambach[2], Julius Denafas[3], Francisco Rodriguez Lorenzo[4], Tamara Delago Garcia[4], Axier Boller[5]

[1]Apollon Solar, Lyon, France, [2]bifa Umweltinstitut GmbH, Augsburg, Germany, [3]UAB Soli Tek, Vilnius, Lithuania, [4]AIMEN, Porrino, Spain, [5]INGESEA, Elgoibar, Spain

H12 Field Study Of Factors Influencing Performance Of Pv Modules In Buildings (Bipv/Bapv) Installed In Uae

Ammar Elnosh, Hind Al-Ali, Jim J John, Aaesha Alnuaimi, Edwin R Ubinas, Marco Stefancich, Pedro Banda

Research & Development Center, Dubai Electricity and Water Authority (DEWA), Dubai, United Arab Emirates

H13 Optimal Location Of Pv Powered Smart Charging Facilities With Energy Storage

Preetham Goli[1], Michael Umeano[2], Shah Rikesh[2], Shireen Wajiha[2]

[1]University of Missouri Kansas City, Kansas City, MO, United States, [2]University of Houston, Houston, TX, United States

H14 Ampere: An European Project Aimed To Decrease The Levelized Cost Of Energy With Innovative Heterojunction Bifacial Module Solution Ready For The Market

Massimo Izzi[1], Mario Tucci[1], Paola Delliveneri[1], Marco Balucani[2], Cosimo Gerardi[4], Anna Battaglia[4], Sandra Scalari[3], Fabrizio Bizzarri[3], Benjamin Strahm[5], Christofer Ballif[6], Delfina Mugnoz[7], Pierre Jean Riberon[7], Mattieu Despeisse[6], Joachen Rentsch[8], Jean-francois Leirat[7], Bruno Meltzer[9]

[1]Enea, Rome, Italy, [2]Universit□ La Sapienza, Rome, Italy, [3]ENEL, Rome, Italy, [4]3SUN, Catania, Italy, [5]MBR, Hauterive, Switzerland, [6]EPFL, Lausanne , Switzerland, [7]CEA-Ines, Chamb駑y, France, [8]F-ISE, Freiburg, Germany, [9]J&R, Berlin, Germany

H15 Hybrid String Inverter With Energy Storage For Grid Independent Power System

Md Tanvir Arafat Khan[1], Takahiro Tanaka[1], Benjamin Tan[1], Ruben Dagstanyan[1], John Borland[2]

[1]Tabuchi Electric Company of America Ltd, San Jose, CA, United States, [2]J.O.B Technologies, Aiea, HI, United States

H16 Evaluation Of Anti-Glare Coating Glass For Photovoltaic Modules

Tae-Hyung Kim, Yongki Min, Ju-ho Choi, Chung-Hyun Kim, In-Ae Kim, Eun-joo Lee, Dong-seop Kim

R&D center Solar R&D Team, Shinsung E&G co., Ltd., 108-73, Hansam-ro, Daeso-myeon, Eumseong-gun, Chungcheongbuk-do, 27676, South Korea

H17 Study Of Ethylene Vinyl Acetate (Eva) Films Used In Photovoltaic Modules

Rahul Kumar, Shashwata Chattopadhyay, Chetan Singh Solanki, Sarita Zele, Parag Bhargava

National Centre for Photovoltaic Research and Education (NCPRE),Indian Institute of Technology Bombay, Powai, Mumbai, India , Mumbai, India

H18 Analysis Of Color And Current Density For A-Si:H Thin-Film Solar Cell Employing Transparent Multilayer Electrodes

Jaesung Lee[1], Sangah Lee[1], Yoojeong Lee[1], Myunghun Shin[2], Gayoung Kim[2], Jungwook Lim[2], JohwaYang Yang[3], JungDae Kwon[3]

[1]Korea Aerospave University, Goyang, South Korea, [2]Universit of Science and Technology and ETRI, Daeseon, South Korea, [3]Korea Institute of Materials Science, Cahngwon, South Korea

H19 Analysis Of Building Performance And Power Generation Performance For Components Of Bipv System Through Mock-Up Demonstration

Seungjoon Lee[1], Jungjin Choi[2]

[1]Korea Conformity Laboratories(KCL), Jincheon-gun, Korea, [2]Korea Conformity Laboratories (KCL), Jincheon-gun, Korea

H20 Analysis And Implementation Of Boost Pfc With Different Cores

Hsuan Liao[1], Sheng-Ping Wang[1], Jiann-Fuh Chen[1], Hsueh-Ko Liao[2]

[1]Department of Electrical Engineering, National Cheng-Kung University,, Tainan City, Taiwan, [2]FSP Technology Inc., Kaohsiung Branch. FSP Group. 2-3, East 3rd Street N.E.P.Z. P.O. Box 35-25, , Kaohsiung City, Taiwan

I1 Open-Source Technologies And Iot As A Tool For Meeting The Challenge Of Mass-Scale Solar Home Systems Monitoring In Developing Countries

Ascensi L ez Vargas[1], Manuel Fuentes Conde[1,2], Marta Vivar Garc僦[2]

[1]IMDEA Water Institute, Alcal□ de Henares, Spain, [2]Grupo IDEA, Universidad de Ja駭, Ja駭, Spain

I2 On The Application Of Iot For Real-Time Monitoring Of Small Stand-Alone Pv Systems: Results From A New Smart Datalogger

Ascensi L ez Vargas[1], Manuel Fuentes Conde[1,2], Marta Vivar Garc僦[2]

[1]IMDEA Water Institute, Alcal□ de Henares, Spain, [2]Grupo IDEA, Universidad de Ja駭, Ja駭, Spain

I3 A Comparison Of Three Optimizing Control Strategies Applied To Pv/T Systems

Danny Luarte, Ruben Pe , Daniel Sbarbaro

Universidad de Concepcion, Concepcion, Chile

I4 Evaluation Of A Single Inductor Based Single-Input Dual-Output Buck Converter For Dc Microgrid Applications

Muhammad S Malik, Hassan A Khan, Nauman Zaffar

Dept. of Electrical Engineering, LUMS, Lahore, Pakistan

I5 Absorber Considerations For H-3 Betavoltaic Devices

S. I. Maximenko[1], J. E. Moore[2], C Affouda[1], P. P. Jenkins[1], R. J. Walters[3]

[1]Naval Research Laboratory, Washington, DC, United States, [2]The George Washington University, Washington, DC, United States, [3]Formerly of Naval Research Laboratory, Washington, DC, United States

I6 Building Integrated Photovoltaic Systems Claim Just 1% Share Of Photovoltaic Installations Worldwide Even After Over Three Decades Of Existence. System Performance Falls Under One Of The Major Challenges Faced By This Niche Technology. Thus, The Performance Of A Bipv System Installed At The University Of Fort Hare Was Monitored For A Period Of Nine Months. The Results Reveal Up To 13 % Difference In Temperature Readings For Modules On The East And The West Sides Of The Array. Also, The Adhesive Used To Bind Adjacent Modules Was Noticed To Be Major Cause Of Numerous Steps On The I-V Curves Measured.

Edson Meyer[1], Carine Buma[2], Raymond Taziwa[3]

[1]1, Alice, South Africa, [2]2, Alice, South Africa, [3]3, Alice, South Africa

I7 Performance Of A Building Integrated Photovoltaic System Installed At The University Of Fort Hare Institute Of Technology, South Africa

Meyer L Meyer, Carine L Buma, Raymond T Taziwa

University of Fort Hare, Institute of Technology, Alice, South Africa

I8 Impact Of Battery Sizing On Self-Consumption, Self-Sufficiency And Peak Power Demand For A Low Energy Single-Family House With Pv Production In Sweden

Patrik Ollas[1], Jon Persson[1], Caroline Markusson[1], Usama Alfadel[2]

[1]RISE Research Institutes of Sweden (RISE), Bor蚶, Sweden, [2]Soliga Energi, Karlstad, Sweden

I9 All Copper Nice Modules

Dirk Reinwand[1], Damian Pysch[2], Norbert Bay[2], John Burschik[2], Holger Kuehnlein[2], Frederic Madon[3], Roland Einhaus[3], Andreas Brand[4], Varun Arya[4], Benjamin Smith[1], Danilo Richter[1], Daniel Kray[1]

[1]Institute for Energy Systems Technology INES, University of Applied Sciences, Offenburg, Germany, [2]RENA Technologies GmbH, Freiburg, Germany, [3]APOLLON SOLAR, Lyon, France, [4]Fraunhofer ISE, Freiburg, Germany

I10 Synchronization Of Solar Stand-Alone Devices And Autonomous Energy Management Through Solar Time Measurements

Adrian A. Santamaria Lancia[1], Nicholas Riedel[1], Rasmus Overgaard Ploug[2], Sune Thorsteinsson[1], Peter Behrensdorff Poulsen[1], Gisele A. dos Reis Benatto[1]

[1]Technical University of Denmark, Department of Photonics Engineering, Roskilde, Denmark, [2]Technical University of Denmark, Department of Electrical Engineering, Kgs. Lyngby, Denmark

I11 Test Platform For Photovoltaic Systems With Integrated Battery Energy Storage Applications

Sergiu V. Spataru, Jo縊 Martins, Daniel I. Stroe, Dezso Sera

Aalborg University, Aalborg, United States

I12 Design And Implementation Of A Novel Bidirectional Dc-Dc Converter With Coupled Inductor

Sheng-Ping Wang, Hsuan Liao, Jiann-Fuh Chen

Department of Electrical Engineering, National Cheng-Kung University, Tainan, Taiwan

I13 Pvsites: Supporting Large-Scale Market Uptake Of Building-Integrated Photovoltaic Technologies

Ingrid Weiss[1], Maider Machado[2], Simon Challet[1], Eduardo Roman[2]

[1]WIP Renewable Energies, Munich, Germany, [2]Tecnalia, San Sebastian, Spain

I14

Multiphysics Simulation Of Induction Soldering Process
Ulli Zeller, Michael Lohmeier, Matthias Pander, Dominik Lausch
Fraunhofer Center for Silicon Photovoltaics CSP, Halle (Saale), Germany

I15 Prediction And Validation Of Cell-To-Module And Environmental Losses Based On Refractive Index Data For Various Encapsulation Materials
Shiwen Zhang, Nitin Nampalli, David N. Payne, Alexander Slade, Matthew B. Edwards
University of New South Wales, Sydney, Australia

I16 The Need For A New Parameter On Pv Modules Datasheet: Shading Tolerability
Hesan Ziar, Sandeep Mishra, Olindo Isabella, Miro Zeman
Delft University of Technology, Delft, Netherlands

I17 Effect Of Glass Texturing On The Efficiency Improvement Of A Silicon Heterojunction Solar Cell Module
Hyeongsik Park[1], Myunghun Shin[2], Youn-Jung Lee[3], Youngjun Kim[4], Jaesung Lee[5], Changkyun Park[6], Junsin Yi[7]
[1]College of Information and Communication Engineering, Sungkyunkwan University (SKKU), Suwon, Korea, [2]School of Electronics, Telecommunications and Computer Engineering, Korea Aerospace University (KAU), Goyang, Korea, [3]College of Information and Communication Engineering, Sungkyunkwan University (SKKU), Suwon, Korea, [4]College of Information and Communication Engineering, Sungkyunkwan University (SKKU), Suwon, Korea, [5]School of Electronics, Telecommunications and Computer Engineering, Korea Aerospace University (KAU), Goyang, Korea, [6]JUSUNG Engineering Co. Ltd., Gwangju, Korea, [7]College of Information and Communication Engineering, Sungkyunkwan University (SKKU), Suwon, Korea

K12 Bifacial Modules: Indoor And Outdoor Measurements And Some Requirements For Correct Simulation Of Energy Generation
Lev Kreinin, Asher Karsenti, Dov Grobgeld, Naftali Eisenberg

3:30 – 5:00 PM	Poster 7
Field Studies	

Chair(s): Juzer Vasi

I18 Development Of Low-Cost, Crack-Tolerant Metallization For Solar Cells

Omar K Abudayyeh[1], Cayla Nelson[2], Andre Chavez[1,2] , John Chavez [2], Sang M Han[1,2]

[1]Osazda Energy LLC, Albuquerque, NM, United States, [2]University of New Mexico, Albuquerque, NM, United States

I19 Bifacial Technology Performance Compared With Three Commercial Monofacial Pv Technologies Under Outdoor High Irradiance Conditions At The Atacama Desert

Paulo Ayala[1], Constanza Mu z[1], Natalia Osorio[1], Catalina Hernandez[1], Fernando Zurita[1], Victor Gutierrez[1], Gonzalo Ramirez[1], Patricio Valdivia[1], Fernando Mancilla[1], Felipe Cuevas[3], Pablo Ferrada[2], Patricio Valdivia[1]

[1]Fraunhofer Chile, Santiago, Chile, [2]University of Antofagasta, Antofagasta, Chile, [3]Chilean Solar Committee – CORFO, Santiago, Chile

I20 Root-Cause And Failure Analysis Of Solar Modules In A Solar Power Plant

Dharmappa Barki

Road no.10,Banjara Hills , Hyderabad, India

J1 Formation Of Hotspots On Healthy Pv Modules And Their Effect On Output Performance

Pallavi Bharadwaj[1], Kaustubh Karnataki[2], Vinod John[1]

[1]Indian Institute of Science, Bangalore, India, [2]KTH Royal Institute of Technology, Stockholm, Sweden

J2 Pv Module Fault Detection Using Integrated Magnetic Sensors

Marjila Burhanzoi[1], Alfanz Rocky[1], Tomoaki Ikegami[1], Shinji Kawai[2]

[1]Kumamoto University, Kumamoto, Japan, [2]Industrial Technology Center of SAGA, Saga, Japan

J3 Application Of Bayseian Belief Network In Non-Conventional Energy Sources To Improve Performance And Reliability.

AMIT CHANDRA

J4 Comparison Between Estimated And Actual Power Generation Amounts Of Photovoltaic Modules At Tosu City In Japan

Yasuo Chiba[1], Tetsuyuki Ishii[2], Ritsuko Sato[1], Sungwoo Choi[1], Atsushi Masuda[1]

[1]National Institute of Advance Industrial Science and Technology, Tosu, Japan, [2]Central Research Institute of Electric Power Industry, Yokosuka, Japan

J5 Aerial Infrared Thermography Of A Utility-Scale Pv Power Plant After A Meteorological Tsunami In Brazil

Aline K. V. de Oliveira[1], Mohammadreza Aghaei[2], Uzoma E. Madukanya[2], Lucas R. do Nascimento[1], Ricardo Ruther[1]

[1]Universidade Federal de Santa Catarina, Florian olis, Brazil, [2]University of Freiburg, Freiburg im Breisgau, Germany

J6 Investigation Of Poor Performing Pv Modules Observed In All-India Survey Of Pv Module Reliability 2016

Rajiv Dubey[1], Shashwata Chattopadhyay[1], Sachin Zachariah[1], Vivek Kuthanazhi[1], Sugguna Rambabu[1], Sonali Bhaduri[1], Hemant K Singh[1], Anil Kottantharayil[1], Chetan S. Solanki[1], Brij M. Arora[1], K. L. Narasimhan[1], Birinchi Bora[2], O.S. Sastry[2], Narendra Shiradkar[1], Juzer Vasi[1]

[1]National Centre for Photovoltaic Research and Education, Indian Institute of Technology Bombay, Mumbai, India, [2]National Institute for Solar Energy, Ministry of New and Renewable Energy, Gurugram, India

J7 Characterisation Of The Shunt Resistance Due To Potential Induced Degradation (Pid) In Crystalline Solar Cells

Michalis Florides, George Makrides, George E. Georghiou

PV Technology Laboratory, FOSS Research Center of Sustainable Energy, Department of Electrical and Computer Engineering, University of Cyprus, Nicosia, Cyprus

J8 Long Term Testing Over 6 Years On Crystalline Silicon Solar Modules With Snail Trails

Wenshuang He[1], Jin Yang[1], Liang Lei[2], Chuanke Chen[1], Hong Yang[1], He Wang[1], Mingchang Ding[3], Shuangqing Zhang[3]

[1]Xi誕n Jiaotong University, Xi'an, China, [2]Shaanxi Photovoltaic Solar Power-generation Co., LTD, Yulin, China, [3]China Electric Power Research Institute, Beijing, China

J9 A Comparison Of Capacity Test Standards; Which Yields More Consistent Results Despite User Bias?

Leah Holton[1], Heidi Larson[1], Mark Reusser[1], Sarah Kurtz[2], Kevin Mayer[3], Chris Deline[4]

[1]ICF, Denver, CO, United States, [2]UC Merced, Merced, CA, United States, [3]Sol Systems, Washington, DC, United States, [4]NREL, Golden, CO, United States

J10 Annual Degradation Rates Of Recent C-Si Pv Modules Under Subtropical Coastal Climate Conditions

Tetsuyuki Ishii[1], Sungwoo Choi[2], Ritsuko Sato[2], Yasuo Chiba[2], Atsushi Masuda[2]

[1]Central Research Institute of Electric Power Industry, Yokosuka-shi, Japan, [2]National Institute of Advanced Industrial Science and Technology, Tosu-shi, Japan

J11 Pv Module Recycling Solution And Module Defects In The Field

Masafumi Ito, Taisuke Doi

NPC Incorporated, Tokyo, Japan

J12 Estimating Degradation Rates From 27 Different Pv Modules Installed In Desert Conditions Using The Nrel/Rdtools

Jim J John, Aaesha Alnuaimi, Ammar Elnosh, Marco Stefancich, Pedro Banda

Dubai Electricity and Water Authority, Dubai, United Arab Emirates

J13 Comparative Review Of High Resolution Monitoring Versus Standard Inverter Data Acquisition For A Single Photovoltaic Power Plant

C Birk Jones[1], Benjamin H. Ellis[2], Joshua S. Stein[1], Joseph Walters[3]

[1]Sandia National Lab, Albuquerque, NM, United States, [2]Lawrence Berkeley Laboratory, Berkeley, CA, United States, [3]Florida Solar Energy Center, Cocoa, FL, United States

J14 Power Estimation Of Photovoltaic System Using 4 And 5-Parameter Solar Cell Models Under Real Outdoor Conditions

Manish Kumar, Arun Kumar

Indian Institute of Technology Roorkee, Roorkee, India

J15 Study On Failure Models And Degradation Rate Of Pv Aged Modules In Field In China

Hailing Li[1,2], Fang lv[1]

[1]The key Laboratory of Solar Thermal Energy and Photovoltaic system, Institute of Electrical Engineering, CAS, beijing, China, [2]University of Chinese Academy of Sciences(UCAS), Beijing, China, [3]nstitute of Electrical Engineering, CAS

J16 The Neutral Point Shift Of Module String And Delamination Caused By Potential-Induced-Degradation In 50 Mwp Photovoltaic Power Plant

Hongtao Li[1], Tianrun Yang[2], Jingsheng Huang[1], Chuanke Chen[3]

[1]China Electric Power Research Institute, Beijing, China, [2]Huazhong University of Science & Technology, Wuhan, China, [3]Xi'an Jiaotong University, Xi'an, China

J17 Comparison Of Photovoltaic Degradation Rates In Tropical Climate Derived From Different Calculation Methods

Amornrat Limmanee[1], Sasiwimon Songtrai[1], Nuttakan Udomdachanut[1], Songpakit Keawniyompanit[2], Yukinobu Sato[3], Masaki Nakaishi[3], Songkiate Kittisontirak[1], Kobsak Sriprapha[1], Yukitaka Sakamoto[3]

[1]NECTEC NSTDA, Pathumtani, Thailand, [2]Thai Tabuchi Electric Co., Ltd., Chachoengsao, Thailand, [3]Tabuchi Electric Co., Ltd., Osaka, Japan

J18 Failure Diagnosis Of Short- And Open-Circuit Fault Conditions In Pv Systems

Andreas Livera, Michalis Florides, Marios Theristis, George Makrides, George E. Georghiou

University of Cyprus, Nicosia, Cyprus

J19

Effect Of Aluminum Back Plate On Pv Module Temperature And Performance.

Pratik Dhananjay Mundle[1], Shaswata Chattopadhyay[1], Chetan Singh Solanki[1], Narendra Shiradkar[1], Anil Kottantharayil[1], K.L. Narasimhan[1], Juzer Vasi[1], B.K. Chakravarthy[2]

[1]National Center of Photovoltaic Research and Education, Mumbai, India, [2]Industrial Design Centre Indian Institute of Technology Bombay, Mumbai, India

J20 Binary Classification Of Defective Solar Photovoltaic Modules Using Thermography

Kamran A K Niazi[1,2], Wajahat Akhtar[3], Hassan A. Khan[1], Sarmad Sohaib[2], Ahmad K Nasir[1]

[1]Dept. of Electrical Engineering, LUMS, Lahore, Pakistan, [2]University of Eng. & Technology, Taxila, Pakistan, Taxila, Pakistan, [3]University of Heriot Watt, Edinburgh, United Kingdom

K1 A Quantitative Assessment Based On Field Survey Of 40 Small-Scale Photovoltaic System

Wonwook Oh, Nochang Park

Korea Electronics Technology Institute, Seongnam, Korea

K2 Iot Based, Inexpensive System For Large Scale, Wireless, Remote Temperature Monitoring Of Photovoltaic Modules

Sweta Priyadarshi[1,2], Narendra Shiradkar[2]

[1]Manipal Institute of Technology, Manipal, India, [2]National Centre for Photovoltaic Research and Education, Indian Institute of Technology Bombay, Mumbai, India

K3 Case Study On Degradation Of 8-Year-Old Bipv Modules In Bangalore,India

Roshan R Rao, Monto Mani

Indian Institute of Science, Bangalore, India

K4 Introducing &Lsquo;Pearl-Pv&Rsquo;: Performance And Reliability Of Photovoltaic Systems: Evaluations Of Large-Scale Monitoring Data

Angele Reinders[1], David Moser[2], Wilfried Van Sark[3], Gernot Oreski[4], Nicola Pearsall[5], Alessandra Scognamiglio[6], Jonathan Leloux[7]

[1]University of Twente, Enschede, Netherlands, [2]EURAC, Bolzano, Italy, [3]Utrecht University, Utrecht, Netherlands, [4]PCCL, Leoben, Austria, [5]Northumbria University, Newcastle upon Tyne, United Kingdom, [6]ENEA, Portici, Italy, [7]UPM, Madrid, Spain

K5 Degradation Of Pv Modules In The Field From Across The Globe

Kaushik Roy Choudhury[1], William J Gambogi[1], Thomas Felder[1], Lucie Garreau-Iles[2], Hongjie Hu[3], Torence J Trout[1]

[1]DuPont Co, Wilmington, DE, United States, [2]Du Pont de Nemours International S.A., Geneva, Switzerland, [3]DuPont (China) Research& Development and Management Co., Ltd., Shanghai, China

K6 Degradation Analysis Of Pv Modules After Long-Term Exposure In Florida

Eric J. Schneller[1,2], Onkar Shinde[1,2], Neelkanth G. Dhere[1,2], Kristopher O. Davis[1,2]

[1]University of Central Florida, Orlando, FL, United States, [2]Florida Solar Energy Center, Cocoa, FL, United States

K7 Pv Lifetime Project: Measuring Pv Module Performance Degradation: 2018 Indoor Flash Testing Results

Joshua S Stein[1], Charles Robinson[1], Bruce King[1], Chris Deline[2], Steve Rummel[2], Bill Sekulic[2]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

K8 Evaluation Of Photovoltaics Module Performances Using Novel Data-Driven I-V Feature Extraction Method

Menghong Wang[1], Xuan Ma[2], Wei-Heng Huang[1], Jiqi Liu[1], Alan J. Curran[1], Erdmut Schnabel[3], Michael K l[3], Kristopher O. Davis[4], Jenn Brynjarsd tir[2], Jennifer L. Braid[1], Roger H. French[1]

[1]SDLE Research Center, Case Western Reserve University, Cleveland, OH, United States, [2]Department of Mathematics, Applied Mathematics and Statistics, Case Western Reserve University, Cleveland, OH, United States, [3]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg im Breisgau, Germany, [4]Materials Science and Engineering, University of Central Florida, Orlando, FL, United States

K9 Spatio-Temporal Model Of Fielded Photovoltaic Backsheet Degradation

Yu Wang[1], Wei-heng Huang[1], Andrew Fairbrother[2], Camille Loyer[3], Adam Hauser[3], Scott Julien[4], Xiaohong Gu[2], Gregory S. O`Brien[3], Liang Ji[5], Kenneth P. Boyce[5], Michael D. Kempe[6], Kai-tai Wan[4], Roger H. French[1], Laura S. Bruckman[1]

[1]Case Western Reserve Univeristy, Cleveland, OH, United States, [2]National Institute of Standards and Technology, Gaithersburg, MD, United States, [3]Arkema, Inc., King of Prussia, PA, United States, [4]Northeastern University, Boston, MA, United States, [5]Underwriter痴 Laboratories Inc., Northbrook, IL, United States, [6]National Renewable Energy Laboratory, Golden, CO, United States

K10 Sub&Shy;Area 9.1: Reliability Field Experience Lifetime Extension Of Photovoltaic Modules By Influencing The Module Temperature Using Phase-Change Material

Daniel Weber, Mohammad Iffat Rafsan Jani, Matti Grabo, Oliver Wallscheid, Joachim B ker, Tobias Klaus, Stefan Krauter

1,2,3,4,5,6,7, Paderborn, Germany

K11 Analysis Of Junction Recombination Of P-Type Single Crystalline Silicon Solar Modules Affected By Potential Induced Degradation Under Non-Stc

Junjun Zhang[1], Shuwen Guo[2], Pan Zhao[3], Chuanke Chen[2], He Wang[2], Hong Yang[2], Jingsheng Huang[1], Hongtao Li[1], Yinghua Dong[1]

[1]State Key Laboratory of Operation and Control of Renewable Energy & Storage Systems, China Electric Power Research Institute, Beijing, China, [2]Xi誕n Jiaotong University, Xi'an, China, [3]SPIC Xi'an Solar Power Co., Ltd, Xi'an, China

5:30 – 7:30 PM	Grand Promenade
Welcome Reception	

5:30 – 7:00 PM	Lagoon Lanai
Women in PV Networking Event	

7:30 – 9:00 PM	Monarchy Plenary
International Special Session	

Chair(s): Masafumi Yamaguchi

7:30 Introduction And Overview Of ″Tw Workshop Ii″
Masafumi Yamaguchi[1], Sarah Kurtz[2]
[1]Toyota , [2]University of California Merced

8:35 Panel Discussion
Larry Kazmerski[1], Arno Smets[2]
[1]NREL, [2]UT Delft

Tuesday, June 12, 2018

8:20 – 8:30 AM	Monarchy Plenary
Highlights and Announcements	

8:30 – 9:00 AM	Monarchy Plenary
High Efficiency Perovskite–silicon Tandem Solar Cells	

Chair(s): Karin Hinzer

9:00 – 9:30 AM	Monarchy Plenary
Perovskite Solar Cells	

Chair(s): Nicole Kotulak

9:30 – 10:00 AM	Monarchy Plenary
The Role of Solar Photovoltaic in Decarbonisation Scenarios: Estimated Market Size by Region and Possible Impact on Power Grids	

Chair(s): Ms. Izumi Kaizuka

10:00 – 10:30 AM	Grand Promenade
Coffee Break	

10:30 – 12:00 PM	Poster 1
Absorber Preparation 2	

Chair(s): Xiaojing Hao

A1 Current&Ndash;Voltage Characteristics Of Co–Evaporated Cu(In, Ga)Se2 Thin Film With Various Cu Content

JACKSON BWEUPE[1], SANG YONG PARK[1], JONG HOON PARK[1], SO MANG PARK[1], JONG EUN PARK[2], DONG GUN LIM[1,2]

[1]DEPARTMENT OF IT CONVERGENCE, CHUNGJU, South Korea, [2]DEPARTMENT OF ELECTRONIC ENGINEERING, CHUNGJU, South Korea

A2 Area–Selective Electrodeposition Of Cu(In,Ga)Se_2 Micro Islands For Micro–Concentrator Solar Cells

David Correia[1], Daniel Siopa[2], Pedro M.P. Salom□[1], Sara Tombolato[2], Kamal Abderrafi[1], Finn Babbe[2], Diego Colombara[1], Pedro Anacleto[1], Phillip J. Dale[2], Sascha Sadewasser[1]

[1]INL – International Iberian Nanotechnology Laboratory, Braga, Portugal, [2]University of Luxembourg, Luxembourg, Luxembourg

A3 $(Ag_XCu_{1-X})_2Znsn(S,Se)_4$ Thin–Films Prepared By Spray Pyrolysis: The Influence Of The Ag Concentration

Lazari Dermenji[1], Leonid Bruc[1], Galina Gurieva[2], Maxim Guc[1], Nicolai Curmei[1], Dormidont A. Sherban[1], Alexei V. Simashkevich[1], Susan Schorr[2,3], Ernest Arushanov[1]

[1]Institute of Applied Physics, Chisinau, Moldova, [2]Helmholtz–Zentrum Berlin f• Materialien und Energie, Berlin, Germany, [3]Institute of Geological Sciences, Free University Berlin, Berlin, Germany

A4 Solution Processed Cztsse Thin Film Solar Cell Absorber: Ink Formulation And Characterization

Dattatray Dhawale[1], Abhishek Lokhande[2], Marie Buffiere[1], Adnan Ali[1], Yahya Zakaria[1]

[1]Qatar Environment and Energy Research Institute (QEERI), Hamad Bin Khalifa University,

Qatar Foundation, P.O. Box: 34110, Doha, Qatar., Doha, Qatar, [2]Optoelectronics Convergence Research Centre, Department of Materials Science and Engineering, Chonnam National University, Gwangju 500-757, South Korea. , Gwangju, South Korea

A5 Over 10% Efficient Copper Zinc Tin Sulfoselenide Solar Cells From Dmso Solution Using Sncl4 As Precursor

Yuancai Gong, Shaotang Yu, Hao Xin

Key Laboratory for Organic Electronics and Information Displays, Institute of Advanced Materials (IAM), Jiangsu National Synergetic Innovation Center for Advanced Materials (SICAM), Nanjing University of Posts & Telecommunications, Nanjing, China

A6 Structural And Optoelectronic Characterization Of (Ag_XCu_{1-X})Znsnse4 Solid Solution

Galina Gurieva[1], Alexandra Franz[1], Jos□ M疵quez Prieto[1], Thomas Unold[1], Susan Schorr[1,2]

[1]Helmholz Zentrum Berlin, Berlin, Germany, [2]Freie Universit舩 Berlin, Berlin, Germany

A7 Ultra-Thin Solar Cells Of Cds/Cdte As Processed By The Magneto-Planar-Sputtering (Mps) Technique.

K. Gutierrez Z-B[1], P. G. Zayas-Baz疣[1], F. de Moure-Flores[2], D. Jim駭ez-Olarte[1], J. Sastr□-Hern疣dez[1], J. R. Aguilar-Hern疣dez[1], C. Mej儆-Garc儆[1], A. Morales-Acevedo[3], G. Contreras-Puente[1]

[1]Escuela Superior de F嫈ica y Matem疸ica del IPN, Ciudad de M騙ico, Mexico, [2]Facultad de Qu匆ica-Materiales, Universidad Aut oma de Quer騁aro, Quer騁aro, Mexico, [3]Centro de Investigaci y de Estudios Avanzados del IPN, Departamento de Ingenier儆 El道trica, Ciudad de M騙ico, Mexico

A8 Blue Cdte Surface Obtained By $Cdcl_2$ Thermal Treatment And Their Performance On Cdte Solar Cell

Cesar Hernandez Vasquez[1], Maria L. Albor Aguilera[1], Miguel A. Gonzalez Trujillo[2], Jose M. Flores Marquez[3], Salvador Gallardo Hernandez[4], Gerardo S. Contreras Puente[1]

[1]Instituto Politecnico Nacional-ESFM, CDMX, Mexico, [2]Instituto Politecnico Nacional-ESCOM, CDMX, Mexico, [3]Instituto Politecnico Nacional-ESIQIE, CDMX, Mexico, [4]CINVESTAV, CDMX, Mexico

A9 Self-Selecting Vapor Growth Of Bulk Sb_2Se_3 Crystals For Fundamental Studies

Theodore D C Hobson, Oliver S Hutter, Ken Durose

Stephenson Institute for Renewable Energy, University of Liverpool, Liverpool, United Kingdom

A10 Residual Stress Analysis Of A Cu_2Znsns_4 Thin Film

Sungwook Hong[1], Chan Kim[2]

[1]Daegu University, Gyeongsan, South Korea, [2]Kyungpook National University, Daegu, South Korea

B1 Understanding The Effect Of Cadmium Alloying In High-Efficiency Sulphide Kesterite $Cu_2Zn_XCd_{1-X}$Sns4 Solar Cell By Pds And Hrstem

Jialiang Huang, Chang Yan, Karwen Sun, Fangyang Liu, Martin Green, Xiaojing Hao

UNSW, Sydney, Australia

B2 10.3% Efficient Cuin(S,Se)2 Solar Cells From Dmf Molecular Solution With The Absorber Selenized Under High Argon Pressure

Jingjing Jiang, Shaotang Yu, Yuancai Gong, Hao Xin

Institute of Advanced Materials (IAM), Jiangsu National Synergetic Innovation Center for Advanced Materials (SICAM), Nanjing University of Posts & Telecommunications, Nanjing, China

B3 Properties Of Tin-Sulfide Films Formed By Annealing Process Of Sn Thin-Film With Sulfur Powder

Chan Kim[1], Sungwook Hong[2]

[1]Kyungpook National University, Daegu, South Korea, [2]Daegu University, Gyeongsan, South Korea

B4 Controlled Thermo-Mechanical Delamination Of Polycrystalline Thin-Film Solar Cells

Deborah L McGott[1,2], Michael D. Kempe[1], Nick Bosco[1], Teresa M. Barnes[1], Nancy M. Haegel[1], Colin A. Wolden[2], Matthew O. Reese[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Colorado School of Mines, Golden, CO, United States

B5 Advanced Co-Sublimation Hardware For Deposition Of Graded Ternary Alloys In Thin-Film Applications

Amit H. Munshi[1], Jason M. Kephart[1], Davis R. Hemenway[1], Carey L. Reich[1], Tushar M. Shimpi[1], Ali Abbas[2], Kevan C. Cameron[1], Adam H. Danielson[1], Kurt L. Barth[1], John M. Walls[2], Walajabad S. Sampath[1]

[1]Colorado State University, Fort Collins, CO, United States, [2]Loughborough University, Loughborough, United Kingdom

B6 Synthesis And Characterization Of Selenized Stacked Cigse Layers By Co-Evaporation Technique

Ganesh Regmi, Jorge sergio Narro Rios, Onyekachi Michael Nwakanma, Velumani Subramaniam

Secci de Electr ica del Estado S ido (SEES), Departamento de Ingenier傚, Centro de Investigaci y de Estudios Avanzados del Instituto Polit嶊nico Nacional (CINVESTAV-IPN), Mexico city, Mexico

B7 Experimental Study On Band Gap Discrepancies Of Sputtered Cu2Znsn(S,Se)4 Thin Films: Using Different Characterization Techniques

Brajendra S. Sengar[1], Vivek Garg [1], Shailendra Kumar [2], C. Mukherjee [3], Shaibal Mukherjee [1]

[1]Hybrid Nanodevice Research Group (HNRG), Electrical Engineering, Indian Institute of Technology (IIT) Indore, Indore-453552, India , Indore, India, [2]Raja Ramanna Center for Advanced Technology, Indore-452013, India, Indore, India, [3]Optical coatings Laboratory, RRCAT, Indore, 452 013, India and Homi Bhabha National Institute, Training School Complex, Anushakti Nagar, Mumbai, 400 094, India., Indore, India

B8 A Comparison Of Organic Back Contact Materials For Cdte Solar Cells

Thomas P Shalvey, Laurie J Phillips, Ken Durose, Jonathan D Major

Stephenson Institute for Renewable Energy, University of Liverpool, Liverpool, United Kingdom

B9 Structure And Phase Composition Of Sputter Deposited (Ag,Cu)(In,Ga)Se_2 Thin Film Solar Cells

Sina Soltanmohammad[1], Jake Wands[1], Rouin Farshchi[2], Dmitry Poplavskyy[2], Angus Rockett[1]

[1]Metallurgical and Materials Science Dep., Colorado School of Mines, , Golden, CO, United States, [2]MiaSole Hi-Tech Corp, Santa Clara, CA, United States

B10 Comparison Of Secondary Phase Formation In $Cu_2Znsnse_2$ Thin Film Fabricated On A Glass And Ti Foil By Solid State Selenization

Yujin SONG[1], Soo Yeon Lim[2], Tharith Sriv[2], Hyeon Sik Cheong[2], Chan-wook Jeon[1]

[1]Yeungnam University, Gyeongsan, Korea, [2]Sogang University, Seoul, Korea, [3]Sogang University, Seoul, Korea, [4]Sogang University, Seoul, Korea, [5]Yeungnam University, Gyeongsan, Korea

B11 Towards 9% Sulfide Czts Solar Cells Fabricated By A Sol-Gel Process

Kaile Sun, Chang Yan, Fangyang Liu, Xiaojing Hao

UNSW, SYDNEY, Australia

B12 Electronic Properties Of Solution-Processed Cu(In,Ga)$(S,Se)_2$ Solar Cells Using Metal Chalcogenides And Amine-Thiol Solvent Mixtures

Sona Ulicna[1], Mustafa Togay[1], Martin Bliss[1], Vincent Tsai[1], Lewis D. Wright[1], Jamie Lowe[1,2], Andrei V. Malkov[2], John M. Walls[1], Jake W. Bowers[1]

[1]CREST, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, Loughborough, United Kingdom, [2]Department of Chemistry, School of Science, Loughborough University, Loughborough, United Kingdom

B13 Preparation Of $Aggate_2$ Layers On Mo/Glass Substrate By Two-Step Closed Sublimation And Its Application To Solar Cells

Aya Uruno[1], Masakazu Kobayashi[1,2]

[1]Waseda University, Dept. of Elec. Eng. & Biosci., Tokyo, Japan, [2]Waseda University, Kagami Mem. Res. Inst. for Mat. Sci. & Technol., Tokyo, Japan

B14 Enhancement In The Pec Performance Of Cdte Thin Films Using Acetate-Based Ionic Liquid Bath

Manmohansingh G Waldiya, Dharini K Bhagat, Indrajit Mukhopadhyay

Solar Research & Development Centre, Department of Solar Energy, Pandit Deendayal Petroleum University, Gandhinagar, India

B15 Fabrication Of Sb_2S_3 Planar Thin Film Solar Cells With Closed-Space Sublimation Method

Yiyu Zeng [1], Fangyang Liu[1], Martin Green[1], Xiaojing Hao[1]

[1]university of new south wales, Sydney, Australia, [2]university of new south wales, Sydney, Australia, [3]university of new south wales, Sydney, Australia, [4]university of new south wales, Sydney, Australia

B16 Structure And Properties Of Radio-Frequency Magnetron Sputtered La Doped Basno3 Thin Films On 7059 Glass

Yufeng Zhang[1], Qiuchen Wu[1], Congyan Li[2], Tao Tang[1], Yuhang Liu[1], Xiangxin Liu[1]

[1]institute of electrical engineering, chinese academy of sciences, Beijing, China, [2]College of Material Science and Engineering, Beijing Institute of Petrochemical Technology, Beijing, China

B17 Morphology Modification Of Sn And Zn Metal Thin Films Applied For Cztse Solar Cell: The Effect Of Pulse Current Electrodeposition

Zhaojing Zhang[1], Qing Gao[1], Jianping Ao[1], Liyong Yao[2], Jinlian Bi[1], Shoushuai Gao[1], Ming-Jer Jeng[3], Guozhong Sun[1], Zhiqiang Zhou[1], Fangfang Liu[1], Yi Zhang[1], Yun Sun[1]

[1]Institute of Photoelectronic Thin Film Devices and Technology, Tianjin Key Laboratory of Thin film Devices and Technology, Nankai University, Tianjin, China, [2]Tianjin Institute of Power Source, Tianjin, China, [3]Department of Electronic Engineering, Chang Gung University, Taoyuan, Taiwan

10:30 – 12:00 PM	Poster 2
III-V Solar Cells and CPV	

Chair(s): Matthew Escarra

B18 A Thin And Light Plastic Integrated Cpv Module With Low Temperature Mounting Process Using Induction Heating Technology

Michihiko Takase, Shutetsu Kanayama, Masaharu Terauchi, Nobuhiko Hayashi, Hikaru Nishitani, Takuji Inohara, Youichirou Aya, Bunji Mizuno

Connected Solutions Company, Panasonic Corporation, Kadoma City, Osaka , Japan

B19 Shockley-Queisser Triangle: An Elegant Analytical Tool For Predicting The Thermodynamic Efficiency Limits Of Multi-Junction Tandem And Bifacial Cells With Arbitrary Concentration And Series Resistance

Muhammad A Alam

Purdue University, West Lafayette, IN, United States

C4 Designing A Heterojunction N+ On P Gasb Thermophotovoltaic Cell With Hydrogenated Amorphous Silicon Interface Passivation

Lewis Fraas[1], Liangliang Tang[2], Yi Zhang[2]

[1]JX Crystals Inc, Issaquah, WA, United States, [2]Hohai University, Nanjing, China

C5 Increased Performance Of Thin-Film Gaas Solar Cells With Improved Rear Interface Reflectivity

Natasha Gruginskie[1], Federica Cappelluti[2], Maarten van Eerden[1], Ariel P. Cedola[2], Gerard J. Bauhuis[1], Peter Mulder[1], Elias Vlieg[1], John J. Schermer[1]

[1]Radboud University, Nijmegen, Netherlands, [2]Politecnico di Torino, Turin, Italy

C6 Analysis And Control Of Deep-Level Defects In Dilute Nitride Semiconductor Gainnassb

Yilun He[1], Naoya Miyashita[2], Yoshitaka Okada[1, 2]

[1]School of Engineering, the University of Tokyo, Tokyo, Japan, [2]Research Center for Advanced Science and Technology (RCAST), the University of Tokyo, Tokyo, Japan

C7 Design Of Bragg Reflector In Gainp/Gainas/Ge Triple-Junction Solar Cells For Spectrum Splitting Applications

Yajie Jiang, Mark Keevers, Martin Green

University of New South Wales, Sydney, Australia

C11 Achieving High Efficiency Static Low-Concentration Photovoltaic Module Using Hybrid Lens Arrays

Kan-Hua Lee, Kenji Araki, Masafumi Yamaguchi

Toyota Technological Institute, Naogya, Japan

C12 Growth Of Tellurium Doped Broadband (Al_XGa_{1-X})Inp/Algaas (X=0.7) Tunnel Junction

Xinyi Li, Hongbo Lu, Wei Zhang

State Key Laboratory of Space Power-sources, Shanghai, China

C13 Epitaxial Lift-Off Of High-Quality Pixelated Thin-Film Gasb Solar Cells

Vijay Saradhi Mangu, Emma Renteria, Sadhvikas Addamane, Ganesh Balakrishnan, Francesca Cavallo

The University of New Mexico, Albuquerque, NM, United States

C14 Growth Temperature Optimization Of Interfacial Misfit Technique For Growth Of Gasb Subcells On Gaas Substrates

Ahmad Mansoori[1], Sadhvikas J Addamane[1], Emma J Renteria[1], Darryl M Shima[1], Ehsan Vadiee[2], Christiana Honsberg[2], Ganesh Balakrishnan[1]

[1]University of New Mexico, Albuquerque, NM, United States, [2]Arizona State University, Tempe, AZ, United States

C15 Maximizing Tandem Solar Cells Performances Using Novel Optimization Techniques

Sherif Michael, Ray Kilway

Naval Postgraduate School, Monterey, CA, United States

C16 Accurate And Low Cost Sun Pointing Detector Unit For Application In Concentrator Photovoltaic Tracking Control System (Cpv)

Alessandro Minuto, Gianluca Tim□

RSE, Piacenza, Italy

C17 Quantitative Loss Analysis Of Voltage Output Characteristics On Multi-Junction Solar Cells

Tetsuya Nakamura[1,2], Lin Zhu[3,4], Masahiro Yoshita[5], Mitsuru Imaizumi[1], Hidefumi Akiyama[3,4], Yoshitaka Okada[2]

[1]Japan Aerospace Exploration Agency, Tsukuba, Japan, [2]Research Center for Advanced Science and Technology, University of Tokyo, Meguro-ku, Japan, [3]Institute for Solid State Physics, University of Tokyo, Kashiwa, Japan, [4]AIST-UTokyo OPERANDO-OIL, University of Tokyo, Kashiwa, Japan, [5]National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

B20 Optical Simulation Of Two-Shell Spherical Lens For Microtracking Cpv System

Masakazu Nakatani[1,2], Novoru Yamada[1]

[1]Nagaoka Univercity of Technology, Nagaoka,Nigata, Japan, [2]Sun Marion Co., Ltd., Nagaoka,Nigata, Japan

C18 Design And Analysis Of A Cpv Retrofit For Parabolic Trough Powerplants

Todd P Otanicar[1], Matthew Orosz[1], Rhetta Wingert[1], Kendall Yetter[1], Clay McPheeters[2], Paul Sharps[2]

[1]The University of Tulsa, Tulsa, OK, United States, [2]SolAero Technologies, Albuquerque, NM, United States

C19 Investigation Of Antimonide-Based Semiconductors For High-Efficiency Multi-Junction Solar Cells

St駱hanie Parola[1,2], Alexandre Vauthelin[1,2], Fr馼駸ic Martinez[1,2], Julie Tournet[1,2], Joanna Kret[1,2], Etienne Quesnel[3], Yves Rouillard[1,2], Eric Tourni□[1,2], Yvan Cuminal[1,2]

[1]Univ. Montpellier, IES, UMR5214, Montpellier, France, [2]CNRS, IES, UMR5214, Montpellier, France, [3]Univerist□ Grenoble-Alpes, CEA, Grenoble, France

C20 Characterization Of Sigesn For Use As A 1 Ev Sub-Cell In Multi-Junction Solar Cells

Phoebe M Pearce[1], Thomas Wilson[1], Andrew D Johnson[2], Nicholas J Ekins-Daukes[1, 3]

[1]Department of Physics, Imperial College London, South Kensington Campus, London, United Kingdom, [2]IQE plc, Pascal Close, St. Mellons, Cardiff, United Kingdom, [3]School of Photovoltaic and Renewable Energy Engineering, UNSW, Sydney, Australia

C1 Verification Of Uncertainty In Cpv'S Outdoor Performance

Hiromu Saiki[1], Takumi Sakai[1], Yasuyuki Ota[1], Kenji Araki[2], Kan-Hua Lee[2], Masafumi Yamaguchi[2], Kensuke Nishioka[1]

[1]University of Miyazaki, Miyazaki, Japan, [2]Toyota Technological Institute, Nagoya, Japan

D1 Design And Evaluation Of Low-Concentration Static Iii-V/Si Partial Cpv Module For Car-Rooftop Application

Daisuke Sato[1], Kan-Hua Lee[2], Kenji Araki[2], Taizo Masuda[3], Masafumi Yamaguchi[2], Noboru Yamada[1]

[1]Nagaoka University of Technology, Nagaoka, Japan, [2]Toyota Technological Institute, Nagoya, Japan, [3]Toyota Motor Corporation, Susono, Japan

D2 Fluorescent Organic Dyes In A Silicone Encapsulant Composite For Luminescent Solar Concentrators

Arunima Sethi, Subhash Chandra, Hind Ahmed, Sarah J. McCormack

Department of Civil, Structural and Environmental Engineering, Trinity College Dublin, Dublin, Ireland

C2 Comparison Of Cpv Systems With Lattice-Matched And Mismatched Solar Cells In Long-Term Outdoor Performance

Hiroki Tawa[1], Yasuyuki Ota[1], Makoto Inagaki[2], Rui Mikami[2], Takahashi Iwasaki[2], Munetsugu Ueyama[2], Kensuke Nishioka[1]

[1]University of Miyazaki, Miyazaki-shi, Japan, [2]Sumitomo Electric Industries, Osaka-shi, Japan

C3 Ingan Based Solar Cells With Hybrid Gan Tunnel Junction Contacts

Ehsan Vadiee[1,2], Evan Clinton[1], heather mcfavilen[3], Zachary Engel[1], Christopher Matthews[1], Chantal Arena[3], stephen goodnick[2], christiana honsberg[2], Alan Doolittle[1]

[1]Georgia Institute of Technology , Atlanta, GA, United States, [2]Arizona State University, Tempe, AZ, United States, [3]Photonitride Inc., Tempe, AZ, United States

D3 Field Performance Of Micro-Cpv And Pv System

Kai-Hsiang Yang, Chun-Yi Chen, Zun-Hao Shih, Yueh-Mu Lee, Hou-Ying Huang, Hwen-Fen Hong

INER, Taoyuan, Taiwan

D4 Spatial Evaluation Of Luminescent Coupling Effect In A Current-Limiting Subcell Of Ingap/Gaas/Ge Triple Junction Solar Cells

Bernice Mae F. Yu Jeco[1,2], Ryo Tamaki[1], Tetsuya Nakamura[1,2,3], Mitsuru Imaizumi[3], Nazmul Ahsan[1,2], Yoshitaka Okada[1,2]

[1]Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, Meguro-ku, Japan, [2]Department of Advanced Interdisciplinary Studies, The University of Tokyo, Meguro-ku, Japan, [3]Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan

D5 Routes To Low Lcoe For Iii-V-Based Solar Cells

Chaomin Zhang[1], Eric Armour[2], Richard King[1], Christiana Honsberg[1]

[1]Arizona State University, Tempe, AZ, United States, [2]Veeco Instruments Inc., MOCVD Operations, Somerset, NJ, United States

10:30 – 12:00 PM	Poster 3

Homojunction Technologies and Device Metallization

Chair(s): Abasifreke Ebong

D6 A Preliminary Study On Local Electrochemical Deposition (Lecd) Of Silicon Heterojunction Cell Front Contact Formation

Antony R Aguilar[1], Stanislau Y Herasimenka[1,2], Lynne Micheaelson[3], William Dauksher[1], Stuart Bowden[1]

[1]Arizona State University, Tempe, AZ, United States, [2]Regher Solar LLC, Tempe, AZ, United States, [3]Technic Inc., Cranston, RI, United States

D7 Industrially Perc Solar Cells With Integrated Front-Side Optimization

Sung-Yu Chen, Yu-Hsuan Lin, Shih-Peng Hsu, Chao-Ping Huang, Li-Yu Li, Chen-Hsun Du

Industrial Technology Research Institute, Hsinchu, Taiwan

D8 New Approaches For The Contact Theory And New Doping Profile Suggestion For Blm Metallization

Young-Wook Choi, Hongwang Zhang, Xiaowen Shi, Weili Shi

DK Electronics Materials, Yixing, China

D9 Reliability Of Anti-Lid Technology For Commercialized B-Doped Perc Solar Cells

Chen Chuanke [1], Yang Jin[1], He Wenshuang[1], Yang Hong[1], Wang He[1], Lv Jun[2,3], Wang Jianbo[2,4], Ding Mingchang[5]

[1]xi'an jiaotong university, xian, China, [2]LONGi Solar Technology Co., Ltd, xian, China, [3]Sanjiang university, Nanjing, China, [4]Southeast University, xian, China, [5]China Electric Power Research Institute, Beijing, China

D10 Q.Antum On *P*-Type Cz Silicon: High-End Performance And Reliability

Fabian Fertig, Ingmar H er, Martin Schaper, Ronny Lantzsch, Friederike Kersten, Matthias Bartzsch, Felix Fr▪auf, Benjamin G. Lee, Ansgar Mette, Bernhard Kl er, J g W. M▪ller

Hanwha Q CELLS, Bitterfeld-Wolfen, Germany

D11 Meyer Burger Single Side Passivated Contact Technology

Thomas Grosse[1], Thomas Kluge[1], Hans-Peter Sperlich[1], Marcel Koenig[1], Naomi Nandakumar[2], Shubham Duttagupta[2], Lauretta Fondop Makoudjou[1], John Woodrofee Rodriguez[2]

[1]Meyer Burger (Germany) GmbH, Hohenstein-Ernstthal, Germany, [2]SERIS, Singapore, Singapore

D12 Evidence Of Rear Surface Related Degradation In Cz-Si Perc-Type Solar Cells

Axel Herguth, Christian Derricks, David Sperber

University of Konstanz, Konstanz, Germany

D13 Effects Of Various Surface Texturing Methods For Screen Printed Electrodes

Hye Kwon Hong[1], Jeong Eun Park[2], Sang Muk Kang[1], Yong ho Jo[1], Dong Sik Kim[1], Donggun Lim[1,2]

[1]Dept. of IT convergence, Korea National University of Transportation, Chungju, South Korea, [2]Dept. of Electronic Engineering, Korea National University of Transportation, Chungju, South Korea

D14 Implications Of Laser-Doping Parameters And Contact Opening Size On Contact Resistivity

Jonas D. Huyeng[1,2], Marco Ernst[2], Kean C. Fong[2], Daniel Walter[2], Andrew Blakers[2]

[1]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany, [2]Centre for Sustainable Energy Systems, Australian National University, Canberra, Australia

D15 Reactive Silver Ink As A Novel Low-Temperature Metallization: Monitoring Corrosion

April M Jeffries[1], Subbarao Raikar[1], Avinash Mamidanna[1], Owen Hildreth[1], Mariana I Bertoni[1,2]

[1]School for Engineering of Matter, Transport, & Energy, Arizona State University, Tempe, AZ, United States, [2]School of Electrical, Computer, & Energy Engineering, Arizona State University, Tempe, AZ, United States

D16 Novel Cost-Effective Large Area Back Contact Solar Cells With Efficiency Up To 23.1%

Genhua Ji, Kangping Zhang, Dajuan He, Mingtao Zhang, Zhifeng Liu
Jolywood (Taizhou) Solar Technology Co., Ltd., Taizhou, China

D17 Advances In Plated Metallisation For Silicon Wafer Solar Cells

Ankit Khanna, Vinodh Shanmugam, Gabby Alonzo de Luna, Jaffar Moideen Yacob Ali, Ge Jia, Thomas Mueller
Solar Energy Research Institute of Singapore (SERIS), National University of Singapore (NUS), Singapore, Singapore

D18 The Effects Of Various Surface Texturing On Crystalline Silicon Solar Cell Efficiency

Dong Sik Kim[1], Jeong Eun Park[2], Sangmuk Kang[1], Hye Kwon Hong[1], Young Ho Cho[1], Donggun Lim[1,2]
[1]Dept. of IT Convergence, Korea National University of Transportation, Chungju, Korea, [2]Dept. of Electronic Engineering, Korea National University of Transportation, Chungju, Korea

E10 Comparative Analysis Of Si Pert Cells With N^+-P-P^+ And N^+-N-P^+ Structures.

Lev Kreinin[1], Ygal Eisenberg[1], Jayarprasad Arumughan[2], Christoph Peter[2], Naftali Eisenberg[1]
[1]SolAround, Jerusalem, Israel, [2]SolAround, Jerusalem, Israel, [3]ISC, Konstanz, Germany, [4]ISC, Konstanz, Germany, [5]SolAround, Jerusalem, Israel

D19 Impact Of Laser-Doped Selective Emitters Parameter For Industrial Mono Perc Solar Cells

Cheng-Wen Kuo, Ta-Ming Kuan, Wei-Lo Chueh, Li-Guo Wu, Chih-Chiang Huang, Cheng-Yeh Yu
TSEC Corporation, Hsin-Chu, Taiwan

D20 Investigation Of The Reaction Mechanism Of Lead-Free And Bismuth-Free Tellurite Glass In Front Silver Paste For C-Si Solar Cells

Masayuki Kurahashi[1], Naoto Shindo[1], Kousuke Nishimura[1], Katsuhiko Shirasawa[2], Hidetaka Takato[2]
[1]Shoei Chemical Inc., Tosu, Japan, [2]National Institute of Advanced Science and Technology (AIST), Koriyama, Japan

E1 Study Of Cu-X Seed Layer On Ito For Copper-Plated Silicon Heterojunction Solar Cells

Sang Hee Lee[1], Doo Won Lee[1], Han Jun Kim[1], Ah Reum Lee[1], Soo Hong Lee[1], Chang Kyun Park[2], Kyoung Jin Lim[2], Won Suk Shin[2]
[1]Sejong University, Seoul, Korea, [2]JUSUNG ENGINEERING, Gwangju-si, Korea

E2 Influences Of Aluminum Rear Contact And Back Surface Field Formation For Perc Solar Cells

Yu-Hsuan Lin, Sung-Yu Chen, Li-Yu Li, Shih-Peng Hsu, Chen-Hsun Du
Industrial Technology Research Institute, Hsinchu, Taiwan

E3 Aged Adhesion Improvement Of Low Solid Content Tabbing Paste

Ying-Chih Lu, Yi Yang, Zhuping Xi, Guang Zhai, Chilong Chen
24 Union Hill Road, West Conshohocken, PA, United States

E4 N-Type Metallization Pastes With Improved Contact

Kirsten E. Myers, Gregory A. Becht, Sandra Kanapathy, Ryan W. Mayberry, Mark O. Naylor, Matthias Hoerteis
Heraeus Photovoltaic Technology, West Conshohocken, PA, United States

E5 Doping Of Zinc Oxides In Atomic Layer Deposition

Hyung-Ho Park
Yonsei University, Seoul, Korea

E6 Effect Of Cu-Assisted Chemical Etching For Black Silicon

Jeong Eun Park, Sangmuk Kang, Hye Kwon Hong, Young Ho Cho, Dong Sik Kim, Donggun Lim
Korea National University of Transportation, Chungju-si, Chungbuk, South Korea

E7 The Impact Of Tellurite Glass On Contact Resistance Of The Fire Through Dielectric (Ftd) C-Si Solar Cell With Lightly Doped Emitter

Keming Ren, Veysel Unsur, Ahrar Chowdhury, Yong Zhang, Abasifreke Ebong
UNC Charlotte, Charlotte, NC, United States

E8 Importance Of Void-Free Al-Si Contacts To Enable 21% Efficient Screen-Printed N-Type Silicon Solar Cells Using Ion Implantation
Vinodh Shanmugam, Ankit Khanna, Jaffar Moideen Yacob Ali, Thomas Mueller
SERIS, Singapore, Singapore

E9 A New Back Metallization Concept For Perc Cells
Wilhelm Stein[1, 2], Kristin L▪emann[1], Axel Schwabedissen[3], Martin Dimer[1], Johannes L nert[1], Steffen Berger[1]
[1]VON ARDENNE GmbH, Dresden, Germany, [2]Stein Engineering & Consulting GmbH, Dresden, Germany, [3]Hanwha Q Cells GmbH, Bitterfeld-Wolfen, Germany

E11 Device Relevant Doped Amorphous Silicon Thin Films By Inductively Coupled Plasma Enhanced Chemical Vapor Deposition
Boon Heng Teo[1,2], Jin Liu[1], Jia Ge[1], Delio Perez[1], Edwin Carmona[3], Maryknol Delos Santos[1], Jennier Jordan Epistola[1], Thomas Mueller[1]
[1]Solar Energy Research Institute o f Singapore, Singapore, Singapore, [2]NUS Graduate School for Integrative Sciences and Engineering, Singapore, Singapore, [3]Heraeus Materials Singapore Pte Ltd, Singapore, Singapore

E12 Electrical Properties Of Electroless Nickel Plated Contacts To Diffused P^+ Hole Collectors.
Alexander To, Tian Zhang, Bram Hoex, Alison Lennon
UNSW Sydney, Sydney, Australia

E13 Industrial N-Type Bifacial Pert Silicon Solar Cells With Efficiency Towards 22%
Jianming Wang, Hongfei Xia, Si Huang, Jingkuo Chen, Zongtao Liu, Jinli Hou, Xiangwei Li, Shunzhi Hu, Yanan Sun
Jolywood (Taizhou) Solar Technology Co., Ltd., Taizhou, China

E14 Fabrication Of Selective Emitter And Rear Passivated Si Solar Cells Using Printed Organic Pastes
Tsun Wong[1], Yun-An Chen[1], Chih-Yao Chen[1], Cheng-Wen Kuo[2], Ta-Ming Kuan[2], Cheng-Yeh Yu[2], I-Chen Chen[1]
[1]Institute of Materials Science and Engineering, National Central University, Zhongli, Taiwan, [2]TSEC Corporation, Hsinchu, Taiwan

E15 Improved Contact Resistance Of New Developed Silver Paste On Mono-Crystalline Silicon Wafer With Ultra-Low Doped Emitter
Li Yan, Cuiwen Guo, Jing Han, Weichen Wang, Scott Kruse, Lei Wang
Heraeus Photovoltaics Global Business Unit, West Conshohocken, PA, United States

E16 Silver Pastes Capable Of Narrow Line, High Aspect Ratio And High Pastes Transferability For Knotless High Mesh Screen Printing
Haixin Yang, Colin Davis
Heraeus Precious Metal LLC, W Conshohocken, PA, United States

E17 Diffusion And Drift Of Sodium Ions In Pid-Affected Mono-Crystalline Silicon Solar Modules
Jin Yang[1], Wenshuang He[1], Fumei Wang[1], Chuanke Chen[1], Hong Yang[1], He Wang[1], Mingchang Ding[2], Shuangqing Zhang[2]
[1]School of Science,Xi'an Jiaotong University, Xi'an, China, [2]China Electric Power Research Institute, Beijing, China

E18 Thermally Diffused Point Contacting By Localized Dielectric Breakdown Solar Cells With Boron Etch Back
Qilin Ye, Ned Western, Anqi Liao, Stephen Bremner
UNSW, Sydney, Australia

10:30 – 12:00 PM	Poster 4
Improvements and Scale-Up of Organic and Perovskite Solar Cells	

Chair(s): Alexander Zakhidov

E19 Innovation Updates For Organic And Perovskites Solar Cells

Brian Azzopardi[1, 2], Artem Sadula[1], John Chircop[1]

[1]Malta College of Arts, Science and Technology (MCAST), Paola, Malta, [2]Brian Azzopardi & Associates, Birkirkara, Malta

F1 Inkjet Printing Of Tio2 Photoelectrodes And Manufacturing Of Large-Area Dye-Sensitized Solar Cell (Dssc) Modules

Chin-Tai Chen, Chung-Hung Yen

National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan

F2 Deep Lowered Lumo With Low Band Gap P-Type And N-Type Conjugated Systems To The Future Polymer Electronics- Dft Study- The Next Big Thing

Saravanan Chinnusamy, Nasrin I Shaikh, Milind S Dangate

Department of Chemistry, Amrita Vishwa Vidyapeetham, Kollam, India

F3 Ozone-Treated Aluminum Doped Zinc Oxide For Etl-Free Stable Perovskite Solar Cells

Arun Singh Chouhan, Naga Prathibha Jasti, Sushobhan Avasthi

Centre for Nanoscience and Engineering, Indian Institute of Science, Bangalore, India

F5 The Effects Of Hydrogen Plasma Treatment Of Zno Electron Transport Layers On V_{Oc} Of Polymer Solar Cells

HongLi Gao

BeiJing University of Technology, BeiJing, China

F6 Radiative Annealing Of Perovskite Solar Cells In A Roll-To-Roll Setup

Amir H. Ghahremani, Thad Druffel

University of Louisville, Louisville, KY, United States

F7 A Moisture Stable,Hysteresis-Free Semi-Transparent Perovskite Solar Cell With Single Wall Carbon Nanotubes.

Shivam Gupta, Rahul Pandey, Trijul Khatri, Rishu Chaujar

Delhi Technological University, New Delhi, India

F8 Output Evaluation On Curved Surface With Each Azimuth Of Transmitted Organic Photovoltaic Modules

Youichi Hirata[1], Yasuyuki Watanabe[1], Toshiaki Yachi[2]

[1]Suwa University of Science, Nagano, Japan, [2]Science University of Tokyo, Tokyo, Japan

F9 Photo-Degradation Of Perovskite Solar Cells: Modeling And Simulation

Istiaque Hossain, Liang Zhang, Mehran Samiee, Pranav Joshi, Ranjith Kottokkaran, Max Noack, Vikram L. Dalal

Iowa State University, Ames, IA, United States

F11 Structural Characterization Of Graphene Oxide And Reduced Graphene Oxide Used As Counter Electrode In Flexible Dssc

Mikel Hurtado-Morales[1,2], Jhon Pazos-Alonso[1,2], M. Alejandro Garcia-Fox[1,2]

[1]Universidad Central, Departamento de Ingenier傚 Electr ica, Bogota, Columbia, [2]Universidad Central, Cluster de Investigaci NBIC, Bogota, Columbia

F12 Snge Mixed Metal Perovskite Solar Cell (Pb Free) With 6.9% Efficiency And Enhancement Of Stability

Nozomi Ito[1], Muhammad Akmal Kamarudin[1], Qing Shen[2], Yuhei Ogomi[1], Satoshi Iikubo[1], Kenji Yoshino Yoshino[3], Takashi Minemoto[4], Taro Toyoda[2], Shuzi Hayase[1]

[1]Kyushu Institute of Technology, Kitakyushu, Japan, [2]University of Electro-communications, Fuchu, Japan, [3]Miyazaki Uniersity, Miyazaki, Japan, [4]Ritsumeikan University, Kusatsu, Japan

F13 Pedot:Pss Based Solar Cells With Radical Driven Benzoquinone Passivation

Abhishek R Iyer

F15 Slowing Tin Oxidation By Lead Substitution In Tin Halide Perovskites

Tomas Leijtens[1], Rohit Prasanna[1], Aryeh Gold-Parker[1,2], Michael F Toney[2], Michael D McGehee[1]

[1]Stanford University, Stanford, CA, United States, [2]SSRL, SLAC National Lab, Menlo Park, CA, United States

F16 Natural Dye-Sensitized Solar Cells Containing Anthocyanin Dyes Extracted From Frozen Blueberry Using Column Chromatography Method

Ayame Mizuno, Genei Yamada, Naoki Ohtani

Doshisha University, Kyotanabe-shi, Japan

F17 Fast Two Step Sequential Process For Large-Scale High-Performance Perovskite Solar Cells

Jangwon Seo

KRICT, Daejeon, South Korea

F18 Perovskite/Silicon-Heterojunction Two-Terminal Tandem Solar Cells

Zhu Shijie, Yao Xin, Shi Biao, Hou Fuhua, Zhao Ying, Zhang Xiaodan

F19 Manufacturing Cost Analysis Of Perovskite Solar Modules In Single-Junction And All-Perovskite Tandem Configurations

Zhaoning Song[1], Adam B. Phillips[1], Ilke Celik[2], Geethika K. Liyanage[1], Dewei Zhao[1], Defne Apul[2], Yanfa Yan[1], Michael J. Heben[1]

[1]University of Toledo, Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States, [2]University of Toledo, Department of Civil Engineering, Toledo, OH, United States

F20 Impact Of Epoxy Encapsulation On Device Stability Of Large-Area Laser-Patterned Perovskite Solar Cells

Zhaoning Song, Changlei Wang, Dewei Zhao, Cong Chen, Xinxing Yin, Chongwen Li, Nikolas J. Podraza, Michael J. Heben, Yanfa Yan

University of Toledo, Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States

G1 Higher Open-Circuit Voltage And Stability In $Mapbi_3$ Perovskite Solar Cells Using A Bilayer Hole-Transport Layer With A D-A-D Architectured Polymer

Pranjal Srivastava, Rudra Mukherjee, Vinila Nellissery Viswana, Praveen C Ramamurthy, Sushobhan Avasthi

Indian Institute of Science, Bangalore, India

G2 Quantifying Innovation Patterns In Next Generation Solar Photovoltaics

Deborah A. Sunter[1,2], Isa Ferrall[1], Jessie Kanpstein[3], David Garfield[4], Noah Kittner[1], Daniel M. Kammen[1]

[1]University of California Berkeley, Berkeley, CA, United States, [2]Tufts University, Medford, MA, United States, [3]Pacific Gas and Electric Company, San Francisco, CA, United States, [4]Rocky Mountain Institute, Boulder, CO, United States

G3 Diketopyrrolopyrrole: Adjustment Of Molecular Properties

Martin Vala, Patricie Heinrichov□, Martin Weiter

Materials Research Centre, Faculty of Chemistry, Brno University of Technology, Brno, Czech Republic

G4 Theoretical Investigation Of Stable Pb-Free Halide Perovskite Materials For Solar Cell Applications

Su-Huai Wei, Peng Zhang, Jingxiu Yang

Beijing Computational Science Research Center, Beijing, China

G5 Binary Blended Small-Molecule Cathode Buffer Layer Materials For Highly Efficient Bulk-Heterojunction Polymer Solar Cells

Chuanlang Zhan, Monika Gupta, Weiping Li, Jiannian Yao

BEIJING NATIONAL LABORATORY FOR MOLECULAR SCIENCES, CAS KEY LABORATORY OF PHOTOCHEMISTRY, INSTITUTE OF CHEMISTRY, CHINESE ACADEMY OF SCIENCES, Beijing, China

10:30 – 12:00 PM	Poster 5
System Design, Simulation, Optimization and Performance	

Chair(s): Roland Einhaus

G8 Modeling The Efficiency Degradation Of Actual Si-Module Arrays

Luigi Abenante, Francesco De Lia, Riccardo Schioppo, Salvatore Castello, Massimo Izzi

ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Roma, Italy

G9 Simulation Of A Load-Managing Photovoltaic System

Joseph A. Azzolini, Meng Tao

Arizona State University, Tempe, AZ, United States

G10 Performance Enhancement Of Solar Pv System Using Pcm: An Overview

Gargi H Bargale[1], Nagesh K Chougule[2], DT Barki[3]

[1]Research Scholar, College of Engineering, Pune, India, [2]Professor, College of Engineering, Pune, India, [3]Technical Director, Photon Energy Systems Pvt.Ltd, Hyderabad, India

G11 Shading Fraction Based Global Maximum Power Prediction For Photovoltaic Energy Conversion Systems

Pallavi Bharadwaj, Vinod John

Indian Institute of Science, Bengaluru, India

G12 Reducing Morning & Late Afternoon Grid-Buy Demand By Engineering Box-Like Rooftop Solar-Pv Generation Profiles Without The High Cost Of Trackers Or Bifacial Panels

John O Borland[1], Ajay Singh[2]

[1]JOB Technologies, Aiea, HI, United States, [2]Campbell Scientific, Logan, UT, United States

G13 Comparison Of The Daily Performance Of Grid-Connected Pv Systems In 3 Locations In Hawaii &Ndash; Field Results, Analysis, And Modelling

Severine Busquet

Hawaii Natural Energy Institute (HNEI), University of Hawaii, Honolulu, HI, United States

H6 Performance Assessment Of Pv Technologies And Complementarity Of Utility-Scale Pv And Wind Power Plants In Brazil

Rafael Antunes Campos, Lucas Rafael do Nascimento, Mar匀ia Braga, Gabriel Sim s, Ricardo R･her

Universidade Federal de Santa Catarina (UFSC), Florian olis-SC, Brazil

G14 Implementation Of A Dynamic Real Time Grid-Connected Dc Microgrid Simulation Model For Power Management In Small Communities

Rachid Darbali-Zamora[1], Jimmy E. Quiroz[2], Javier Hern疣dez-Alvidrez[3], Jay Johnson[2], Eduardo I. Ortiz-Rivera[1]

[1]University of Puerto Rico-Mayaguez, Mayaguez, PR, Puerto Rico, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]New Mexico State University , Las Cruces, NM, United States

G15 Automatic Detection And Characterization Of Partial Shading In Pv System

Levi Davies, Ryan Thornton, Paul Hudson, Biswajit Ray

University of Alabama in Huntsville, Huntsville, AL, United States

G16 A Comprehensive Review For Solar Tracking Systems Design In Photovoltaic Cell, Module, Panel, Array, And Systems Applications

A.Z. Hafez[1,2], A.M. Yousef[2,3], A. Soliman[2,4], I.M. Ismail[2,4]

[1]Nottingham Transportation Engineering Centre, Faculty of Engineering, University of Nottingham, Nottingham, United Kingdom, [2]Renewable Energy Engineering Program, University of Science and Technology, Zewail City of Science and Technology, Giza, Egypt, [3]Department of Mechanical Engineering, Faculty of Engineering, Alexandria University, Alexandria, Egypt, [4]Department of Chemical Engineering, Faculty of Engineering, Cairo University, Cairo, Egypt

G17

Fault Discovery Method Using Numerical Calculations In Mega-Watt Solar Power Plant
Shigeomi Hara, Makoto Kasu
Saga University, Saga, Japan

G18 Power Generation Characteristics Of Solar Matching Photovoltaic System And Estimation Of Its Power Generation
Kazuya Hosokawa[1], Rissyu Sei[1], Toshiaki Yachi[1], Yasuyuki Watanabe[2]
[1]Tokyo University of Science, Tokyo, Japan, [2]Suwa Tokyo University of Science, Suwa, Japan

G19 System Effect Analysis And Case Study On Temperature Coefficient Of Photovoltaic Modules
Hye Mi Hwang, Hyung-Jun Song, Seokwhan Ko, Young Chul Ju, Jeong In Lee, Woo Gyun Shin
Korea Institute of Energy Research, Daejeon, South Korea

G20 Use Of The Plantpredict Application Programming Interface For Automating Energy Prediction-Based Analyses
Stephen Kaplan, Lauren Ngan, Kendra Passow, Ramsey Callaway
First Solar, Inc., San Francisco, CA, United States

H1 Temperature Dependence Measurements Of Highly-Efficient Ibc, Perc, Shj-Type Photovoltaic Modules
Makoto Kasu[1,2], Jaffar Abdu[1], Sungwoo Choi[2], Yasuo Chiba[2], Atsushi Masuda[2], Shigeomi Hara[1]
[1]Department of Electrical and Electronic Engineering, Saga University, Saga, Japan, [2]National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

H2 Characterising Bifacial Modules In Variable Operating Conditions
Robert P Kenny, Juan Lopez Garcia, Elisa Garcia Menendez, Haile Bereket, David Shaw
JRC, Ispra, Italy

H3 Characterization Of C-Si Solar Cell Module Performance Using A Wafer Of Wave Patterned Microstructure In Tilted Angle Conditions
Soo Min Kim[1], Sang Hoon Jung[1], Min Gu Kang[2], Hee-eun Song[2], Junhee Kim[3], Yong Bae Kim[1], Gyu-seok Choi[1]
[1]Gumi Electronics & Information Technology Research Institute, Gumi-si, Gyeongsangbuk-do 39171, Korea, [2]Korea Institute of Energy Research, 152 Gajeong-ro, Yuseong-gu, Daejeon 34129, Korea, [3]Solar Process Engineering Function Division, LG Electronics, 77 Sanho-daero, Gumi-si, Gyeongsangbuk-do 39381, Korea

H4 Improved Modelling Technique For Reconfigurable Photovoltaics With Embedded Cmos
Rakeshkumar V Mahto, Samarth Revankar, Krishnakumarr Velumani
Computer Engineering Program, California State University, Fullerton, CA, United States

H5 Empowerment In Solar Energy Of Village Of Baol: Ndem
Badara MBOW [1], Senghane MBODJI[1,2], Fakoro Souleymane DIA[1,2], Amadou DIAO[2], Gregoire SISSOKO[2]
[1]Research team in renewable energies, materials and laser of Department of Physics, Alioune DIOP University of Bambey, Bambey, Senegal, BAMBEY, Senegal, [2]Research team in renewable energies, materials and laser of Department of Physics, Alioune DIOP University of Bambey, Bambey, Senegal, BAMBEY, Senegal, [3]Research team in renewable energies, materials and laser of Department of Physics, Alioune DIOP University of Bambey, Bambey, Senegal, BAMBEY, Senegal, [4]Laboratory of Semiconductors and Solar Energy, Department of Physics, Faculty of Science and Technology, Cheikh Anta Diop University, Dakar, SENEGAL, DAKAR, Senegal, [5]Laboratory of Semiconductors and Solar Energy, Department of Physics, Faculty of Science and Technology, Cheikh Anta Diop University, Dakar, SENEGAL, DAKAR, Senegal

H7 A Hybrid Photovoltaic-Photochemical Prototype For Simultaneously Energy Generation And Water Purification In Rural Areas Of Mexico
Natalia Pichel Mira[1], Marta Vivar Garc傚[2], Manuel Fuentes Conde[2], Keyla Eugenio Cruz[3], Arlette Sanper[3]
[1]IMDEA Water Institute, Alcal□ de Henares, Spain, [2]Grupo IDEA, Universidad de Ja駭, Ja駭, Spain, [3]Grupo IDEA, Universidad de Ja駭, Ja駭, Spain, [4]Escuela de Ciencias, Universidad Aut

oma Benito Ju疵ez, Oaxaca, Mexico, [5]Escuela de Ciencias, Universidad Aut oma Benito Ju疵ez, Oaxaca, Mexico

H8 Optimization Study Of A Photovoltaic-Photochemical Hybrid System (Solwat) For Meeting The Needs Of Electricity And Clean Water

Natalia Pichel Mira[1], Marta Vivar Garc傚[2], Manuel Fuentes Conde[2]

[1]IMDEA Water Institute, Alcal□ de Henares, Spain, [2]Grupo IDEA, Universidad de Ja駭, Ja駭, Spain, [3]Grupo IDEA, Universidad de Ja駭, Ja駭, Spain

H9 Methodology For The Sizing Of Grid-Connected Photovoltaic Systems

Guido J. Rostegui, Mauricio B. C. Salles, Matheus Gemignani

University of Sao Paulo, Sao Paulo, Brazil

H10 Building Integrated Photovoltaic Facades In Singapore:Online Bipv Lcc Calculator

Veronika SHABUNKO, Monika BIERI, Thomas REINDL

Solar Energy Research Institute of Singapore (SERIS), SINGAPORE, Singapore

H12 Switch Based Power Optimization Technique Of Spv Arrays With Voltage And Current Compensation

Aswani Uppada[1], Venkata Rao Basam[2], Siddhartha P. Duttagupta[3], T I Eldho[3]

[1]1, Mumbai, India, [2]2, Visakhapatnam, India, [3]3, Mumbai, India

H13 Testing A Pv-Battery Integrated Module Prototype

Victor Vega-Garita, Shiwankar Garg, Nishant Narayan, Laura Ramirez-Elizondo, Pavol Bauer

1, Delft, Netherlands

H14 Photovoltaic System Optimization For An Austere Location Using Time-Series Data

Torrey J. Wagner[1], Eric J. Lang[2], Warren J. Assink[3], Douglas S. Dudis[3]

[1]Air Force Institute of Technology, WPAFB, OH, United States, [2]University of Dayton Research Institute, Dayton, OH, United States, [3]Air Force Research Laboratory, WPAFB, OH, United States

H15 Design Of An Ergonomic Sun-Tracking System And Reduction Of Energy Losses Of Solar Trackers Through Scaling

Mukhammaddin Zinaddinov, Samson Mil'shtein

Advanced Electronic Technology Center, ECE Dept., University of Massachusetts Lowell, Lowell, MA, United States

10:30 – 12:00 PM	Poster 6
Module Testing	

Chair(s): Timothy Silverman

H17 Life Prediction Model Development For Flexible Photovoltaic Modules Using Accelerated Damp Heat Testing

Venkata Bheemreddy, Bill J.J. Liu, Andrew Wills, C. Paola Murcia

MiaSole Hi-Tech Corp., Santa Clara, CA, United States

H18 Water Ingress Mapping In Photovoltaic Packaging Materials

Mihail Bora, Vincenzo Lordi, Joel Varley

Lawrence Livermore National Laboratory, Livermore, CA, United States

H19 Initial Stability Of Perc Vs. Al-Bsf Cells

Jennifer L. Braid[1], Trey D. Wager[1], Alexandra J. Longacre[2], Bryan D. Huey[2], Roger H. French[1]

[1]Case Western Reserve University, Cleveland, OH, United States, [2]University of Connecticut, Storrs, CT, United States

H20 El And I-V Correlation For Degradation Of Perc Vs. Al-Bsf Commercial Modules In Accelerated Exposures

Jennifer L. Braid[1], Alan J. Curran[1], Jing Sun[2], Eric J. Schneller[3], Justin S. Fada[1], Jiqi Liu[1], Menghong Wang[1], Alexandra J. Longacre[4], Jeff Dai[5], Bryan D. Huey[4], Kristopher O. Davis[3], Jean-Nicolas Jaubert[2], Laura S. Bruckman[1], Roger H. French[1]

[1]Case Western Reserve University, Cleveland, OH, United States, [2]Canadian Solar Inc., Suzhou, China, [3]University of Central Florida, Orlando, FL, United States, [4]University of Connecticut, Storrs, CT, United States, [5]Cybrid Technologies, Suzhou, China

I1 Early Detection Of Encapsulant Discoloration By Uv Fluorescence Imaging And Yellowness Index Measurements

Kshitiz Dolia, Archana Sinha, Sai Tatapudi, Jaewon Oh, GovindaSamy TamizhMani

Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States

I3 Co-Located Accelerated Testing Of Module Level Power Electronics And Associated Pv Panels

Jack D. Flicker[1], Govindasamy Tamizhmani[2]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]Arizona State University Photovoltaic Reliability Lab, Mesa, AZ, United States

I4 Financial Challenges And Risk Management Of Solar Warranty Risks

Edward P.H. Hsi, Joseph C.P. Shieh

National Taiwan University of Science and Technology, Taipei, Taiwan

I5 Directly Detect The Damage Type And Damage Degree Of Pv Module By Using Thermal Imaging Camera

Der-Ray Huang[1,2], Yu-Jen Chen[1], Guo-Zua Wu[3], Wei-Hsiang Chiang[1]

[1]Green Energy & Photonics Center, National Chiao Tung University, Tainan, Taiwan, [2]Research Center for Applied Science, Academia Sinica, Taipei, Taiwan, [3]Bio-IT Tech Division, Biomedical Technology & Device Research Center, Hsinchu, Taiwan

I6 Study On Uv Induced Eva Discoloration For Crystalline Silicon Solar Modules

Xuefang Jiang[1,2], Wenshuang He[1], Jin Yang[1], Chuanke Chen[1], Hong Yang[1], He Wang[1], Hongtao Li[3], Yinghua Dong[3]

[1]Xi'an Jiaotong University, Xi'an, China, [2]Xi'an Polytechnic University, Xi'an, China, [3]China Electric Power Research Institute, Beijing, China

I7 Iec 61215 Qualification Tests Vs Outdoor Performance Using Module Level In Situ I-V Curve Tracing Devices

C Birk Jones[1], Babak Hamzavy[2], William B. Hobbs[3], Cara Libby[4], Olga Lavrova[1]

[1]Sandia National Lab, Albuquerque, NM, United States, [2]Southeastern Solar Research Center, Birmingham, AL, United States, [3]Southern Company Service, Inc., Birmingham, AL, United States, [4]Electric Power Research Institute, Palo Alto, CA, United States

I8 The Performance Analysis For Damp Heat Test Of Flexible Cigs Photovoltaics Modules
Hyun-A Kim[1], Je Hyun Baeg[2], Sunmook Lee[1]
[1]Korea Conformity Laboratories, Seoul, Korea, [2]Korea Conformity Laboratories, Seosan, Korea

I9 The Reliability And Degradation Of Solar Roadways
Jae Hyun Kim[1], Firoz Khan[1]
[1]DGIST, Daegu, Korea, [2]DGIST, Daegu, Korea

I10 An Automated Algorithm For Quantifying Cracks In Photovoltaic Backsheets Under Accelerated And Real-World Exposures
Addison G. Klinke[1], Abdulkerim Gok[1,2], Silas I. Ifeanyi[1], Laura S. Bruckman[1]
[1]SDLE Research Center, Case Western Reserve University, Cleveland, OH, United States, [2]Department of Materials Science and Engineering, Gebze Technical University, Gebze, Turkey

I11 Geographical Distribution Of Factors Accelerating Performance Degradation Of Pv Modules
Vicente Lara Fanego, Jose A. Ruiz Arias, Artur Skoczek, Marcel Suri, Tomas Cebecauer
Solargis, Bratislava, Slovakia

I12 Comparsion Of Sequential Acceleration Tests With Pct For Encapulants Of Pv Modules
Yu-Tai Li, Wei-Yu Lin, Wei-Lun Yang, Chin Lien, Cho-Fan Hsieh
Industrial Technology Research Institute, Hsinchu, Taiwan

I13 The Comparative Study In The Performance Of Bifacial And Monofacial C-Si Photovoltaic Modules Under The Specific Sequential Tests
Chin Lien, Wei-Lun Yang, Kuan-Wu Lu, San-Yu Ting, Ssu-Hung Chen, Cho-Fan Hsieh, Hung-Sen Wu, Teng-Chun Wu, Ching-Chiao Tsai
Industrial Technology Research Institute, Hsinchu, Taiwan

I14 Influence Of Environmental Conditions On Uv Fluorescence Imaging In The Field
Arnaud Morlier, Michael Siebert, Iris Kunze, Susanne Blankemeyer, Marc K tges
ISFH, Emmerthal, Germany

I15 Artifact-Free Coring Procedures For Removing Samples From Photovoltaic Modules For Microscopic Analysis
Helio Moutinho[1], Bobby To[1], Steve Johnston[1], Chun-Sheng Jiang[1], Chuanxiao Xiao[1], Peter Hacke[1], John Moseley[1], Jerry Tynan[1], Neelkanth Dhere[2], Mowafak Al-Jassim[1]
[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Florida Solar Energy Center, Cocoa, FL, United States

I16 Temperature Dependency And Coefficients Of Lid Regeneration For Outdoor Performance Forecasting
S. Roest, E. Garcia Goma, M. Passaro
Eternal Sun Spire Solar, Den Haag, Netherlands

I17 Backsheet Degradation In Accelerated Sequential Weathering Of Full-Size Commercial Modules
Kaushik Roy Choudhury[1], William Gambogi[1], Torence Trout[1], Ryan Desharnais[2]
[1]E. I. DuPont de Nemours and Company, Wilmington, DE, United States, [2]DNV-GL LLC, Berkeley, CA, United States

I18 Accelerated Outdoor Pid Testing Of Cigs Modules And Comparison With Indoor Pid Tests
Keiichiro Sakurai[1], Hiroshi Tomita[2], Darshan Schmitz[2], Shuuji Tokuda[2], Kinichi Ogawa[1], Hajime Shibata[1], Atsushi Masuda[1]
[1]National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, [2]Solar Frontier, Atsugi, Japan

I19 Influence Of Partial Shading On The Power Output Of A Solar Cell And A Pv Module
Rocio de la Luz Santos Magdaleno, Pedro Andres Sanchez Perez, Jose Luis Zaratustra Ramirez Cruz, Dalia Martinez Escobar, Aaron Sanchez Juarez
Instituto de Energias Renovables, Temixco, Mexico

I20 Accelerating Cyclic Loading

Hubert Seigneur[1], Eric Schneller[1], Jason Lincoln[1], Andrew Gabor[2]

[1]UCF Florida Solar Energy Center, Cocoa, FL, United States, [2]BrightSpot Automation LLC, Westford, MA, United States

J1 Corrosion Of The Glass And Formation Of Lead Compounds In The Metallization By High Temperature And High Humidity Test Of Crystalline Silicon Pv Module

Taeko Semba[1], Takeo Shimada[1], Kazuyoshi Yamada[1], Katsuhiko Shirasawa[2], Hidetaka Takato[2]

[1]Namics Corporation, Niigata, Japan, [2]Fukushima Renewable Energy Institute AIST, Koriyama, Japan

J2 Activation Energy Determination For Photovoltaic Encapsulant Discoloration By Indoor Accelerated Uv Testing

Archana Sinha[1], Deepak Kumar[1], Michael Kempe[2], Dirk Jordan[2], GovindaSamy TamizhMani[1]

[1]Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States, [2]National Renewable Energy Laboratory , Golden, CO, United States

J3 Acceleration Factor Modeling For Degradation Rate Prediction Of Photovoltaic Encapsulant Discoloration

Archana Sinha, Shantanu Pore, Arun Balasubramaniyan, GovindaSamy TamizhMani

Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States

J4 A Numerical Study Of Moisture Diffusion In Pv Modules In A Tropical Climate And Its Implications On The Standard Damp Heat Test

Wenjian M.Ridhuan Song, Andrew Tay, Arief Suriadi Budiman

Singapore University of Technology and Design, Singapore, Singapore

I2 Design Of Experimental Test Setup For Large-Scale Reliability Evaluation Of Module Level Power Electronics (Mlpe)

Sai Tatapudi[1], Jack Flicker[2], Devarajan Srinivasan[3], Jigeesha Upadhyaya[1], Kabilan Selvarangan[1], Lakshmi Nadakumar[1], Joswin Leslie[1], Govindasamy Tamizhmani[1]

[1]Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]Poundra LLC, Tempe, AZ, United States

J5 Accelerated Exposure Tests For Photovoltaic Backsheets To Cross-Correlate Real-World Climate Zones

Yu Wang[1], Wei-heng Huang[1], Andrew Fairbrother[2], Camille Loyer[3], Adam Hauser[3], Scott Julien[4], Xiaohong Gu[2], Gregory S. O`Brien[3], Liang Ji[5], Kenneth P. Boyce[5], Michael D. Kempe[6], Kai-tai Wan[4], Roger H. French[1], Laura S. Bruckman[1]

[1]Case Western Reserve Univeristy, Cleveland, OH, United States, [2]National Institute of Standards and Technology, Gaithersburg, MD, United States, [3]Arkema, Inc., King of Prussia, PA, United States, [4]Northeastern University, Boston, MA, United States, [5]Underwriter痴 Laboratories Inc., Northbrook, IL, United States, [6]National Renewable Energy Laboratory, Golden, CO, United States

J6 Interaction Of Permeats During The Measurement Of Permeation Coefficients Of Dense Polymer Films Under Realistic Conditions

Karl-Anders Weiss, Andreas Piekarczyk, Michael K l

Fraunhofer ISE, Freiburg, Germany

J7 Training The Next Generation Of Pv Reliability Experts &Ndash;Project Solar-Train With 14 Phd Projects

Karl-Anders Weiss[1], Sandrin Saile[1], Enik□ Bed□[1], Luciana Pita-Bauermann[1], Gernot Oreski[2], Ralph Gottschalg[3], David Moser[4], Marko Topic[5], Ana Rosa Lagunas[6], Paolo Chiantore[7], Mike van Iseghem[8]

[1]Fraunhofer ISE, Freiburg, Germany, [2]PCCL, Leoben, Austria, [3]Uni Loughborough, Loughborough, United Kingdom, [4]EURAC, Bolzano, Italy, [5]Uni Lubljana, Lubljana, Slovenia, [6]CENER, Pamplona, Spain, [7]Baywa-Re, Milano, Italy, [8]EDF, Paris, France

J8 Influence On Light-Induced Degradation In Cz-Si Perc Cells Under Light Soaking Of Variant Wavelength And Intensity

Ching-Wen Wu[1], Yen-Chun Lee[2], Li-Chieh Yu[2], Min-An Tsai[2], Hung-Sen Wu[2], C.W. Kuo[3], T.M. Kuan[3], C.Y. Yu[3], Peichen Yu[1]

[1]Department of Photonics, National Chiao-Tung University, Hsinchu, Taiwan, [2]Center for Measurement Standards, Industrial Technology Research Institute, Hsinchu, Taiwan, [3]TSEC Corporation, Hsinchu, Taiwan

J9 Factors Influence On Validation Of Rapid Cell-Scale Pid Susceptibility Test

Li-Chieh Yu[1], Min-An Tasi[1], I-Liang Chen[2], Yen-Chun Lee[1], Hung-Sen Wu[1]

[1]Industrial Technology Research Institute, Hsinchu, Taiwan, [2]Win Win Precision Technology, Hsinchu, Taiwan

J10 Comparison Of Line Scan Luminescence Imaging Techniques For Defect Characterisation In Crystalline Silicon Solar Modules

Iskra Zafirovska[1], Mattias K. Juhl[1], Thorsten Trupke[1,2]

[1]The University of New South Wales, Sydney, Australia, [2]BT Imaging Pty Ltd, Sydney, Australia

J11 The Mechanism And Damage Of Snail Trails

Shudong Zhou

Guangzhou Bothleader Electrical Materials Co., Ltd, Guangzhou, China

10:30 – 12:00 PM	Poster 7
Grid Integration of PV	

Chair(s): Dr. Benjamin Kroposki

J15 Design Considerations For Campus Micro-Grid: Mcast Case Study

Brian Azzopardi[1, 2], Stefan Azzopardi[1], Renata Mikalauskiene[1], Al-Agtash Salem[3], Lenos Hadjidemetriou[4], Dimitris Tzovaras[5], Francisco de Paula Garcia Lope[6], Petra Brandl[7], Ahmet Onen[8], Nicholas Borg[9], Mounir Khait[10], Tim Camilleri[11]

[1]Malta College of Arts, Science and Technology (MCAST), Paola, Malta, [2]Brian Azzopardi & Associates, Birkirkara, Malta, [3]German Jordanian University, Amman, Jordan, [4]University of Cyprus, Nicosia, Cyprus, [5]The Centre for Research & Technology, Hellas, Thessaloniki, Greece, [6]University of Seville, Seville, Spain, [7]Energynautics GmbH, Darmstadt, Germany, [8]Abdullah Gul University, S•er Campus Kayseri, Turkey, [9]Electronic Systems Design Ltd (ESDL), San Gwann, Malta, [10]National Technical University of Oran, ENPO, Oran, Algeria, [11]GeoSYS, San Gwann, Malta

J16 Modeling High-Penetration Of Solar Pv And Renewables In The Electrical Grid: A Case For Mexico

Sergio Castellanos[1], Josiah Johnston[1], Aldo Pasos-Trejo[2], Mateo Torres[2], Pedro S疣chez-Perez[2], Apollo Jain[1], Alejandra Monroy[2], Florin James-Langer[1], Diego Ponce de Leon[1], Oliver Probst[3], Daniel M. Kammen[1]

[1]Energy and Resources Group, Berkeley, CA, United States, [2]Universidad Aut oma de M騨ico, CDMX, Mexico, [3]Escuela de Ingenier儆 y Ciencias, Tecnol ico de Monterrey, Campus Monterrey, Monterrey, Mexico

J17 Validation Of A Real-Time Power Hardware-In-The-Loop Distribution Circuit Simulations With Renewable Energy Sources

Rachid Darbali-Zamora[1], Jimmy E. Quiroz[2], Javier Hern疣dez-Alvidrez[3], Jay Johnson[2], Eduardo I. Ortiz-Rivera[1]

[1]University of Puerto Rico-Mayaguez, Mayaguez, PR, Puerto Rico, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]New Mexico State University , Las Cruces, NM, United States

J18 Algorithms To Effectively Quantize Scenarios For Pv Impact Analysis Using Qsts Simulation

Jeremiah Deboever[1], Santiago Grijalva[1], Matthew Reno[2], Robert Broderick[2]

[1]Georiga Institute of Technolgy, Atlanta, GA, United States, [2]Sandia National Laboratory, Albuquerque, NM, United States

J19 A Comparison Between Using A Firefly Algorithm And A Modified Pso Technique For Stability Analysis Of A Pv System Connected To Grid

A.Elrheem E.A. Mostafa[1], Naglaa K. Bahgaat[2]

[1]Electrical Power Eng. Dept.Faculty of Engineering-Al-Azhar University, qena, Egypt, [2]Elec. Comm. Dept. Faculty of Eng.Canadian International College (CIC)6 October City, Giza, Egypt-, Cairo, Egypt

J20 Submission Category: Grid Integration, High-Penetration Pv And Energy Storage Abstract Title: Development Of Electric Cost Reduction Method By Aggregation Of Housing And Commercial Buildings

Miku Enomoto, Yuzuru Ueda

Tokyo University of Science, Tokyo, Japan

K1 Impacts Of High Penetration Of Photovoltaic Integration In Malta

Yesbol Gabdullin[1], Brian Azzopardi[1, 2]

[1]Malta College of Arts, Science and Technology (MCAST), Paola, Malta, [2]Brian Azzopardi & Associates, Birkirkara, Malta

K2 Grid Flexibility And The Cost Of Integrating Variable Renewable Energy: Toward A Renewable Energy Integration Adder For San Diego Gas And Electric Service Territory And The California Electric Grid

Michael Ginsberg, Shahar Goeta, Vasilis Fthenakis

Columbia University, New York, NY, United States

K3 Assessment Of Overcurrent Relay Coordination In A Microgrid With High Pv Penetration Deployment

Preetham Goli[1], Rikesh Shah[2], Shireen Wajiha[2]

[1]University of Missouri Kansas City, Kansas City, MO, United States, [2]University of Houston, Houston, TX, United States

K4 Fault Current Experimental Results Of Photovoltaic Inverters Operating With Grid-Support Functionality

Sigifredo Gonzalez, Nichoas Gurule, Matthew Reno, Jay Johnson

Sandia National Laboratories, Albuquerque, NM, United States

J14 Pv-Inverter Dynamic Model Validation And Comparison Under Fault Scenarios Using A Power Hardware-In-The-Loop Testbed

Javier Hernandez-Alvidrez[1], Adam Summers[2,3], Nataraj Pragallapati[1], Matthew J Reno[2], Satish Ranade[1], Jay Johnson[2], Sukumar Brahma[1], Jimmy Quiroz[2]

[1]New Mexico State University, Las Cruces, NM, United States, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]University of New Mexico, Albuquerque, NM, United States

K5 Residential Advanced Photovoltaic Inverter Pilot Study Results For Select Distribution Secondaries In Hawai&Lsquo;I

Andy Hoke[1], Earle Ifuku[2], Peter Gotseff[1], Nick Wunder[1], Reid Ueda[2]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Hawaiian Electric Company, Honolulu, HI, United States

K6 Self-Consumption Of Electricity Produced From Pv Systems In Apartment Buildings - Comparison Of The Situation In Australia, Denmark, Germany, Italy And Switzerland

Arnulf J襷er-Waldau[1], Christof Bucher[2], Kenn H.B. Fredriksen[3], Diana Moneta[4], Mike Roberts[5]

[1]European Commission, DG JRC, Ispra, Italy, [2]Basler & Hofmann AG, Z・ich, Switzerland, [3]Kenergy, Horsens, Denmark, [4]Ricerca sul Sistema Energetico - RSE S.p.A, Milano, Italy, [5]UNSW, Sydney, Australia

K7 Hils Test Facilities For Pv-Pcs And Pcs For Storage Battery At Aist

Hiroo Konishi, Masaichi Suzuki, Shuichi Sugahara, Taha Selim Utsun, Jun Hashimoto, Kenji Otani

AIST, Koriyama, Japan

J12 The Sundial Framework: Enabling High Penetration Solar Through The Integration Of Energy Storage, Demand Management, And Forecasting

Matthew A Kromer, Michael Zeifman, Kurt Roth, Tsz Yip

Fraunhofer Center for Sustainable Energy, Boston, MA, United States

J13 Gridpulse: Public User Library For Systems Evaluation To Accelerate Grid Modernization

Matthew Lave[1], Rob Hovsapian[2]

[1]Sandia National Laboratories, Livermore, CA, United States, [2]Idaho National Laboratory, Idaho Falls, ID, United States

K8 Validating The Test Procedures Described In Ul 1741 Sa And Ieee P1547.1

Rasel Mahmud, Anderson Hoke, David Narang

National Renewable Energy Laboratory, Golden, CO, United States

K9 Service Entrance Hosting Capacity

Jouni Peppanen, Mobolaji Bello, Matthew Rylander

Electric Power Research Institute, Palo Alto, CA, United States

K10 Islanding And Single Phase Open Detection Effectiveness Of A Subharmonic Plcp Based Island Detection System

Scott Perlenfein, Yinan Cui, Michael Ropp

Northern Plains Power Technologies, Brookings, SD, United States

K11 Transactive Mitigation Of Variability In The Output Of 1 Mw Photovoltaic Array Using Volttron

David M. Raker[1,3], Roshan Kini[2], Robert Huntsman[5], Michael Green[5], Onur Sapci[4], Thomas

Stuart[2], Randy Ellingson[1,3], Raghav Khanna[2], Michael Heben[1,3]
[1]School for Solar and Advanced Energy, Department of Physics and Astronomy, Toledo, OH, United States, [2]Department of Electrical Engineering and Computer Science, University of Toledo, Toledo, OH, United States, [3]Wright Center for Photovoltaics Innovation and Commercialization, University of Toledo, Toledo, OH, United States, [4]Department of Economics, University of Toledo, Toledo, OH, United States, [5]Plant Operations, University of Toledo, Toledo, OH, United States

K12 Optimal Siting Of Pv On The Distribution System With Smart Inverters
Matthew J Reno, Robert J Broderick
Sandia National Laboratories, Albuquerque, NM, United States

K13 Optimal Use Of Distributed Resources To Control Energy Variances In Microgrids
Ramon A. Reyes Colon, Efrain O'Neill Carrillo
University of Puerto Rico Mayaguez Campus, Mayaguez, PR, Puerto Rico

K14 Using Pv And Thermal Energy Storage To Decrease Carbon Dioxide Emissions
Alexander F. Routhier, Christiana Honsberg
Arizona State Unviersity, Tempe, AZ, United States

K15 Battery Energy Storage For Pv And Electric Vehicle
Pankaj (PK) Sen, Aoxia Chen, Yaswanth Nag Velaga
Colorado School of Mines, Golden, CO, United States

K16 Adaptive Integration Of Photovoltaic Inverters In A Smart Grid System
Philippe Steinbusch[1], Marcel Modemann[1], Roman Uhlig[1], Marcus St zel[1], Markus Zdrallek[1], Wolfgang Friedrich[2], Uwe Schl•er[2]
[1]University of Wuppertal, Wuppertal, Germany, [2]Phoenix Contact Energy Automation GmbH, Velbert, Germany

K17 Technical Solutions For Increasing Pv Penetration In Distribution Grids In The Czech Republic In Terms Of Interflex Project
Jan Svec, Jan Kula, Stanislav Hes
CEZ Distribuce, Prague, Czech Republic

K18 Basics About Cooled Pv Plant Design Inside The Site Of A Hydro Power Plant
Miguel E.M. Udaeta[1], Brunno R. Silotto[1], Erich H.A. Tsai[1], Luiz C.R. Galv縠[6], Vinicius O.D. Silva[1], Andre L.V. Gimenes[6]
[1]GEPEA/EPUSP, S縠 Paulo, Brazil, [2], S縠 Paulo, Brazil, [3], S縠 Paulo, Brazil, [4]EPUSP, S縠 Paulo, Brazil

K19 A Criterion Of Crop Selection Based On The Novel Concept Of An Agrivoltaic Unit And M-Matrix For Agrivoltaic Systems
Deng Wang, Yiqiang Zhang, Yaojie Sun
Fudan University, Shanghai, China

K20 Coordinative Voltage Control Strategy With Multiple-Resource For Distribution Systems Of High Pv Penetration
Xiangqi Zhu, Yingchen Zhang
National Renewable Energy Laboratory, Golden, CO, United States

12:00 – 1:30 PM	Grand Promenade
Lunch on Your Own	

1:30 – 3:00 PM	Queen 5,6
Buffer Layers	

Chair(s): Shigeru Niki

1:30 Impact Of Sodium Doping On The Electronic And Chemical Structure Of Indium Sulfide Buffer Layers For Cu(In,Ga)(S,Se)2 Thin-Film Solar Cells

Dirk Hauschild[1,2,3], Frank Meyer[3], Andreas Benkert[1,3], Thomas Dalibor[4], J g Palm[4], Monika Blum[5,6], Wanly Yang[6], Friedrich Reinert[3], Clemens Heske[1,2,5], Lothar Weinhardt[1,2,5]

[1]Institute for Photon Science and Synchrotron Radiation (IPS), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, [2]Institute for Chemical Technology and Polymer Chemistry (ITCP), Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, [3]Experimental Physics VII, University of W▪zburg, W▪zburg, Germany, [4]AVANCIS GmbH, Munich, Germany, [5]Department of Chemistry and Biochemistry, University of Nevada, Las Vegas, NV, United States, [6]Advanced Light Source (ALS), Lawrence Berkeley National Laboratory, Berkeley, CA, United States

2:00 Fast Chemical Bath Deposition Process At Room Temperature Of Zns-Based Materials For Buffer Application In High Efficiency Cu(In,Ga)Se2-Based Solar Cells

Thibaud Hildebrandt[1,2], Margot Kozolinsky[1,2], Nicolas Loones[1,2], Muriel Bouttemy[3], Jackie Vigneron[3], Arnaud Etcheberry[3], Daniel Lincot[2,4], Fr鋜駸ique Donsanti[1,2], Negar Naghavi[2,4]

[1]EDF R&D, Palaiseau, France, [2]IPVF, Palaiseau, France, [3]ILV, Versailles, France, [4]CNRS, Palaiseau, France

2:15 Modeling The Performance Of Cdte Solar Cells With A $Ch_3Nh_3Pb(I_{1-x}Br_x)_3$-Like Back Buffer Layer

Geethika K Liyanage, Adam B Phillips, Fadhil K Alfadhili, Zhaoning Song, Khagendra P Bhandari, Randy J Ellingson, Michael J Heben

Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, University of Toledo, Toledo, OH, United States

2:30 Ald Znsno Buffer Layer For Enhancing Heterojunction Interface Quality In Czts Solar Cell

Xin Cui, Kaiwen Sun, Chang-Yeh Lee, Chang Yan, Heng Sun, Yuanfang Zhang, Fangyang Liu, Martin Green, Bram Hoex, Xiaojing Hao

School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Sydney, Australia

Best Student Presentation Award Finalist

2:45 Control Of Donor Concentration In *N*-Type Buffer Layer For High-Efficiency $Cu(In,Ga)Se_2$ Solar Cells

Takahiro Hayakawa[1], Takahito Nishimura[2], Hiroki Sugiura[3], Naoki Suyama[3], Kazuyoshi Nakada[3], Akira Akira[3]

[1]School of Engineering, Tokyo tech., Meguro-ku, Tokyo, Japan, [2]Department of Physical Electronics, Tokyo tech., Meguro-ku, Tokyo, Japan, [3]Department of Electrical and Electronics Engineering, Tokyo tech., Meguro-ku, Tokyo, Japan

1:30 – 3:00 PM	Monarchy
Passivated Contacts, Carrier Selective Contacts: Device Integration	

Chair(s): Frank Feldman

Best Student Presentation Award Finalist

1:30 A Simple Process Flow For Silicon Solar Cells With Co-Annealing Of Electron And Hole Selective Passivating Contacts

Gizem Nogay, Andrea Ingenito, Esteban Rucavado, Josua St・kelberger, Quentin Jeangros, Philippe Wyss, Monica Morales-Masis, Franz-Josef Haug, Philipp L　er, Christophe Ballif

Ecole Polytechnique F鍼騁ale de Lausanne-PVLAB, Neuchatel, Switzerland

2:00 Large Area Topcon Technology Achieving 23.4% Efficiency

Bernd Steinhauser[1], Frank Feldmann[1,2], Jana-Isabelle Polzin[1,2], Leonard Tutsch[1], Varun Arya[1], Benjamin Gr・el[1], Andreas Fischer[1], Anamaria Moldovan[1], Jan Benick[1], Armin Richter[1], Andreas A. Brand[1], Sven Kluska[1], Martin Hermle[1]

[1]Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany, [2]Albert-Ludwigs-University of Freiburg, Freiburg, Germany

2:15 >24% Silicon Heterojunction Solar Cells On Meyer Burger担 On Mass Production Tools And How Wafer Material Impacts Cell Parameters

Jun Zhao[1], Marcel Koenig[1], Yu Yao[2], Yichun Wang[3], Rui Zhou[3], Tian Xie[3]

[1]Meyer Burger (Germany) GmbH, Hohenstein-Ernstthal, Germany, [2]Meyer Burger AG, Thun, Switzerland, [3]LONGi Green Energy Technology Co., Ltd, Xi An, China

2:30 Simplified Silicon Heterojunction Ibc Process Flow: Development Of *In Situ* Dry Clean For Rear-Side Patterning With Efficiencies Above 22.5%

Hariharsudan Sivaramakrishnan Rad[1], MD Gius Uddin[1], Menglei Xu[1,2], Yaser Abdulraheem[3], Ivan Gordon[1], Jozef Szlufcik[1], Jef Poortmans[1,2,4]

[1]imec, Leuven, Belgium, [2]KU Leuven, Leuven, Belgium, [3]Kuwait University, Safat, Kuwait, [4]University of Hasselt, Hasselt, Belgium

2:45 Strategies For Integration Of Passivating Contacts In Existing Production Lines

Andrea Ingenito[1], Philippe Wyss[1], Gizem Nogay[1], Josua Andreas St・kelberg[1], Christophe Alleb□[2], Quentin Jeangros[1], J　g Horzel[2], Matthieu Despeisse[2], Franz-Josef Haug[1], Philipp L　er[1], Christophe Ballif[1,2]

[1]Ecole Polytechnique F鍼騁ale de Lausanne , Neuchatel, Switzerland, [2]CSEM, PV-Center, Neuchatel, Switzerland

1:30 – 3:00 PM	Kona 4
Homojunction Devices and Technologies	

Chair(s): Ziv Hameiri

1:30 Gettering Efficacy Of Apcvd Based Process Steps For Low Cost Pert-Type Multicrystalline Silicon Solar Cells

Johannes Fichtner[1], Heiko Zunft[2], Annika Zuschlag[1], Holger Knauss[2], Giso Hahn[1]

[1]University of Konstanz, Konstanz, Germany, [2]Gebr. Schmid GmbH, Freudenstadt, Germany

1:45 *A Novel Co-Diffusion Process For P-Type Perl Solar Cells By Using Aluminum Doping Paste*

Yung-Sheng Lin[1], Jui-Yi Hung[2], Chen-Hao Ku[1], Jung-Ching Wang[3], Tsung-Cheng Chen[1], Jusfong Yu[1], Shih-Lung Lee[1], Shih-Lung Guo[1], Ching-Chang Wen[1]

[1]E-Ton Solar Tech, Tainan, Taiwan, [2]New E Materials Co., LTD., Kaohsiung, Taiwan, [3]Eternal Chemical Co., LTD., Kaohsiung, Taiwan

2:00 Analysis Of Phosphosilicate Glass Structures Formed By Atmospheric Pressure And High Throughput Low Pressure $POCl_3$ Diffusion

Sabrina Lohm‧ler (n馥 Werne[1], Marius Me˚mer[1], Stefan Schmidt[1], Elmar Lohm‧ler[1], Alexander Piechulla[2], Andreas Wolf[1]

[1]Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, [2]centrotherm international AG, Blaubeuren, Germany

2:15 Performance Improvement Of Front Junction N-Type Pert Solar Cell By Wafer Thinning

Kyotaro Nakamura[1], Tomoyuki Kawatsu[2], Takefumi Kamioka[3], Yoshio Ohshita[1]

[1]Toyota Technological Institute, Nagoya, Japan, [2]Komatsu NTC Ltd., Toyama, Japan, [3]Meiji University, Kawasaki, Japan

2:30 Latest Results In Screen-Printed Ibc-Zebra Solar Cells

Giuseppe Galbiati, Haifeng Chu, Valentin Mihailetchi, Joris Libal, radovan kopecek

International Solar Energy Research Center Konstanz, Konstanz, Germany

2:45 Advancements In The Utilization Of Screen Printed Boron Doping Paste For High Efficiency Back-Contact Back-Junction Silicon Solar Cells

Jonas D. Huyeng[1], Simon F. Lang[1], Raphael Efinger[1], Stefan Schmidt[1], Alma Spribille[1], David Bruge[2], Andreas Wolf[1], Roman Keding[1], Oliver Doll[2], Florian Clement[1]

[1]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany, [2]Merck KGaA, Darmstadt, Germany

1:30 – 3:00 PM	King 1

Understanding Perovskite Optoelectronic Properties

Chair(s): Ulrich Paetzold

1:30 Biexciton Auger Recombination Differs In Hybrid And Inorganic Halide Perovskite Quantum Dots

Giles E. Eperon, Erin Jedlicka, David Ginger

University of Washington, Seattle, WA, United States

1:45 Temperature-Dependent Electromodulation Spectroscopy Of Excitons In Perovskite Solar Cells

Fabian Ruf[1], Alice Magin[1], Moritz Schultes[2], Meltem F. Ayg•er[3], Pablo Docampo[4], Erik Ahlswede[2], Heinz Kalt[1], Michael Hetterich[1,5]

[1]Institute of Applied Physics, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany, [2]Zentrum f• Sonnenenergie- und Wasserstoff-Forschung Baden-W•ttemberg (ZSW), 70563 Stuttgart, Germany, [3]Department of Chemistry and Center for NanoScience (CeNS), LMU Munich, 81377 Munich, Germany, [4]Physics Department, School of Electrical and Electronic Engineering, Newcastle University, Newcastle upon Tyne, NE1 7RU, United Kingdom, [5]Light Technology Institute, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany

2:00 Imaging Performance-Limiting Mechanisms Of Mixed Halide Perovskites

Sarah Wieghold[1], Jason S. tresback[2], Juan-Pablo Correa-Baena[1], Zhe Liu[1], Lea Nienhaus[1], Shijing Sun[1], Seong Sik Shin[1], Moungi G. Bawendi[1], Tonio Buonassisi[1]

[1]Massachusetts Institute of Technology, Cambridge, MA, United States, [2]Center for Nanoscale Systems, Harvard University, Cambridge, MA, United States

2:15 Cation And Anion Substitution In Hybrid Perovskites: Solubility Limits And Phase Stabilizing Effects

Susan Schorr[1,3], Frederike Lehmann[1,2], Silvia Binet[1], Alexandra Franz[1], Andreas Taubert[2]

[1]Helmholtz-Zentrum Berlin for Materials and Energy, Berlin, Germany, [2]University Potsdam, Potsdam, Germany, [3]Freie Universitaet Berlin, Berlin, Germany

Best Student Presentation Award Finalist

2:30 Correlative Microscopy Characterization Of Cesium-Lead-Bromide Thin-Films

Hannah Funk[1], Sebasti疣 Caicedo-D疱ila[1], Robert Lovrincic[2], Christian M•ler[2], Michael Sendner[3], Frederike Lehmann[1], Ren□ Gunder[1], Alexandra Franz[1], Markus Wollgarten[1], Benedikt Haas[4], Christoph T. Koch[4], Daniel Abou-Ras[1]

[1]Helmholtz-Zentrum Berlin f• Materialien und Energie, Berlin, Germany, [2]InnovationLab GmbH, Heidelberg, Germany, [3]Kirchhoff Institute of Physics, Heidelberg , Germany, [4]Humboldt-Universit舩 zu Berlin, Berlin, Germany

1:30 – 3:00 PM	Queens 4

Characterization Technologies for Space PV

Chair(s): Don Walker

1:30 Determination Of Subcell Properties In Multijunction Cells Through Pulsed Illumination

Claus G Zimmermann, Martin Rutzinger, Manuel Salzberger, Carmine Pellegrino, Helmut Nesswetter

Airbus, Munich, Germany

2:00 Comparison Of Primary High Altitude And Synthetic Calibration Methods Of Solar Cells For Space Applications In View Of An Updated Am0 Spectrum

Carsten Baur[1], Ingo Kr er[2], Stefan Winter[2], Florian Witt[2], Val駸ie Pichetto[3], Etienne Rapp[3]

[1]European Space Agency, Noordwijk, Netherlands, [2]Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, [3]Centre national d帝tudes spatiales, Toulouse, France

2:15 Impact Of Post Irradiation Annealing On Predicted Mission Performance Of Xtj Prime Space Solar Cells

Philip T Chiu, Chris M Fetzer, Daniel C Law, Moran Haddad, Rob Cravens, Jeffrey Krogen

Spectrolab, Sylmar, CA, United States

2:30 Recovery Of Radiation Degradation In Ingap Solar Cells By Light Soaking

Yuichi Shibata[1], Mitsuru Imaizumi[1], Shin-ichiro Sato[2], Takeshi Ohshima[2], Masafumi Akiyoshi[3], Shuichi Okuda[3]

[1]Japan Aerospace Exploration Agency, Tsukuba, Japan, [2]National Institutes for Quantum and Radiological Science and Technology, Takasaki, Japan, [3]Osaka Prefecture University, Sakai, Japan

2:45 Solar Cell Analysis Under Venus Atmosphere Conditions

Jonathan Grandidier[1], Alexander Kirk[2], Mark L. Osowski[2], Shizhao Fan[3], Minjoo L. Lee[3], Margaret Stevens[1], Phillip Jahelka[4], Giulia Tagliabue[4], Harry A. Atwater[4], James A. Cutts[1]

[1]NASA – Jet Propulsion Laboratory, Pasadena, CA, United States, [2]MicroLink Devices, Niles, IL, United States, [3]University of Illinois Urbana-Champaign, Urbana, IL, United States, [4]California Institute of Technology, Pasadena, CA, United States

1:30 – 3:00 PM	King 2,3
Backsheets and UV testing	

Chair(s): John Wohlgemuth

1:30 Wavelength Sensitivity In Photodegradation Of Pv Backsheets
Xiaohong Gu, Chen-An Wang, Yadong Lyu, Li-Chieh Yu, Jae Hyun Kim, Andrew Fairbrother, Tinh Nguyen
NIST, Gaithersburg, MD, United States

1:45 Experimental Approaches To Investigate Behaviors Of Crack Formation Of Pv Backsheets Under Simultaneous Or Sequential Small Tensile Strains
Jae Hyun Kim, Yadong Lyu, Andrew Fairbrother, Chen-An Wang, Xiaohong Gu
NIST, Gaithersburg, MD, United States

2:00 In-Situ Monitoring Cracking Of An Aged Polyamide-Based Backsheet Under Tension: A Sequential Fragmentation Test Method For Backsheet Cracking Evaluation
Yadong Lyu, Jae Hyun Kim, Andrew Fairbrother, Xiaohong Gu
NIST, Gaithersburg, MD, United States

2:15 Sequential Stress Testing To Predict Photovoltaic Module Durability
William J. Gambogi[1], Thomas Felder[1], Steven W. MacMaster[1], Kaushik Roy Choudhury[1], Bao-Ling Yu[1], Katherine Stika[1], Hongjie Hu[2], Nancy Phillips[1], T.-John Trout[1]
[1]E. I. DuPont de Nemours and Company, Wilmington, DE, United States, [2]DuPont (China) Research & Development and Management Co., Ltd., Shanghai, China

2:30 Ultraviolet Fluorescence Of Ethylene-Vinyl Acetate In Photovoltaic Modules As Estimation Tool For Yellowing And Power Loss
Arnaud Morlier, Michael Siebert, Iris Kunze, Susanne Blankemeyer, Marc K tges
ISFH, Emmerthal, Germany

Best Student Presentation Award Finalist

2:45 Novel Accelerated Uv Testing Of Field Aged Modules: Correlating El And Uv Fluorescence Images With Current Drop
Hamsini Gopalakrishna, Archana Sinha, Jaewon Oh, Kshitiz Dolia, Sai Tatapudi, GovindaSamy TamizhMani
Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States

1:30 – 3:00 PM	Kona 5
Grid Integration of PV	

Chair(s): Dr. Yuzuru Ueda

1:30 Lowest-Cost, Firm Pv Without Conventional Backup: Supply Shaping Through Curtailment

Marc J Perez[1], Richard R Perez[2], Karl Rabago[3], Morgan C Putnam[1]

[1]Clean Power Research, Napa, CA, United States, [2]Atmospheric Sciences Research Center, Albany, NY, United States, [3]Pace Energy and Climate Center, New York, NY, United States

Best Student Presentation Award Finalist

1:45 A Fast Quasi-Static Time Series Simulation Method For Pv Smart Inverters With Var Control Using Linear Sensitivity Model

Muhammad Umer Qureshi[1], Santiago Grijalva[1], Matthew J. Reno[2]

[1]Georgia Institute of Technology, Atlanta, GA, United States, [2]Sandia National Laboratory, Albuquerque, NM, United States

2:00 Configuration Of Large-Scale Battery System With Volt-Var Function In Distribution Network With Advanced Load Tap Changer Control

Satoru Akagi[1], Ben York[2], Mobolaji Bello[2], Hideo Ishii[1], Yasuhiro Hayashi[1]

[1]Waseda University, Shinjuku, Japan, [2]Electric Power Research Institute, Knoxville, TN, United States

2:15 Variable Time-Step Implementation For Rapid Quasi-Static Time-Series (Qsts) Simulations Of Distributed Pv

Matthew J. Reno[1], Joseph A. Azzolini[1], Barry Mather[2]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

2:30 Distribution Voltage Regulation Using Extremum Seeking Control With Power Hardware-In-The-Loop

Jay Johnson[1], Rachid Darbali[2], Javier Hernandez-Alvidrez[3], Adam Summers[1,4], Jimmy Quiroz[1], Daniel Arnold[5]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]University of Puerto Rico at Mayag▪z, Mayag▪z, PR, United States, [3]New Mexico State University, Las Cruces, NM, United States, [4]University of New Mexico, Albuquerque, NM, United States, [5]Lawrence Berkeley National Laboratory, Berkeley, CA, United States

2:45 Solar Photovoltaic Capacity Demand For A Full Sustainable Mobility Sector &Ndash; How To Fulfil The Paris Agreement By 2050

Christian Breyer, Siavash Khalili, Eetu Rantanen, Mahdi Fasihi, Dmitrii Bogdanov

Lappeenranta University of Technology, Lappeenranta, Finland

3:00 – 3:30 PM	Grand Promenade
Coffee Break	

3:30 – 5:00 PM	Queen 5,6
Alkali-issues	

Chair(s): Sergio Giraldo

3:30 Effects Of Alkali-Pdt In High-Efficiency Cu(In,Ga)Se_2 Solar Cells

Stefan Paetel[1], Philip Jackson[1], Wolfram Witte[1], Roland W•z[1], Theresa Magorian Friedlmeier[1], Philipp Sch pe[2], Sven Sch herr[2], Carsten Ronning[2], Claudia S. Schnohr[2], Wiltraud Wischmann[1], Michael Powalla[1]

[1]Zentrum fuer Sonnenenergie- und Wasserstoffforschung Baden-Wuerttemberg (ZSW), Stuttgart, Germany, [2]Friedrich-Schiller-Universitaet Jena, Institut fuer Festk perphysik, Jena, Germany

4:00 Modification Of Electronic Grain Boundary Properties Of Cu(In,Ga)Se_2 By Alkali-Fluoride Post Deposition Treatments

Nicoleta Nicoara[1], Roby Manaligod[1], Philip Jackson[2], Dimitrios Hariskos[2], Wolfram Witte[2], Sascha Sadewasser[1]

[1]International Iberian Nanotechnology Laboratory , Braga, Portugal, [2]Zentrum f• Sonnenenergie-und Wasserstoff-Forschung Baden-W•ttemberg , Stuttgart, Germany

4:15 Optimization Of Alkali Supply And Ga/(Ga+In) Evaporation Profile For Thin (0.5 &Micro;M) Cigs Solar Cells

Viktoria Gusak, Olle Lundberg, Erik Wallin, Sven-Olof Katterwe, Ulf Malm, Lars Stolt

Solibro Research AB, Uppsala, Sweden

4:30 An Innovative Alkali Doping Strategy For $Cu_2Znsnse_4$ Through The Cds Buffer Layer

Yudania S疣chez[1], Sergio Giraldo[1], Jacob Andrade-Arvizu[1], Markus Neuschitzer[1], Lorenzo Calvo-Barrio[2], Victor Izquierdo-Roca[1], Alejandro P駸ez-Rodr劭uez[1,3], Edgardo Saucedo[1]

[1]Catalonia Institute for Energy Research (IREC), Sant Adri□ del Bes -Barcelona, Spain, [2]Centres Cient屓ics i Tecnol ics (CCiTUB) de la Universitat de Barcelona, Barcelona, Spain, [3]Departament d'Enginyeria Electr ica i Biom鐵ica, IN2UB, Universitat de Barcelona, Barcelona, Spain

4:45 Ag Alloying And Kf Treatment Effects On Low Bandgap Cigs Solar Cells

Nicholas H Valdes[1,2], JinWoo Lee[3], William N Shafarman[1,2]

[1]University of Delaware, Newark, DE, United States, [2]Institute of Energy Conversion, Newark, DE, United States, [3]Global Solar Inc. , Tucson, AZ, United States

3:30 – 5:00 PM	Queens 4
CPV Modules and Systems	

Chair(s): Tyler Grassman

Best Student Presentation Award Finalist

4:00 Motorless Microtracking For Rooftop Cpv

Alex J. Grede[1], Gregory S. Brulo[2], Andrew J. Ren[1], Christopher D. Rahn[2], Noel C. Giebink[1]
[1]School of Electrical Engineering and Computer Science, The Pennsylvania State University, University Park, PA, United States, [2]Department of Mechanical and Nuclear Engineering, The Pennsylvania State University, University Park, PA, United States

4:15 Highly-Integrated Hybrid Micro-Concentrating Photovoltaics

Lan Li[1], Duanhui Li[1], Bradley Jared[2], Bill Miller[2], William Sweatt[2], Scott Paap[2], Michael Saavedra[2], Charles Alford[2], John Mudrick[2], Michael Wood[2], Ujjwal Das[3], Steve Hegedus[3], Anna Tauke-Pedretti[2], Juejun Hu[1], Tian Gu[1]
[1]Massachusetts Institute for Technology, Cambridge, MA, United States, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]Institute of Energy Conversion, University of Delaware, Newark, DE, United States

4:30 A Hybrid Cpv/T System Featuring Transmissive, Spectrum-Splitting Concentrator Photovoltaics

Matthew D. Escarra[1], Daniel Codd[2], Fletcher Miller[3], James Ermer[4], Vince Romanin[5], Brian C. Riggs[1], John Robertson[1], Yaping Ji[1], Kazi Islam[1], Claire Davis[1], Maxwell Woody[1], Christopher M. Spitler[2], Jacob K. Platz[2], Naman Gupta[3], Jacob Tubbs[3], Dimitri Krut[4]
[1]Tulane University, New Orleans, LA, United States, [2]University of San Diego, San Diego, CA, United States, [3]San Diego State University, San Diego, CA, United States, [4]Boeing-Spectrolab, Sylmar, CA, United States, [5]Otherlab, San Francisco, CA, United States

4:45 Optimization Of The Partially Radiative-Coupling Multi-Junction Solar Cells Considering Fluctuation Of Atmospheric Conditions.

Kenji Araki[1], Yasuyuki Ota[2], Kan-Hua Lee[1], Kensuke Nishioka[2], Masafumi Yamaguchi[1]
[1]Toyota Technological Institute, Nagoya, Japan, [2]University of Miyazaki, Miyazaki, Japan

3:30 – 5:00 PM	Monarchy

Silicon Material, Feedstock and Wafers: Technology

Chair(s): Gianluca Coletti

3:30 Impurity Gettering By Diffusion-Doped Polysilicon Passivating Contacts For Silicon Solar Cells

AnYao Liu[1], Di Yan[1], Jennifer Wong-Leung[2], Li Li[2], Sieu Pheng Phang[1], Andres Cuevas[1], Daniel Macdonald[1]

[1]Research School of Engineering, Australian National University, Canberra, Australia, [2]Department of Electronic Materials Engineering, Research School of Physics and Engineering, Australian National University, Canberra, Australia

3:45 Investigation Of Low-Cost And High Efficiency Ga-Doped Cz-Si Solar Cells

Chuanke Chen[1], Jin Yang[1], Wenshuang He[1], Hong Yang[1], He Wang[1], Jun Lv[2], Jianbo Wang[3], Mingchang Ding[4]

[1]xi'an jiaotong university, xi'an, China, [2]Sanjiang university, Nanjing, China, [3]Southeast University, Nanjing, China, [4]China Electric Power Research Institute, Beijing, China

4:00 >700 Mv Open-Circuit Voltages On Defect-Engineered P-Type Silicon Heterojunction Solar Cells On Czochralski And Multicrystalline Wafers

Daniel Chen[1], Moonyong Kim[1], Jianwei Shi[2], Zhengshan Yu[2], Ashling Leilaeioun[2], Shaoyang Liu[1], Bruno Stefani[1], Roland Einhaus[3], Stuart R Wenham[1], Zachary C Holman[2], Brett J Hallam[1]

[1]University of New South Wales, Sydney, Australia, [2]Arizona State University, Tempe, AZ, United States, [3]Apollon Solar, Lyon, France

4:15 Eliminating Letid Using Rapid Thermal Processing: Impact Of Thermal Profile

Chandany Sen, Daniel Chen, Catherine E Chan, Utkarshaa Varshney, Moonyong Kim, Shaoyang Liu, Alison M. Ciesla, Stuart R. Wenham, CheeMun Chong, Brett J. Hallam, Malcolm D. Abbott

University of New South Wales, Sydney, Australia

4:30 The Behavior And Transport Of Hydrogen In Silicon Solar Cells Observed Through Changes In Contact Resistance

Phillip G. Hamer[1,2], Hantao Li[1], Catherine E. Chan[2], Ruy S. Bonilla[1], Peter R. Wilshaw[2]

[1]Department of Materials, The University of Oxford, Oxford, United Kingdom, [2]The School of Photovoltaic and Renewable Energy Engineering, The University of New South Wales, Sydney, Australia

4:45 Impact Of Tabula Rasa And Phosphorus Diffusion Gettering On Heterojunction Solar Cells Based On N-Type Czochralski-Grown Upgraded Metallurgical-Grade Silicon

Rabin Basnet[1], William Weigand[2], Chang Sun[1], Sieu P Phang[1], Fiacre E. Rougieux[1], Roland Einhaus[3], Julien Degoulange[3], Zachary Holman[2], Daniel Macdonald[1]

[1]Research School of Engineering, The Australian National University, Canberra, Australia, [2]Arizona State University, Tempe, AZ, United States, [3]Apollon Solar, Lyon, France

3:30 – 5:00 PM	Kona 4
Microscopic Characterization Techniques	

Chair(s): Chun Sheng Jiang

3:30 Investigation Of Localized Phase Changes Using High Resolution Electron Back-Scatter Diffraction In Thin Film Cadmium Telluride Photovoltaic Material With High Lattice Defect Densities

A ABBAS[1], A Munshi[2], K L Barth[2], W S Sampath[2], G D West[3], J M Walls[1]

[1]Loughborough University, Loughborough, United Kingdom, [2]Colorado State University, Ft. Colins, CO, United States, [3]Warwick Manufacturing Group, University of Warwick, Coventry, United Kingdom

Best Student Presentation Award Finalist

3:45 Cathodoluminescence Characterization Of Semiconductor Doping At The Nanoscale

Hung-Ling Chen[1], Andrea Scaccabarozzi[1], Romaric De L駱inau[1,2], Chalermchai Himwas[1], Pierre Rale[1], Fabrice Oehler[1], Aristide Lema美re[1], Maria Tchernycheva[1], Jean-Christophe Harmand[1], Andrea Cattoni[1], St駱hane Collin[1,2]

[1]Centre for Nanoscience and Nanotechnology (C2N), Palaiseau, France, [2]Institut Photovoltaïque d'Ile-de-France (IPVF), Antony, France

4:00 Large Area 3D Elemental Mapping Of A Mgzno/Cdte Solar Cell With Correlative Ebsd Measurements

Thomas Fiducia[1], Kexue Li[2], Amit Munshi[3], Walajabad Sampath[3], Chris Grovenor[2], Michael Walls[1]

[1]Loughborough University, Loughborough, United Kingdom, [2]Oxford University, Oxford, United Kingdom, [3]Colorado State University, Fort Collins, CO, United States

4:15 Nanoscale Imaging Of Photocurrent In Perovskite Solar Cells Using Near-Field Scanning Photocurrent Microscopy

Dongheon Ha[1,2], Yohan Yoon[1,2], Ik Jae Park[3], Paul M. Haney[1], Nikolai B. Zhitenev[1]

[1]Center for Nanoscale Science and Technology, National Institute of Standards and Technology, Gaithersburg, MD, United States, [2]Maryland Nanocenter, University of Maryland, College Park, MD, United States, [3]Department of Materials Science and Engineering, Seoul National University, Seoul, Korea

4:30 Electrical Characterization On The Nanoscale: Multi-Probe Stm Of Nanowires For Solar Energy Conversion

Andreas Naegelein, Matthias Steidl, Cornelia Timm, Peter Kleinschmidt, Thomas Hannappel

Ilmenau University of Technology, Ilmenau, Germany

4:45 Carrier-Transport Imaging Of Cadmium Telluride Intra- And Inter- Grains

Chuanxiao Xiao[1], Clyde Scandrett[2], Kevin Blaine[3], ChunSheng Jiang[1], John Moseley[1], Mowafak Al-Jassim[1], Nancy M. Haegel[1], Helio Moutinho[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Naval Postgraduate School, Monterey, CA, United States, [3]Air Force Institute of Technology, Wright-Patterson AFB, OH, United States

3:30 – 5:00 PM	King 1
Perovskite Material Development	

Chair(s): Sam Stranks

3:30 Anharmonicity And Disorder In The Black Phases Of Cspbi3 Used For Stable Inorganic Perovskite Solar Cells

Arthur Marronnier[1], Guido Roma[2], Soline Boyer-Richard[3], Laurent Pedesseau[3], Jean-Marc Jancu[3], Yvan Bonnassieux[1], Claudine Katan[4], Constantinos C. Stoumpos[5], Mercouri G. Kanatzidis[5], Jacky Even[3]

[1]LPICM, CNRS, Ecole Polytechnique, Paris-Saclay University, Palaiseau, France, [2]SRMP, CEA Saclay, Saclay, France, [3]FOTON, Insa Rennes, Universit Rennes 1, CNRS, Rennes, France, [4]Univ. Rennes, CNRS, Univ. Rennes 1, Rennes, France, [5]Department of Chemistry and Argonne-Northwestern Solar Energy Research (ANSER) Center, Northwestern University, Evanston, IL, United States

4:00 Compositional Engineering Of Tin-Lead Halide Perovskites For Efficient And Stable Low Band Gap Solar Cells

Rohit Prasanna[1], Tomas Leijtens[1], Aryeh Gold-Parker[2], Bert Conings[3], Aslihan Babayigit[3], Hans-Gerd Boyen[3], Michael F. Toney[2], Michael D. McGehee[1]

[1]Stanford University, Stanford, CA, United States, [2]SLAC National Accelerator Laboratory, Menlo Park, CA, United States, [3]Hasselt University, Diepenbeek, Belgium

4:15 Inkjet Printed Perovskite Photovoltaics

Florian Mathies[1,2], Bryce S. Richards[1,3], Gerardo Hernandez-Sosa[1,2], Uli Lemmer[1,3], Ulrich W. Paetzold[1,3]

[1]Light Technology Institute, Karlsruhe Institute of Technology, Karlsruhe, Germany, [2]InnovationLab GmbH, Heidelberg, Germany, [3]Institute of Microstructure Technology, Karlsruhe Institute of Technology, Karlsruhe, Germany

4:30 Crystal Growth, Defect Density, And Its Effect On Intrinsic Properties

David T. Moore[1], Peter Beaucage[2]

[1]National Renewable Energy Lab, Goden, CO, United States, [2]Cornell University, Ithaca, NY, United States

4:45 Getting Rid Of Anti-Solvents: Gas Quenching For High Performance Perovskite Solar Cells

Bert Conings[1,2], Aslihan Babayigit[1,2], Matt Klug[2], Sai Bai[2,3], Nicolas Gauquelin[4], Nobuya Sakai[2], Jacob T.-W. Wang[2,5], Jo Verbeeck[4], Hans-Gerd Boyen[1], Henry J. Snaith[2]

[1]Hasselt University, Diepenbeek, BE, Belgium, [2]University of Oxford, Oxford, UK, United Kingdom, [3]Link ing University, Link ing, SE, Sweden, [4]University of Antwerp, Antwerp, BE, Belgium, [5]CSIRO Energy, Newcastle, AU, Australia

3:30 – 5:00 PM	Kona 5
Bifacial PV Modules	

Chair(s): Yifeng Chen

Best Student Presentation Award Finalist

3:30 A Comparison Study Of The Performance Of South/North-Facing Vs East/West-Facing Bifacial Modules Under Shading Conditions

Amir Asgharzadeh[1], Chris Deline[2], Joshua Stein[3], Fatima Toor[1]

[1]Electrical and Computer Engineering Department, The University of Iowa, Iowa City, IA, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States, [3]Sandia National Laboratories, Albuquerque, NM, United States

Best Student Presentation Award Finalist

3:45 Model And Validation Of Single-Axis Tracking With Bifacial Pv

Silvana Ayala Pelaez[1], Chris Deline[2], Peter Greenberg[3], Josh Stein[4], Raymond K. Kostuk[1]

[1]University of Arizona, Tucson, AZ, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States, [3]NRGWise Lighting, Albany, OR, United States, [4]Sandia National Laboratories, Albuquerque, NM, United States

Best Student Presentation Award Finalist

4:00 Performance Of Bifacial Pv Arrays With Fixed Tilt And Horizontal Single Axis Tracking: Comparison Of Simulated And Measured Data

Djaber Berrian[1], Joris Libal[1], Markus Klenk[2], Hartmut Nussbaumer[2], Radovan Kopecek[1]

[1]ISC Konstanz e.V, Konstanz, Germany, [2]Zurich University of Applied Sciences/ZHAW, Winterthur, Switzerland

Best Student Presentation Award Finalist

4:15 Design And Construction Of Controlled Back Reflectors For Bifacial Photovoltaic Modules

David Bowersox, GovindaSamy TamizhMani

Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States

4:30 Terrestrial Study Of Bifacial Silicon Heterojunction Solar Modules

Fuguo Peng, Wei Long, Cheng Zhou, Xiuqing Yang, Jun Duan, Wei Zhang, Lianbing Li, De-Cheng Hu, Cao Yu, Jinyan Zhang, Yuanmin Li, Xixiang Xu

Chengdu R&D Center, Beijing Juntai Innovation Technology Co., Ltd., Chengdu, China

4:45 Performance Of Bifacial Pv Modules With Mlpe Vs. String Inverters

Daniel M Riley, Joshua S Stein, Craig K Carmignani

Sandia National Laboratories, Albuquerque, NM, United States

3:30 – 5:00 PM	King 2,3
PV System Safety and Components	

Chair(s): Adrian Haering

3:30 Electrical Safety And Data Integrity Requirements For Energy Storage Systems In The European Market

Nicolas Bogdanski[1], R. Brueck[1], Z. Zhu[2], F. Reil[1]

[1]TÜV Rheinland Germany, [2]TÜV Rheinland North America

3:45 Arc Fault Detection And Localization In Photovoltaic Systems Using Parallel Capacitors

Qing Xiong[1,2], Xianyong Feng[2], Angelo L. Gattozzi[2], Xiaojun Liu[1], Hang Yang[1], Shengchang Ji[1], Lingyu Zhu[1], Robert E. Hebner[2]

[1]State Key Laboratory of Electrical Insulation and Power Equipment, Xi誕n Jiaotong University, Xi誕n, China, [2]Center for Eletromechanics, University of Texas, Austin, TX, United States

4:00 Hazard Analysis Of Fire Fighter Interactions With Photovoltaic Arrays

Jack D. Flicker[1], Olga Lavrova[1], Jimmy E. Quiroz[1], Tim Zgonena[2], Hai Jiang[2], Kent Whitfield[2], Kenneth Boyce[2], Paul Courtney[2], John Carr[2], Paul Brazis[2]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]UL LLC, Northbrook, IL, United States

4:15 Evaluating Energy Impacts And Costs From Pv Component Faults And Failures

Geoffrey T Klise[1], Janine M Freeman[2]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

4:30 Revising The Bypass Diode Test In Iec 61215 To Incorporate The Effects Of Photovoltaic Module Mounting Configuration And Climate Of Deployment

Narendra Shiradkar[1,2,3], Vivek Gade[2], Eric Schneller[3], Kalpathy Sundaram[3]

[1]National Centre for Photovoltaic Research and Education, Indian Institute of Technology Bombay, Mumbai, India, [2]Jabil Circuit Inc, St. Petersburg, FL, United States, [3]University of Central Florida, Orlando, FL, United States

4:45 Automatically And Real–Time Identifying Malfunctions In Pv Systems Using Massive On–Line Pv Yield Data

Roeland C. Nijman[1], Frank Kreuwel[2], Hiltjo Carp[2], Arno H.M. Smets[1]

[1]Delft University of Technology, Delft, Netherlands, [2]Alliander NV, Arnhem, Netherlands

5:30 – 7:00 PM	Monarchy Plenary
Outstanding Technical Achievements Awards Ceremony	

Chair(s): Alex Freundlich

5:30 Award Ceremony Welcome Remarks
Alexandre Freundlich
General Chair

7:00 – 9:00 PM	Lagoon Lanai
Awards Reception	

Wednesday, June 13, 2018

8:20 – 8:30 AM	Monarchy Plenary
Highlights and Announcements	

8:30 – 9:00 AM	Monarchy Plenary
Bringing III–V Photovoltaics Down to Earth with Dynamic–Hydride Vapor Phase Epitaxy	

Chair(s): Tyler Grassman

8:30 Bringing Iii–V Photovoltaics Down To Earth With Dynamic–Hydride Vapor Phase Epitaxy
Aaron J. Ptak
National Renewable Energy Laboratory, Golden, CO, United States

9:00 – 9:30 AM	Monarchy Plenary
Has Time Come for CIGS Thin Film Solar?	

Chair(s): Nicolas Barreau

9:30 – 10:00 AM	Monarchy Plenary
Electrochemical Energy Storage: Challenges and Options	

Chair(s): Pierre Verlinden

9:30 Electrochemical Energy Storage: Challenges And Options
Anthony Burrell
National Renewable Energy Laboratory

10:00 – 10:30 AM	Monarchy Plenary
Manufacturing Crystalline Silicon PERC Solar Cells	

Chair(s): Mariana Bertoni

10:00 Manufacturing Crystalline Silicon Perc Solar Cells
Qi Wang, Peiting Zheng, Xinyue Zhang, Hao Jin
JinkoSolar, Yuanhua Town, China

10:30 – 11:00 AM	Grand Promenade
Coffee Break	

11:00 – 12:30 PM	Poster 1
Fundamental Conversion Mechanisms / Novel Material Systems	

Chair(s): Laurent Lombez

A1 Effect Of Zno Interfacial Layer Grown By Atomic Layer Deposition On The Performance Of Graphene/Silicon Schottky Junction Solar Cells
Aaesha Alnuaimi[1,2], Ibraheem Almansouri [2], Irfan Saadat[2], Ammar Nayfeh[2]
[1]Research & Development Center, Dubai Electricity and Water Authority (DEWA), Dubai, United Arab Emirates, [2]Department of Electrical and Computer Engineering (ECE), Masdar Institute, Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates

A2 Low–Cost Fabrication Of Lead Oxide Microcrystallites And Its Application As A Photoelectrode.

Dharini K Bhagat, Manmohansingh G Waldiya, Indrajit Mukhopadhyay
Pandit Deendayal Petroleum University, Gandhinagar, India

A3 Low-Cost Virtual Substrates For High Efficiency Iii-V Photovoltaics
Gandhari Bhandari, Sean J Babcock, Christopher G Bailey
Old Dominion University, Norfolk, VA, United States

A4 Π-Cubic Sns And Spinel-Type Zn2Geo4: Strategies For The Bulk Synthesis Of Metastable Compounds For Solar Energy Conversion.
Joachim Breternitz[1], Susan Schorr[1,2]
[1]Helmholtz-Zentrum Berlin f• Materialien und Energie, Berlin, Germany, [2]Freie Universit舩 Berlin, Berlin, Germany

A5 Facilitated Carrier Collection Of Surface-Textured Hybrid Pedot:Pss-Silicon Solar Cells Using Kirigami Graphene
Chih-Lin Chiu[1], Zih-Yang Chen[1], Chi-Hsien Huang [2], Pei-Chen Yu[1]
[1]Department of Photonics, National Chiao-Tung University, Hsinchu county, Taiwan, [2]Department of Materials Engineering, Ming Chi University of Technology, New Taipei City , Taiwan

A6 Genetic Algorithm Design Of Multi Junction Solar Cells: 50% Efficiency Target And Beyond
Slobodan Cicic, Stanko Tomic
University of Salford, Manchester, United Kingdom

A7 Investigation Of P-$Basi_2$/N-Si Heterojunction Solar Cells On Si(001) And Comparison To Those On Si(111)
Tianguo Deng, Takuma Sato, Zhihao Xu, Ryota Takabe, Suguru Yachi, Yudai Yamashita, Kaoru Toko, Takashi Suemasu
Institute of Applied physics, University of Tsukuba, Tsukuba, Japan

A8 Pid Prevention In Solar Modules By Application Of A Back-Side Cover Glass Coating
Robert A. Fleming[1], Sergiu C. Pop[2], Corey S. Thompson[1]
[1]WattGlass, Fayetteville, AR, United States, [2]SCP Sys LLC, San Francisco, CA, United States

A9 Effect Of Light Irradiation On Carrier Mobility Of N- And P-Type Si Substrates For Solar Cell Application
Atsuhiko Fukuyama, Shuya Tategami, Kenjiro Takauchi, Naoki Matsuda, Tsubasa Nakamura, Hidetoshi Suzuki, Kensuke Nishioka, Tetsuo Ikari
University of Miyazaki, Miyazaki, Japan

A10 Reduction Of V_{Oc} Induced By The Electron-Phonon Scattering In Gaas And Ch3Nh3Pbi3
Benoit Galvani[1], Amaury Delamarre[2,3], Daniel Suchet[2,4], Marc Bescond[5], Fabienne Michelini[1], Michel Lannoo[1], Masakazu Sugyiama[2,3], Jacky Even[6], Jean-Fran輟is Guillemoles[3,7], Nicolas Cavassilas[1,2]
[1]Aix Marseille Universit□, CNRS, Universit□ de Toulon, IM2NP □ UMR 7334, Marseille, France, [2]NextPV, LIA, CNRS-RCAST/U. Tokyo-U. Bordeaux, Tokyo, Japan, [3]RCAST, The University of Tokyo , Tokyo, Japan, [4]LPICM □ UMR 7647 , Palaiseau, France, [5]LIMMS, CNRS-IIS, UMI 2820, University of Tokyo, Tokyo, Japan, [6]Univ Rennes, INSA Rennes, CNRS, Institut FOTON □ UMR 6082, Rennes, France, [7]CNRS, IPVF □ UMR 9006 , Palaiseau, France

B1 Advanced Light Trapping For Hot-Carrier Solar Cells
Maxime Giteau[1,2], St駱hane Collin[1,3], Zacharie Jehl[1,2], Daniel Suchet[1,2], Jean-Fran輟is Guillemoles[1,4], Yoshitaka Okada[1,2]
[1]NextPV, LIA RCAST-CNRS, The University of Tokyo, Tokyo, Japan, [2]Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, Japan, [3]Centre for Nanoscience and Nanotechnology (C2N), CNRS, University Paris-Sud/Paris-Saclay, Marcoussis, France, [4]CNRS, Institut Photovoltaique d'Ile de France (IPVF), Palaiseau, France

B2 Critical Analysis Of $In_xGa_{1-x}N$ Based Solar Cells
Carlos Alberto Hern疣dez-Guti騨rez[1, 4], Arturo Morales-Acevedo[2], Dagoberto Cardona[3], Gerardo Contreras-Puente[4], Maximo L ez-L ez[5]
[1]Cinvestav-IPN, Nanoscience and nanotechnology program, Ciudad de M騧ico, Mexico,

[2]Cinvestav-IPN, Electrical engineering Department, Ciudad de M騙ico, Mexico, [3]ITESO, Mathematics and Physics Department, Jalisco, Mexico, [4]National Polytechnic Institute, ESFM, Ciudad de M騙ico, Mexico, [5]Cinvestav-IPN, Physics Department, Ciudad de M騙ico, Mexico

B3 Optical Properties Of Patterned Inn In Photodetection Devices

Lung-Hsing Hsu[1], Yuh-Jen Cheng[2], Peichen Yu[1], Hao-Chung Kuo[1], Chien-Chung Lin[1]
[1]National Chiao Tung University, Hsinchu, Taiwan, [2]Academia Sinica, Taipei, Taiwan

B4 What Limits Mobility In Hydrogenated Indium Oxide?

Sebastian Husein[1], Michael Stuckelberger[2], Bradley West[1], Laura Ding[3], Monica Morales-Masis[4], Fabien Dauzou[5], Martial Duchamp[6], Mariana I. Bertoni[1]
[1]Arizona State University, Tempe, AZ, United States, [2]Deutsches Elektronen-Synchrotron, Hamberg, Germany, [3]Centre Suisse d'Electronique et de Microtechnique, Neuch穰el, Switzerland, [4]ノcole polytechnique f馘駻ale de Lausanne, Neuch穰el, Switzerland, [5]Institut National de la Recherche Scientifique, ノnergie, Mat駻iaux et T駘馗ommunication, Qu襲ec, QC, Canada, [6]Peter Grunberg Institut, Forschungzentrum J・ich , J・ich , Germany

B5 Hot Carrier Extraction Using Energy Selective Contacts And Feedback On The Remaining Distribution

Zacharie Jehl [1,2], Daniel Suchet[1,2], Naoya Miyashita[1,2], Benoit Behagel[2,3], Maxime Giteau[1,2], Amaury Delamarre[1,2], Bernice Mae F. Yu Jeco[2], Jean-Francois Guillemoles[2,3], Yoshitaka Okada[1,2]
[1]NextPV, LIA RCAST-CNRS, The University of Tokyo, Tokyo, Japan, [2]Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, Japan, [3]IRDEP, UMR CNRS EDF ENSCP, Paris, France

B6 A Solar Cell Enabling Heat Recovery Without Fast Carrier Extraction

Kenji Kamide[1], Toshimitsu Mochizuki[1], Hidefumi Akiyama[2,3], Hidetaka Takato[1]
[1]Renewable Energy Research Center, National Institute of Advanced Industrial Science and Technology (AIST), Koriyama, Fukushima, 963-0298, Japan, [2]The Institute for Solid State Physics (ISSP), The University of Tokyo, Kashiwa, Chiba, 277-8581, Japan, [3]Advanced Operando-Measurement Technology Open Innovation Laboratory (OPERANDO-OIL), Kashiwa, Chiba, 277-8581, Japan

B7 Impact Of Passivation On Base Thickness For Single Junction Flexible Gaas Solar Cells On Epi-Ready Metal Tape

Devendra Khatiwada, Pavel Dutta, Monika Rathi, Bo Yu, Yao Yao, Sicong Sun, Yongkuan Li, Sara Pouladi, Jae-Hyun Ryou, Venkat Selvamanickam
Advanced Manufacturing Institute, Department of Mechanical Engineering, Texas Center for Superconductivity, University of Houston, Houston, TX, United States

B8 Demonstration Of Basi&Shy;$_2$ Pn Homojunction Solar Cells And Improvement Of Photoresponsivity Of Basi$_2$ Absorbers By Ba/Si Deposition Rate Ratio

Komomo Kodama, Ryota Takabe, Kaoru Toko, Takashi Suemasu
University of Tsukuba, Tsukuba, Japan

B9 The Analysis Of Recombination Current For Multiple Exciton Generation Solar Cell From Single Junction To Multijunction

Jongwon Lee, Christiana B. Honsberg
School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ, United States

B10 Study Of The Influence Of Structural Defects On The Opto-Electronic Properties Of Two Dimensional Transition Metal Di-Chalcogenides.

HIMANI MISHRA, SITANGSHU BHATTACHARYA
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY ALLAHABAD, ALLAHABAD, India

B11 Investigating A New Operating Point For Pv Panels Seeking Maximum Life Span

Bechara Fadi Nehme[1, 2], Nacer Kouaider MSirdi[2], Tilda Roger Akiki[1], Barbar Bechara Zeghondy[3]
[1]Department of Electrical, Telecommunications and Computer Engineering, Faculty of Engineering, Holy Spirit University of Kaslik (USEK), B.P. 446, Jounieh, Lebanon, [2]Aix Marseille Universit□, CNRS, ENSAM, Universit□ de Toulon, LSIS UMR 7296, 13397, Marseille, France,

[3]Department of Mechanical Engineering, Faculty of Engineering, Holy Spirit University of Kaslik (USEK), B.P. 446, Jounieh, Lebanon

B12 Development Of Patterned Graphene Transparent Conductive Film For Solar Cells Application

Hiroki Nishida, Ryousuke Ishikawa, Sho Watanabe, Takahiro Nomoto, Nozomu Tsuboi
Niigata University, Niigata, Japan

B13 Effects Of Sub-Gap Absorption On Photovoltaic Performance

Stefan T. Omelchenko, Joeson Wong, Nathan S. Lewis, Harry A. Atwater
California Institute of Technology, Pasadena, CA, United States

B14 Comparison Of Possible Realisations Of A Quantum Ratchet Intermediate Band Solar Cell

Andreas Pusch[1], Nic Hylton[2], Nicholas Ekins-Daukes[1]
[1]UNSW, Kensington, Australia, [2]Imperial College London, South Kensington, United Kingdom

B15 Demonstration Of A New Oxide Absorber Ag_2Cro_4 Using Top-Contacted Schottky Cells

Pramod Ravindra[1], Suresh Kumar[1], Eashwer Athresh[2], Asmita Jash[1], Rajeev Ranjan[3], Sushobhan Avasthi[1]
[1]Centre for Nanoscience and Engineering, Indian Institute of Science, Bangalore, India, [2]Interdisciplinary Center fir Energy Research, Indian Institute of Science, Bangalore, India, [3]Materials Engineering Department, Indian Institute of Science, Bangalore, India

B16 Ge Thin Films On Glass By Al-Induced Crystallization As Low-Cost Substrates For Iii-V Photovoltaics

Kaveh Shervin, Khim Kharel, Michael Fitchette, Wei Wang, Alexandre Freundlich
University of Houston, HOUSTON, TX, United States

B17 Numerical Analysis Of Znte Based Solar Cell With Sb_2Te_3 As Back Surface Field Layer Using Scaps-1D

Sadia Binte Sohid, Amal Kabalan
Bucknell University, Lewisburg, PA, United States

B18 Tailoring Doping Of Efficient Sb_2Se_3 Solar Cells In Substrate Configuration By Low Temperature Post Deposition Selenization Process

Kunal J. Tiwari[1], Markus Neuschitzer[2], Mois駸 Esp匡dola-Rodr劭uez[2], Yudania S疣chez[2], Pedro Vidal-Fuentes[2], Edgardo Saucedo[2], Piraviperumal Malar[1]
[1]SRM Institute of Science and Technology, Kattankulathur Chennai, India, [2]IREC – Catalonia Institute for Energy Research, Sant Adri□ del Bes -Barcelona, Spain

B19 Growth Of Ingaas:N δ-Doped Superlattices For Multi-Junction Solar Cells

Shumpei Umeda[1], Shuhei Yagi[1], Naoya Miyashita[2], Yoshitaka Okada[2], Hiroyuki Yaguchi[1]
[1]Saitama University, Saitama, Japan, [2]The University of Tokyo, Tokyo, Japan

B20 Hybrid Pedot:Pss – Silicon Solar Cell Packaging Employing Ultrathin Transparent Conductive Films

Ching-Wen Wu[1], Peichen Yu[1], You-Lan Li[1], Chi-Lin Chiu[1], Hsin-Lung Wu[1], Pang-Hua Huang[1], Hiroyuki Kitazawa[3], Hsin-Fei Meng[2]
[1]Department of Photonics, National Chiao-Tung University, Hsinchu, Taiwan, [2]Institute of Physics, National Chiao-Tung University, Hsinchu, Taiwan, [3]SHASHIN KAGAKU CO., LTD , Kyoto, Japan

C1 Design Of Light-Emitting Diodes And Photovoltaic Cells For Electroluminescent Refrigeration

T Patrick Xiao[1], Kaifeng Chen[2], Parthiban Santhanam[2], Shanhui Fan[2], Eli Yablonovitch[1]
[1]University of California, Berkeley, Berkeley, CA, United States, [2]Stanford University, Stanford, CA, United States

C2 Photoresponsivity Improvement Of $Basi_2$ Epitaxial Films By Capping With Hydrogenated Amorphous Si Layers By Radio-Frequency H_2 Plasma

Zhihao Xu[1], Kazuhiro Gotoh[2], Tianguo Deng[1], Kaoru Toko[1], Noritaka Usami[2], Takashi suemasu[1]
[1]University of Tsukuba, Tsukuba shi, Japan, [2]Nagoya university, Nagoya shi, Japan

C3 Carrier Collection Improvement In Ingaas/Gaasn Multiple Quantum Well Solar Cell With Flat Conduction Band

Warakorn Yanwachirakul, Naoya Miyashita, Hassanet Sodabanlu, Kentaroh Watanabe, Masakazu Sugiyama, Yoshitaka Okada, Yoshiaki Nakano

The University of Tokyo, Tokyo, Japan

11:00 – 12:30 PM	Poster 2
Characterization	

Chair(s): Charles Hages

C4 Electrical Impedance Characterization Of Cdte Thin Film Solar Cells With Hydrogen Iodide Back Surface Etching

Rasha Awni, Corey R. Grice, Dengbing Li, Yanfa Yan

The University of Toledo, Toledo, OH, United States

C5 Modeling Of Impurities Diffusion In Molybdenum Thin Films As A Function Of Substrates Temperature

Benjamin Belfore, Orlando Ayala, Tasnuva Ashrafee, Grace Rajan, Shankar Karki, Sylvain Marsillac

Virginia Institute of Photovoltaics, Old Dominion University, Norfolk, VA, United States

C6 Thin Cigs Cells: Enhanced Absorption And Reduced Contact Recombination

Antonius R Burgers, Dong Zhang, George Giannakoudakis, Wim J Soppe

ECN Solar Energy, Petten, Netherlands

C7 Sesame: A Numerical Simulation Tool For Polycrystalline Photovoltaics

Paul M Haney[1], Benoit Gaury[1,2], Yubo Sun[3], Peter Bermel[3]

[1]National Institute for Standards and Technology, Gaithersburg, MD, United States, [2]University of Maryland, College Park, MD, United States, [3]Purdue University, West Lafayetter, IN, United States

C8 Evaluation Of Optical Absorption In $Cu_2Znsn(S,Se)_4$ Absorber Within Cell Structure By Fourier Transform Photocurrent Spectroscopy

Takashi Itoh[1], Abd R. Nur Syazwana[1], Kousei Tanabe[1], Shigeru Yamada[1], Shuichi Nonomura[1], Kanta Sugimoto[2], Akira Yamada[2]

[1]Gifu University, Gifu, Japan, [2]Tokyo Institute of Technology, Tokyo, Japan

C9 Influence Of Effective Thermal Conductivity On The Performance Of The Highly Efficient Cztsse Thin Film Solar Cells

Woo-Lim Jeong[1,2], Jung-Hong Min[1,2], Hae-Sun Kim[1,2], Ji-Hun Kim[1], Jin-Hyeok Kim[3], Dong-Seon Lee[1,2]

[1]Gwangju Institute of Science and Technology, Gwangju, South Korea, [2]Research Institute for Solar and Sustainable Energies, Gwangju, South Korea, [3]Chonnam National University, Gwangju, South Korea

C10 Thin-Film Module Reverse-Bias Breakdown Sites Identified By Thermal Imaging

Steve Johnston[1], Dana Sulas[1], Elizabeth Palmiotti[2], Andreas Gerber[3], Harvey Guthrey[1], Lorelle Mansfield[1], Timothy J. Silverman[1], Angus Rockett[2], Mowafak Al-Jassim[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Colorado Schoo of Mines, Golden, CO, United States, [3]IEK5-Photovoltaics, Forschungszentrum Julich GmbH, Julich, Germany

C11 A Versatile Optical Model Applied To Cdte And $Cdse_{1-y}Te_y$ Alloys: Sensitivity To Film Composition And Relative Defect Density

Maxwell M. Junda, Corey R. Grice, Prakash Uprety, Prakash Koirala, Robert W. Collins, Yanfa Yan, Nikolas J. Podraza

University of Toledo, Toledo, OH, United States

C12 Characterization Of Electronic Defects In Rbf Treated Cigs Solar Cells

Shankar Karki[1], Pran Paul[2], Grace Rajan[1], Angus Rockett[3], Aaron Arehart[2], Sylvain Marsillac[1]

[1]Virginia Institute of Photovoltaics, Old Dominion University, Norfolk, VA, United States, [2]Dept. of Electrical & Computer Engineering, The Ohio State University, Columbus, OH, United States, [3]Dept. of Metallurgical and Materials Engineering, Colorado School of Mines, Golden, CO, United States

C13 Efficiency Limitation On High Efficiency $Cu_2Znsn(S,Se)_4$ Solar Cell

SeongYeon Kim[1], Tanka R. Rana[1], JunHo Kim[1], Dae-Ho Son[2], Kee-Jeong Yang[2], Jin-Kyu

Kang[2], Dae-Hwan Kim[2]

[1]Incheon National University, Incheon, South Korea, [2]DGIST, Daegu, South Korea

C14 Numerical Simulation Of Cigs Solar Cell For Defect Modeling

Sangah Lee[1], Jaesung Lee[1], Myunghun Shin[1], Yoojeong Lee[1], Byungkoun Min[2]

[1]Korea Aerospace University, Gyeonggi-do, South Korea, [2]Clean Energy Research and Advanced Analysis Center, Seoul, South Korea

C15 Modulation Spectroscopy Characterization Of Cu Based Chalcopyrites And Kesterites

Sergiu Levcenco[1], Charles J. Hages[1], Shreyash H. Hadke[2], Helena Stange[3], Roland Mainz[1], Lydia H. Wong[2], Rakesh Agrawal[4], Thomas Unold[1]

[1]Helmholtz Zentrum Berlin, Berlin, Germany, [2]Energy Research Institute, Nanyang Technological University, Singapore, Singapore, [3]Technische Universit舩 Berlin, Institut f・ Werkstoffwissenschaften, Berlin, Germany, [4]School of Chemical Engineering, Purdue University, Indiana, IN, United States

C16 Influence Of Stoichiometry And Temperature On Quasi Fermi Level Splitting Of Sulfide Cis Absorber Layers

Alberto Lomuscio, Michele Melchiorre, Susanne Siebentritt

University of Luxembourg, Belvaux, Luxembourg

C17 Mapping Carrier Lifetime Variations Using Confoal Microscopy In Polycrystalline Cdte Thin Films

Sudhajit Misra[1], Dennis S Pruzan[1], Lauren R Richey-Simonsen[1], Maoji Wang[1], Vasilios Palekis[2], Jeffery A Aguiar[3], Jordan Gerton[1], Christos Ferekides[2], Michael A Scarpulla[1]

[1]University of Utah, Salt Lake City, UT, United States, [2]University of South Florida, Tampa, FL, United States, [3]Idaho National Laboratory, Idaho Falls, IA, United States

C18 On The Determination Of The Back Contact Barrier Height Of $Cu(In,Ga)(S,Se)_2$ Thin Film Solar Cells

Dennis Muecke, Tetiana Lavrenko, Ricardo Vidal Lorbada, Thomas Walter

University of Applied Sciences Ulm, Ulm, Germany

C19 First Principles Approach To Cdte/Te Interface Band Alignment Using Density Functional Theory And Nonequilibrium Green&Rsquo;S Function

Anthony P Nicholson, Amit H Munshi, Walajabad S Sampath

Colorado State University, NSF Next Generation Photovoltaics Center, Department of Mechanical Engineering, Colorado State University, Fort Collins, CO, United States

C20 Investigating The $Cu_2Zn(Sn_{1-X}Ge_X)S_4$ Alloy As A Potential Absorber In Developing An Efficient Thin Film Solar Cell

Muteeu A. Olopade, Adeyinka D. Adewoyin, Olusola O. Oyebola, Michael C. Chendo

D1 Cdte Thin Film Solar Cells Based On N-Type Polycrystalline Cdte Absorber

Vasilios Palekis[1], Imran Khan[1], Shamara Collins[1], Chih A. Hsu[1], Chris Ferekides[1], Don Morel[1], Sudhajit Misra[2], Michael A. Scarpulla[2], Yong-Hang Zhang[3]

[1]University of South Florida, Tampa, FL, United States, [2]University of Utah, Salt Lake City, UT, United States, [3]Arizona State University, Tempe, AZ, United States

D2 Determination Of Current Transport Efficiency Map By Optoelectronic Reciprocity Relation In Cdte Solar Cells

Aobo Ren[1,2], Hao Xu[2], Amaury Delamarre[2], Cai Liu[1], Jingquan Zhang[1], Lili Wu[1], Masakazu Sugiyama[2]

[1]Institute of Solar Energy Materials and Devices, Sichuan University, Chengdu, China, [2]Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, Japan

D3 Spectroscopic Ellipsometry Investigation Of $Cuinse_2$ As A Narrow Bandgap Component Of Thin Film Tandem Solar Cells

Dhurba R Sapkota[1], Prakash Koirala[1], Puja Pradhan[1], Niraj Shrestha[1], Maxwell M Junda[1], Adam B Phillips[1], Randy J Ellingson[1], Michael J Heben[1], Sylvan Marsillac[2], Nikolas J Podraza[1], Robert W Collins[1]

[1]Wright Center for Photovoltaics Innovation & Commercialization, Univ. Toledo, Toledo, OH,

United States, [2]Viriginia Institute of Photovoltaics, Old Dominion Univ., Norfolk, VA, United States

D4 Electroreflectance Spectroscopy On Cds And Zn(O,S) Buffer Layers In Cu(In,Ga)Se_2 Solar Cells: Suppression Of Interference Effects

Jasmin Seeger[1], Ulrich Piesch[1], Wolfram Witte[2], Dimitrios Hariskos[2], Oliver Kiowski[2], Heinz Kalt[1], Michael Hetterich[1,3]

[1]Institute of Applied Physics, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany, [2]Zentrum f• Sonnenenergie- und Wasserstoff-Forschung Baden-W•ttemberg (ZSW), 70563 Stuttgart, Germany, [3]Light Technology Institute, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany

D5 A Unified 2D Solver For Modeling Carrier And Defect Transport In Photovoltaic Devices

Abdul Rawoof Shaik[1], Daniel Brinkman[3], Igor Sankin[2], Dmitry Krasikov[2], Christian Ringhofer[1], Dragica Vasileska[1]

[1]Arizona State University, Tempe, AZ, United States, [2]First Solar Inc, Perrysburg, OH, United States, [3]San Jose State University, San Jose, CA, United States

D7 Characterization And Simulation Of Electronic Effects Of Front Bandgap Gradients In Selenized/Sulfized Cu(In,Ga)(Se,S)2 Solar Cells

Christopher P Thompson, Isaac Lam, William N Shafarman

Institute of Energy Conversion, University of Delaware, Newark, DE, United States

D8 Exploring Metastable Defect Behavior In Solution-Processed Antimony Doped Cigs Thin Film Solar Cells

Mustafa Togay, Sona Ulicna, Syeda Bukhari, Fabiana Lisco, Martin Bliss, Alex Eeles, John M. Walls, Jake W. Bowers

CREST, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, Loughborough, United Kingdom

D10 Enhancing The Performance Of Cdte Solar Cell Through Alloying With Cdse: A Theoretical Study

Jingxiu Yang, Su-Huai Wei

Beijing Computational Science Research Center, Beijing, China

D11 Dependence Of Photovoltage On Incident Photon Energies Investigated By Photo-Assisted Kelvin Probe Force Microscopy On Cu(In,Ga)Se_2 Solar Cells

Hyeondeuk Yong[1], Takashi Minemoto[2], Takuji Takahashi[1]

[1]The University of Tokyo, Tokyo, Japan, [2]Ritsumeikan University, Shiga, Japan

11:00 – 12:30 PM	Poster 3
Passivated Contacts, Carrier Selective Contacts, Heterojunctions I	

Chair(s): Marius Peters

D12 High Efficiency Hetero-Junction: From Pilot Line To Industrial Production

Anna Battaglia[1], Wilfried Favre[2], Giuseppe Condorelli[1], Pietro Rotoli[1], Andrea Canino[1], Marcello Sciuto[1], Antonino Ragonesi[1], Adrien Danel[2], Delfina Munoz[2], Charles Roux[2], Jean-Francois Lerat[2], Frank Medlege[2], Vincent Barth[2], Lionel Sicot[2], Pierre-Jean Ribeyron[2], Cosimo Gerardi[1]

[1]Enel Green Power, Catania, Italy, [2]CEA, LITEN, Le Bourget du Lac, France

D13 Characterization Of Amorphous Silicon/Aluminum Carrier-Selective Contacts To Silicon Heterojunction Solar Cells

Jonathan L Bryan, Zhengshan J Yu, Ashling (Mehdi) Leilaeioun, Jianwei Shi, William Weigand, Kathryn C Fisher, Zachary C Holman

Arizona State University, Tempe, AZ, United States

D14 Investigation Of P-Type Hydrogenated Nanocrystalline Silicon Grown By Vhf-Pecvd As Emitter In Silicon Heterojunction Solar Cells

Pei-Ling Chen[1,2], Po-Wei Chen[1,2], Takuya Matsui[1], Hitoshi Sai[1], Chuang-Chuang Tsai[2], Koji Matsubara[1]

[1]Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan, [2]Department of Photonics, College of Electrical and Computer Engineering, National Chiao Tung University (NCTU), Hsinchu, Taiwan

D15 Application Of Porous A-Si:H Passivation Layer Deposited Using Si_2H_6 Precursor In Silicon Heterojunction Solar Cells

Po-Wei Chen[1,2], Pei-Ling Chen[1,2], Takuya Matsui[1], Hitoshi Sai[1], Chuang-Chuang Tsai[2], Koji Matsubara[1]

[1]Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST), Ibaraki, Japan, [2]Department of Photonics, College of Electrical and Computer Engineering, National Chiao Tung University (NCTU), Hsinchu, Taiwan

D16 Controllable Optical And Electrical Properties Of Nb Doped Tio_2 Films By Rf Sputtering

Xuemei Cheng, Kazuhiro Gotoh, Mochizuki Takeya , Noritaka Usami

Nagoya University, Nagoya, Japan

D17 Effect Of Rear Passivation And Local Back Contact For High Efficiency C-Si Solar Cell With Variable Laser Feed Speed

Young Ho Cho[1], Jeong Eun Park[2], Sangmuk Kang[1], Hye Kwan Hong[1], Dong Sik Kim[1], Chang-Soon Han[3], Donggun Lim[1,2]

[1]Department of IT convergence, Korea National University of Transportation, chung ju, Korea, [2]Department of Electronic Engineering, Korea National University of Transportation, chung ju, Korea, [3]Laser Advanced System Industrialization Center, Jeollanam-do, Korea

D18 Monopoly Cells: Large-Area Silicon Solar Cells With Screen-Printed And Fired Passivated Contacts

Shubham Duttagupta, Naomi Nandakumar, Rolf Stangl, Armin Aberle

Solar Energy Research Institute of Singapore (SERIS), Singapore, Singapore

D19 Direct Contact To Tco With Smartwire Connection Technology

A. Faes, L. Curvet, H.-Y. Li, J. Champliaud, J. Levrat, K. Thomas, N. Badel, B. Paviet-Salomon, J. Geissb▪ler, C. Alleb□, L. Barraud, A. Desceudres, A. Lachowicz, L.-L. Senaud, C. Ballif, M. Despeisse

CSEM PV-Center, Neuchatel, Switzerland

D20 Excellent Phosphorus Doped Lpcvd Polysilicon Passivated Contacts Via Low Pressure Oxidation

Kean Chern Fong[1], Teng Choon Kho[1], WenSheng Liang[1], Teck Kong Chong[1], Marco Ernst[1], Daniel Walter[1], Matthew Stocks[1], Evan Franklin[1,2], Keith McIntosh[3], Andrew Blakers[1]

[1]The Australian National University, Canberra, Australia, [2]University of Tasmania, Hobart, Australia, [3]PVLighthouse, Wollonggong, Australia

E1 Thermally Stable Molybdenum Oxide Hole-Selective Contacts Deposited Using Spatial Atomic Layer Deposition

Geoffrey S. Gregory[1], Marshall Wilson[2], Kristopher O. Davis[1]

[1]Department of Materials Science and Engineering, University of Central Florida, Orlando, FL, United States, [2]Semilab SDI, Tampa, FL, United States

E2 Optoelectronic Properties Improvement Of Pm-Si:H Films With Silane Flux Variation

Leon Hamui[1], Guillermo Santana[2]

[1]Universidad Anahuac, Mexico, Mexico, [2]UNAM, Mexico, Mexico

E3 Opto-Electrical Properties Of Gan/Si Nanoheterostructure Array Device

Chang Bao Han

Beijing University of Techbology, Beijing, China

E4 Effect Of Deposition Conditions On The Properties Of Tco Films

Yongcai He[1], Gangqiang Dong[2], Ge Cui[2], Haichuan Lu[2], Tianxiang Lan[2], Zhangda Shen[2], Wei Long[2], Cao Yu[2], Hui Yan[1], Jinyan Zhang[2], Yuanmin Li[2], Xixiang Xu[2]

[1]The College of Materials Science and Engineering, Beijing University of Technology, Beijing, China, [2]Chengdu R&D Center, Beijing Juntai Innovation Technology Co., Ltd., Chengdu, China

E5 Low Cost Fabrication Of Back Contact Crystalline-Silicon Heterojunction Solar Cells With N-A-Si Layers Partially Converted From P-A-Si By Phosphine (Ph_3) Plasma Ion-Implantation

ThiCamTu Huynh[1], Koichi Koyama[1,3], Noboru Yamaguchi[2], Hideo Suzuki[2], Keisuke Ohdaira[1], Hideki Matsumura[1]

[1]Japan Advanced Institute of Science and Technology, Nomi, Ishikawa, Japan, [2]ULVAC, Inc., Susono, Shizuoka , Japan, [3]ULVAC, Inc., Chigasaki, Kanagawa, Japan

E6 Effect Of Ito Capping Layer On Interface Workfunction Of Moo_X In Ito/Moo_X/Sio_2/Si Contacts

Takefumi Kamioka[1,2], Yutaka Hayashi[2], Yuki Isogai[2], Kyotaro Nakamura[2], Yoshio Ohshita[2], Atsushi Ogura[1]

[1]Meiji University, Kawasaki, Japan, [2]Toyota Technological Institute, Nagoya, Japan

E7 P-Type Hybrid Heterojunction Solar Cells Naturally Incorporating Gettering And Bulk Hydrogenation

Moonyong Kim[1], Daniel Chen[1], Jianwei Shi[2], Malcolm Abbott[1], Zachary Holman[2], Stuart Wenham[1], Brett Hallam[1]

[1]University of New South Wales, Sydney, Australia, [2]Arizona State University, Tempe, AZ, United States

E8 Structural, Optical And Electrical Characterization Of Heterojunction Rib-Si Solar Cells

Makoto Konagai[1], Rei Kondo[1], Toshiki Otani[1], Satomi Takahashi[1], Kentarou Sawano[1], Yukimi Ichikawa[1], Kazuyoshi Nakada[2], Yasuyoshi Kurokawa[3]

[1]Tokyo City University, Tokyo, Japan, [2]Tokyo Institute of Technology, Tokyo, Japan, [3]Nagoya University , Nagoya, Japan

E9 Performance Of Silicon Heterojunction Solar Cells With Various Metal-Electrodes Directly Formed On A-Si Films Without Insertion Of Tco

Takeo Konishi, Koichi Koyama, Keisuke Ohdaira, Hideki Matsumura

Japan Advanced Institute of Science and Technology, Nomi, Japan

E10 Potential Of Chemical Rounding For The Performance Enhancement Of A Monolithic Perovskite/Bifacial N-Pert Si Tandem Cell

Hyunju Lee[1], Inseol Song[2], Sang-Won Lee[3], Soo Hyun Bae[3], Ji Yeon Hyun[3], Yoonmook Kang[2], Haeseok Lee[3], Donghwan Kim[3], Atsushi Ogura[4], Yoshio Ohshita[1]

[1]Toyota Technological Institute, Nagoya, Japan, [2]KU-KIST Green School, Graduate School of Energy and Environment, Korea University, Seoul , South Korea, [3]Department of Materials Science and Engineering, SERC, Korea University, Seoul , South Korea, [4]School of Science and Technology, Meiji University, Kawasaki, Japan

E11

Chromium Trioxide Hole-Selective Heterocontacts For Silicon Solar Cells

Wenjie Lin[1], Weiliang Wu[1], Zongtao Liu[2], Lun Cai[1], Zhirong Yao[1], Qi Xie[1], Lanxiang Meng[1], Zongcun Liang[1,2], Hui Shen[1,2,3]

[1]Institute for Solar Energy Systems, School of Physics and State Key Laboratory of Optoelectronic Materials and Technologies, Sun Yat-Sen University, Guangzhou, China, [2]Shunde-SYSU Institute for Solar Energy, Shunde, China, [3]Jiangsu Collaborative Innovation Center of Photovoltaic Science and Engineering, Changzhou University, Changzhou, China

E12 Towards 22% Monopoly Cells With In-Situ Plasma-Assisted Tunnel Oxides Deposited By Inline Pecvd

Naomi Nandakumar[1], John Rodriguez[1], Thomas Kluge[2], Thomas Grosse[2], Dirk Landgraf[2], Nagarajan Balaji[1], Michelle Esber[1], Pradeep Padhamnath[1], Shubham Duttagupta[1]

[1]Solar Energy Research Institute of Singapore, Singapore, Singapore, [2]Meyer Burger (Germany), Hohenstein-Ernstthal, Germany

E13 Fabrication Of 25.1% Efficient Hetero Junction Back Contact Si Solar Cells By Mass-Production Process

Chikao Okamoto, Naoki Koide, Shuichiro Sugiyama, Yoshiroh Takaba, Makoto Higashikawa, Tetsuya Ohnishi, Masamichi Kobayashi, Yuji Nishimura, Teruaki Higo, Masahito Ishii, Rihito Suganuma, Takeshi Mori, Yuta Matsumoto, Natsuko Fujiwara, Tomohiro Machida, Hajime Horinaka

Sharp Corpration, Nara, Japan

E14 Development And Optimization Of Carrier (Hole/Electron) Selective Contact Technology For A High-Efficiency Crystalline Si Substrate Based Solar Cell Application

Cheolmin Park[1], Shihyun Ahn[2], Sunhwa Lee[2], Sangwook Han[2], Sooyoung Park[2], Yongjun Kim [2], Jinjoo Park[2], Youngkuk Kim[2], Younghyun Cho [2], Junsin Yi[2]

[1]Department of Energy Science, Sungkyunkwan University, Suwon, Korea, [2]College of Information and Communication Engineering, Sungkyunkwan , Suwon, Korea

E15 Silicon-Organic Heterojunction Solar Cells With Electron-Selective Contacts Based On Organic Interface Dipoles

Christian Reichel[1], Uli W･fel[1,2], Kristina Winkler[1], Hans-Frieder Schleiermach[1,2], Markus Kohlst 膥t[1,2], Moritz Unm･sig[1,2], Christoph Messmer[1], Martin Hermle[1], Stefan Glunz[1,3]

[1]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany, [2]Freiburg Materials Research Center (FMF), University of Freiburg, Freiburg, Germany, [3]Department of Sustainable Systems Engineering (INATECH), University of Freiburg , Freiburg, Germany

E16 Interplay Between Intrinsic Bi-Layers And Overlying Doped Layers In A-Si:H/C-Si Heterojunction Solar Cells

Hitoshi Sai, Takuya Matsui, Shota Nunomura, Koji Matsubara

AIST, Tsukuba, Japan

E17 Gap/Si Heterojunction Solar Cells: An Interface Study

Rebecca Saive[1,2], Hal S Emmer[1], Christopher T Chen[1], Chaomin Zhang[3], Christiana Honsberg[3], Harry A Atwater[1]

[1]California Institute of Technology, Pasadena, CA, United States, [2]University of Twente, Enschede, Netherlands, [3]Arizona State University, Tempe, AZ, United States

E18 Simplified Silicon Heterojunction Ibc Process Flow: Development Of Partial Etching For Rear-Side Patterning With Efficiencies Close To 23%

Hariharsudan Sivaramakrishnan Rad[1], MD Gius Uddin[1], Menglei Xu[1,2], Jinyoun Cho[1,2], Ivan Gordon[1], Jozef Szlufcik[1], Jef Poortmans[1,2,3]

[1]imec, Leuven, Belgium, [2]KU Leuven, Leuven, Belgium, [3]University of Hasselt, Hasselt, Belgium

E19 Performance Of Silicon Heterojunction Solar Cells Under Low Illumination Conditions

Apoorva Srinivasa, Joseph Karas, Andre Augusto, Stuart G. Bowden

Arizona State University, Tempe, AZ, United States

E20 Direct Laser Isolation For Interdigitated Back Contact Heterojunction Solar Cells

Zeming Sun[1], Ugochukwu Nsofor[2], Nuha Ahmed[2], Ujjwal K. Das[2], Steven Hegedus[2], Mool C. Gupta[1]

[1]Charles L. Brown Department of Electrical and Computer Engineering, University of Virginia,

Charlottesville, VA, United States, [2]Institute of Energy Conversion, University of Delaware, Newark, DE, United States

F1 Tunnel Oxides Formed By Field-Induced Anodization For Silicon Solar Cell Passivation

Jingnan Tong, Fa-Jun Ma, Bram Hoex, Alison Lennon
UNSW, Sydney, Australia

F2 Development Of Close-To-Zero Damage Rear Heterojunction Stripe Contacts And Compatible Front Metallization Approaches For Hybrid Heterojunction Solar Cells

Puqun Wang, Mei Huang, Jaffar Moideen YACOB ALI, Ranjani SRIDHARAN, Ankit KHANNA, Mengjie LI, Rolf STANGL
Solar Energy Research Institute of Singapore, Singapore, Singapore

F3 Tantalum Nitride Electron-Selective Contact For Crystalline Silicon Solar Cells

Xinbo Yang[1], Erkan Aydin[1], Hang Xu[1], Jingxuan Kang[1], Wenzhu Liu[1], Yimao Wan[2], Christian Samundsett[2], Andres Cuevas[2], Stefaan De Wolf[1]
[1]KAUST Solar Center, King Abdullah University of Science and Technology (KAUST), Jeddah, Saudi Arabia, [2]Research School of Engineering, Australian National University, Canberra, Australia

F4 Simulation Of Solar Cells Employing 2 Dimensional Transition Metal Dichalcogenide &Ndash; Silicon Front Surfaces

Jing Zhao[1], Yuanfeng Xu[2], Fa-jun Ma[1], Anita Ho-Baillie[1], Hao Zhang[2], Stephen Bremner[1]
[1]UNSW, Sydney, Australia, [2]Fudan University, Shanghai, China

11:00 – 12:30 PM	Poster 4
Passivated Contacts, Carrier Selective Contacts, Heterojunctions II	

Chair(s): Lev Kreinin

F17 Silicon Heterojunction Solar Cell With A P-Type Amorphous Silicon Emitter Formed By Catalytic Impurity Doping

Katsuya Akiyama, Keisuke Ohdaira

Japan Advanced Institute of Science and Technology, Nomi, Ishikawa, Japan

F18 Development Of 40 Um Thin Flexible Silicon Heterojunction Solar Cells

Pradeep Balaji, Andre Augusto, Stuart Bowden

Arizona State University, Tempe, AZ, United States

F19 The Amazing Improvement Of Silicon Heterojunction Technology: Ready For A True Mass Market Launch?

Christophe Ballif[1,2], Mathieu Boccard[1], Matthieu Despeisse[2]

[1]EPFL, Neuch穣el, Switzerland, [2]CSEM, Neuch穣el, Switzerland

G1 Techno-Economic Analysis Of Silicon Heterojunction Cell Sequences Using Hydrogenated P-Type Wafers

Nathan L Chang, Brett Hallam, Daniel Chen, Renate J Egan

University of New South Wales, Sydney, Australia

G2 Development Of The Passivation Layer For P-Type Cui Thin Film Fabricated By The 2-Step Method As The Novel Hole Selective Contact Of Silicon Heterojunction Solar Cells

Min Cui, Kazuhiro Gotoh, Yasuyoshi Kurokawa, Noritaka Usami

Graduate School of Engineering, Nagoya University, Nagoya, Japan

G3 Effect Of Dielectric Layers On Laser-Fired-Contact Performance In A-Si/C-Si Heterojunction Solar Cells

Ujjwal Das[1], Christopher Thompson[1], Ugochukwu Nsofor[1], Zeming Sun[2], Mool C. Gupta[2], Steven Hegedus[1]

[1]Institute of Energy Conversion, University of Delaware, Newark, DE, United States, [2]Charles L. Brown Department of Electrical and Computer Engineering, University of Virginia, Charlottesville, VA, United States

G4 Water Vapor Doped Tco Films And Application In Silicon Heterojunction Solar Cells

Gangqiang Dong[1], Chengjian Hong[1], Ge Cui[1], Wei Long[1], Haichuan Lu[1], Tianxiang Lan[1], Zhangda Shen[1], Yongcai He[2], Cao Yu[1], Hui Yan[2], Yuanmin Li[1], Xixiang Xu[1]

[1]Chengdu R&D Center, Beijing Juntai Innovation Technology Co., Ltd., Chengdu, China, [2]College of Materials Science and Engineering, Beijing University of Technology, Beijing, China

G5 Durable High-Performance Water-Based Anti-Reflective Coating For Pv Module Glass

Brennen M. Freiburger[1], Kenan Isbilir[2], Fabina Lisco[2], Gerald Womack[2], John M. Walls[2], Corey S. Thompson[1]

[1]WattGlass, Fayetteville, AR, United States, [2]Loughborough University, Leicester, United Kingdom

G6 Surface Passivation By Atmospheric Pressure Plasma Coated Silicon Oxide For Passivated Contact Solar Cell Applications

Jia Ge, Ankit Khanna, Thomas Mueller

SERIS, Singapore, Singapore

G7 Energy Band Alignment Of ZnS_xSe_{1-x} Films On Si For Photovoltaic Carrier-Selective Contacts

Rebecca D. Glaudell, Harry A. Atwater

California Institute of Technology, Pasadena, CA, United States

G8 Towards Solar Cells With Black Silicon Texturing Passivated By A-Si:H

Beniamino Iandolo[1], Maksym Plakhotnyuk[2], Rasmus S. Davidsen[1], Eugen Stamate[2], Ole Hansen[1], Shota Nunomura[3]

[1]Technical University of Denmark, Kgs. Lyngby, Denmark, [2]Technical University of Denmark,

Roskilde, Denmark, [3]National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan

G9 Porous Silicon Infiltration With Advanced Materials For Their Use In Third Generation Of Solar Cells.

Pamela Jim駭ez-Cruz[1], Ateet Dutt[1], Batriz De la Mora[2], Guillermo Santana[1]

[1]Instituto de Investigaciones en Materiales, Universidad Nacional Aut oma de M騧ico, M騧ico, Mexico, [2]Instituto de Ciencias Aplicadas y Tecnolog儀, UNAM, M騧ico, D.F., C.P. 04510, Mexico, M騧ico, Mexico

G10 Optimization Of Laser-Opening Pattern For The Efficiency Improvement Of Industrial Perc Solar Cell

DoKywn Kim, Vichai Meemongkolkiat, Je-Min Yeon, Byeong Jun Kim, Jong-youb Lim, Chang Seob Park, Keunkee Hong, Eunjoo Lee, Su-og Choi, Dong Seop Kim

Shinsung E&G, Bundang, Korea

G11 Silicon Heterojunction Solar Cells With Cu_2O:N As P-Type Layer

Jinwoo Kim[1], Yuki Takiguchi[2], Kazuyoshi Nakad[1], Shinsuke Miyajima[1]

[1]Department of Electircal Electronic Engineering, Tokyo Instiute of Technology, Tokyo, Japan, [2]Department of Physical Electronics Institute of Technology, Tokyo, Japan

G12 Application Of Room Temperature Sputtered Al-Doped Zinc Oxide In Silicon Heterojunction Solar Cells

Huimin Li, Weiyuan Duan, Andreas Lambertz, J･gen H･kes, Kaining Ding, Friedhelm Finger, Uwe Rau, Oleksandr Astakhov

IEK-5 Photovoltaik, Forschungszentrum J･ich GmbH, J･ich, Germany

G13 Development Of Large Flexible Module Based On Thin Silicon Heterojunction Solar Cell

Zhengxin Liu, Fanying Meng, Liping Zhang, Jiantao Bian, Jianhua Shi, Yucheng Liu, Jian Yu, Junlin Du, Anjun Han

Research Center for New Energy Technology, Shanghai Institute of Microsystem & Information Technology Chinese Academy of Sciences, Shanghai, China

G14 Aqueous Solution Deposited Molybdenum Oxide Crystalline Silicon Heterojunction Solar Cells

Chenjin Lu[1], Rusli Rusli[2], Ari Bimo Prakoso[3], Zeyu Li[4]

[1]Nanyang Technological University, Singapore, Singapore, [2]Nanyang Technological University, Singapore, Singapore, [3]Nanyang Technological University, Singapore, Singapore, [4]Nanyang Technological University, Singapore, Singapore

G15 Exploration Of A Tmo Layer Matched To C-Si Through Electronic Structure Selection

Z.Q Ma, M Gao, Y.Z Wan, D.Y Chen, X.M Song, B.C Han, F Xu, H.B Guo

Shanghai University, Shanghai, China

G16 Interfacial Spectral Response Under Voltage And Light Bias To Analyse Low Voltage In Amorphous-Crystalline Silicon Heterojunction Solar Cell With S-Shape Characteristics

Sapna Mudgal, Sonpal Singh, Vamsi Krishna Komarala

Centre for Energy Studies, Indian Institute of Technology Delhi, New Delhi, India

F5 Doped Cu_2O / N-Si Heterojunction Solar Cell

Rudra Mukherjee, Pranjal Srivastava, Pramod Ravindra, Sushobhan Avasthi

IISc Bangalore, Bangalore, India

F6 Effects Of Gap Doping, Interface Trap Density And Illumination Intensity On Gap/Si Interface

Srinath Murali, Maxwell Cotton, Yongjie Zou, Christiana Honsberg

Arizona State University, Tempe, AZ, United States

F7 Understanding Transport In Heterojunction Contact Stacks By Simulating Silicon Heterojunction Tlm Structures

Pradyumna Muralidharan, Ashling (Mehdi) Leilaeioun, William Weigand, Zachary Holman, Stephen M Goodnick, Dragica Vasileska

Arizona State University, Tempe, AZ, United States

F8 *Evaluation Of Ito/A-Si Properties By Hard X-Ray* Photoemission Spectroscopy

Tappei Nishihara[1], Takuya Hiyama[1], Takuto Kojima[1], Hideki Matsumura[2], Takefumi Kamioka[3], Yoshio Ohshita[3], Satoshi Yasuno[4], Ichiro Hirosawa[4], Atsushi Ogura[1]

[1]Meiji University, Kanagawa, Japan, [2]Japan Institute of Science and Technology, Ishikawa, Japan, [3]Toyota Technological Institute, Aichi, Japan, [4]JASRI, Hyogo, Japan

F9 C-Si Heterojunction Solar Cells With Metal Oxide Window Layers

Erenn Ore, Gehan Amaratunga

University of Cambridge, Cambridge, United Kingdom

F10 Flexible, Dopant Free A&Shy;-Si:H Solar Cell

Erenn Ore, Gehan Amaratunga

University of Cambridge, Cambridge, United Kingdom

F11 Role Of Polysilicon In Poly-Si/Siox Passivating Contact Solar Cells

HyunJung Park, Se Jin Park, Soohyun Bae, Ji Yeon Hyun, Chang Hyun Lee, Seung Hyun Shin, Yoonmook Kang, Hae-Seok Lee, Donghwan Kim

Korea University, Seoul, South Korea

F12 Towards Full-Area Passivating Contacts For Silicon Surfaces Based On Al2O3-Tiox Double Layers

David Tr er[1], Matthias Grube[1], Martin Knaut[2], Johanna Reif[2], Johann W. Bartha[2], Thomas Mikolajik[1,2]

[1]NaMLab gGmbH, Dresden, Germany, [2]Institute of Semiconductor and Microsystems Technology, TU Dresden, Dresden, Germany

F13 Construction Of Si Solar Cells With Bifacial Metal Oxides Carrier Selective Layers

Fengyou Wang[1,2], Shanzhen Zhao[1], Qianshang Ren[1], Ying Zhao[1], Xiaodan Zhang[1]

[1]Nankai University, Tianjin, China, [2]Jilin Normal University, Siping, China

F14 Investigation Of Nickel Oxide As Carrier-Selective Interlayer For Silicon Solar Cell Contacts

Muyu Xue[1], Raisul Islam[2], Yusi Chen[2], Ching-Ying Lu[2], Zheng Lyu[2], Kai Zang[2], Jieyang Jia[2], Huiyang Deng[2], Ted Kamins[2], Krishna Saraswat[1,2], James Harris[1,2]

[1]Department of Materials Science and Engineering, Stanford, CA, United States, [2]Department of Electrical Engineering, Stanford, CA, United States

F15 Pulsed Laser Deposition Nickel Oxide On Crystalline Silicon As Hole Selective Contacts

Jing Zhao, Anita Ho-Baillie, Stephen Bremner

UNSW, Sydney, Australia

F16 Energy Band Profile Optimization Of The Emitter For High Efficiency C-Si Heterojunction Solar Cell

Lei Zhao[1,2], Guanghong Wang[1], Hongwei Diao[1], Wenjing Wang[1,2]

[1]Key Laboratory of Solar Thermal Energy and Photovoltaic System of Chinese Academy of Sciences, Institute of Electrical Engineering, the Chinese Academy of Sciences, Beijing, China, [2]University of Chinese Academy of Sciences, Beijing, China

11:00 – 12:30 PM	Poster 5
Materials and Device Characterization	

Chair(s): Gerald Siefer

G17 Transmission Electron Microscopy Studies Of Transition Metal Oxides Employed As Carrier Selective Contacts In Silicon Solar Cells

Haider Ali[1,2], James Bullock[3], Geoffrey Gregory[1,2], Xinbo Yang[4], Matthew Schneider[5], Klaus Weber[6], Ali Javey[3], Kristopher O. Davis[1,2]

[1]Department of Materials Science and Engineering, University of Central Florida, Orlando, FL, United States, [2]Florida Solar Energy Center, University of Central Florida, Cocoa, FL, United States, [3]Department of Electrical Engineering and Computer Science, University of California, Berkeley, CA, United States, [4]King Abdullah University of Science and Technology, Thuwal, Saudi Arabia, [5]Los Alamos National Laboratory, Los Alamos, NM, United States, [6]Australian National University, Canberra, Australia

G19 Unravelling The Origins Of Contact Recombination For Localized Laser-Doped Contacts

Marco Ernst[1], Jonas D. Huyeng[1,2], Daniel Walter[1], Kean C. Fong[1], Andrew Blakers[1]

[1]Centre for Sustainable Energy Systems, Australian National University, Canberra, Australia, [2]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany

G20 Influence Of The Concentration Of Cs On The Properties Of Thin Films Of $Cs_xMa_{(1-x)}Pbi_3$ To Be Used As Active Layer In Hybrid Solar Cells

Gerardo Gordillo[1], Liliana C. Luis[1], Jenny Buitrago[2], Miguel Angel Reinoso[3]

[1]Universidad Nacional de Colombia, Bogot□, Columbia, [2]Fundaci Universidad de America, Bogot□, Columbia, [3]Universidad Estatal de Milagro, Milagro, Ecuador

H1 Pv Module Loss Analysis Using System In-Situ Monitoring Data

Siyu Guo[1], Joseph Walters[1], Eric Schneller[1], Matthew Boyd[2]

[1]Florida Solar Energy Center, University of Central Florida, Cocoa, FL, United States, [2]National Institute of Standards and Technology, Gaithersburg, MD, United States

H2 Contactless Measurement Of Pico-To-Nanosecond Dynamics Of Photovoltage: Its Utility And Constraint

Yuji Hazama[1,2], Yukiaki Ishida[1,2], Lin Zhu[1,2,3], Changsu Kim[1], Shik Shin[1,2], Hidefumi Akiyama[1,2]

[1]The Institute for Solid State Physics, University of Tokyo, Kashiwa, Chiba 277-8581, Japan, [2]AIST-UTokyo OPERANDO-OIL, University of Tokyo, Kashiwa, Chiba 277-8589, Japan, [3]Institute for Solar Energy Systems, Sun Yat-sen University, Guangzhou 510006, China

H3 Detailed Performance Loss Analysis Of Silicon Solar Cells Using High-Throughput Metrology Methods

Mohammad J. Hossain[1], Geoffrey Gregory[2], Hardik Patel[2], Siyu Guo[3], Eric J. Schneller[2,3], Andrew M. Gabor[4], Zhihao Yang[5], Adrienne L. Blum[6], Kristopher O. Davis[1,2,3]

[1]CREOL, the College of Optics and Photonics, University of Central Florida, Orlando, FL, United States, [2]Department of Materials Science and Engineering, University of Central Florida, Orlando, FL, United States, [3]Florida Solar Energy Center, University of Central Florida, Cocoa, FL, United States, [4]BrightSpot Automation, Westford, MA, United States, [5]School of Materials Science and Energy Engineering, Foshan University, Guangdong, China, [6]Sinton Instruments, Boulder, CO, United States

H4 Detection Of Hot Spot Defects For Crystalline Solar Cell

Hsin-Hsin Hsieh[1], Wei-Lun Yang[1], Han-Kuei Fu[2], Hung-Sun Wu[1], Chin Lien[1]

[1]Center for Measurement Standards, Industrial Technology Research Institute, Hsinchu, Taiwan, [2]Electronic and Optoelectronic System Research Laboratories, Industrial Technology Research Institute, Hsinchu, Taiwan

H5 Ultrasonic Methods For Inline Solar Cell Interconnector Inspection: Method Overview, Applications And Limits

Rico Meier[1,2]

[1]Fraunhofer CSP, Halle (Saale), Germany, [2]Arizona State University, Tempe, AZ, United States

H6

Limitations Of Photoluminescence Based External Quantum Efficiency Measurements
Appu Paduthol, Mattias K Juhl, Thorsten Trupke
University of New South Wales, Sydney, Australia

H7 Implementation Of A Novel Led Based Light Soaking System For Solar Cell Characterisation
sumukh ramprasad[1], samuel raj[1], Jian-Wei Ho[1], Johnson Wong[3], Thomas Mueller[1], Armin G Aberle[1,2]
[1]Solar Energy Research Institute of Singapore, National University of Singapore, Singapore, Singapore, [2]Department of Electrical and Computer Engineering, National University of Singapore, Singapore, Singapore, [3]Aurora Solar Technologies, Vancouver, BC, Canada

H8 Evaluation Of Optical, Morphological And Structural Properties Of Mapi Thin Films Deposited By Co-Evaporation
Miguel Angel Reinoso[1,2], Hebert G ez [1], Gerardo Gordillo[1]
[1]Universidad Nacional de Colombia, Bogot□, Columbia, [2]Universidad Estatal de Milagro, Milagro, Ecuador

H9 Development Of Evaluation System For Solar Cell By Scanning With Lens-Focused White Led Illumination
Nobuo Satoh, Hideaki Okada, Kai Yabumoto
Chiba Institute of Technology, 2-17-1 Tsudanuma, Narashino, Chiba, Japan

H10 Temperature Dependent Suns-V_{Oc} On Multicrystalline Silicon Solar Cells From Different Ingot Positions
Sissel T. Sondergaard[1], Jan O. Odden[2], Rune Strandberg[1]
[1]University of Agder, Grimstad, Norway, [2]Elkem Solar AS, Kristiansand, Norway, [3]University of Agder, Grimstad, Norway

H11 Low-Temperature Characterization Of Multijunction Solar Cells Using A Combined Characterization Approach
Don Walker, John C. Nocerino, Jacqueline E. Baidoo, Yao Y. Lao, Colin J. Mann, Simon H. Liu
The Aerospace Corporation

H12 Simple, Robust Hydrogen Passivation Of Bare Silicon For Estimating Bulk Lifetime Of Silicon Wafers
Ned Western, Mattias Juhl, Stephen Bremner
UNSW, Sydney, Australia

H13 Photoluminescence Spectra From Heavily-Doped Regions Of Crystalline Silicon Solar Cells
Huiting Wu, Hieu T. Nguyen, Daniel Macdonald
Australian National University, Canberra, Australia

H14 Transport Efficiency Imaging In Multi-Junction Solar Cells By Luminescence Analysis
Hao Xu[1,2], Amaury Delamarre[2,4], Jieyang Jia[3], Bernice Mae F. Yu Jeco[1,2], Kentaroh Watanabe[2,4], Yoshitaka Okada[1,2,4], Jean-Fran輟is Guillemoles[4,5], Yoshiaki Nakano[4,6], Masakazu Sugiyama[1,2,4]
[1]Department of Advanced Interdisciplinary Studies, University of Tokyo, Tokyo, 1538904, Japan, [2]RCAST, University of Tokyo, Tokyo, 1538904, Japan, [3]Department of Electrical Engineering, Stanford University, Stanford, 94305, CA, United States, [4]NextPV, LIA RCA ST-CNRS, University of Tokyo, Tokyo, 1538904, Japan, [5]IPVF, UMR CNRS, Palaiseau, 9006, France, [6]Department of Electrical Engineering, University of Tokyo, Tokyo, 1138656, Japan

H15 Series Resistance Measurements Of Csfa Peorvskite Solar Cells Using Jsc-Voc Measurements
Zhengshan J. Yu[1], Noemi Mundhaas[1,2], Kevin A. Bush[3], Hsin-Ping Wang[3], Michael D. McGehee[3], Zachary C. Holman[1]
[1]Arizona State University, Tempe, AZ, United States, [2]University of Konstanz, Konstanz, Germany, [3]Stanford University, Stanford, CA, United States

11:00 – 12:30 PM	Poster 6
Resource and Forecasting	

Chair(s): Dazhi Yang

H16 KÖPpen-Geiger-Photovoltaic Climate Classification
Julian Ascencio-Vasquez, Kristijan Brecl, Marko Topič
LPVO, Faculty of Electrical Engineering, University of Ljubljana, Ljubljana, Slovenia

H17 Impact Of Uncertainity In Iam Measurement On Energy Prediction
Sravanthi Boppana[1], Kendra Passow[1], Jim Sorensen[1], Bruce H. King[2], Charles Robinson[2]
[1]First Solar Inc., Tempe, AZ, United States, [2]Sandia National Laboratories, Albuquerque , NM, United States

H18 Ensuring Data Bankability For A Smart Solar Resource Assessment And Many Field Of Applications
Moulay Hafid Bouhamidi, Amine Amar
Masen, Rabat, Morocco

H19 A Low-Cost Two-Camera Sky-Imager Ground-Based Intra-Hour Solar Forecasting System With Cloud Base Height Estimation Capabilities Working In A Smart Grid
David Ca dillas[1], Benjam匡 Gonz疝ez-D傚z[2], Ricardo Guerrero-Lemus[1]
[1]Departamento de F婆ica. Universidad de La Laguna, San Crist al de La Laguna, Spain, [2]Departamento de Ingenier傚 Industrial. Universidad de La Laguna, San Crist al de La Laguna, Spain

H20 Solar Radiation Variability Assessment Using Different Metrics In Chile As A Case Study
Armando Castillejo-Cuberos, Fernando Antonanzas-Torres, Rodrigo Escobar
Escuela de Ingenier傚, Pontificia Universidad Cat ica de Chile, Santiago, Chile

I1 Deployment Of A High-Quality Sky Camera Network In Singapore For Solar Irradiance Mapping
Remi Chauvin, Wilfred Walsh
Solar Energy Research Institute of Singapore , Singapore, Singapore

I2 Analysis Of Albedo Irradiance Utilising Multiband (Spectrally Resolved) Satellite Imagery
Ian R Cole, Tom R Betts
Loughborough University, Loughborough, United Kingdom

I3 Automatic Detection Of Clear-Sky Periods Using Ground And Satellite Based Solar Resource Data
Benjamin H Ellis[1], Michael Deceglie[2], Anubhav Jain[1]
[1]Lawrence Berkeley National Laboratory, Berkeley, CA, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

I4 Improving Regional Pv Power Curtailment With Better Day-Ahead Pv Forecasts: An Evaluation Of 3 Forecasts
Joao Gari da Silva Fonsec[1], Yuki Nishitsuji[1], Yusuke Udagawa[1], Takashi Oozeki[2], Ogimoto Kazuhiko[1]
[1]University of Tokyo, Tokyo, Japan, [2]National Institute of Advanced Industrial Science and Technology – AIST, Tsukuba, Japan

I5 Comparative Analysis Of Different Time Series Forecasting Techniques For Missing Data Estimation
PRIYANKA GUTTE, Dhiraj Magare, shwetha shetty

I6 Assessment Of The National Solar Radiation Database (Nsrdb 1998-2016)
Aron Habte, Manajit Sengupta, Anthony Lopez, Galen Maclaurin, Yu Xie
National Renewable Energy Laboratory, Golden, CO, United States

I7 Characterization Of A Low-Cost Multi-Parameter Sensor For Solar Resource Applications
Aron Habte[1], Manajit Sengupta[1], Afshin Andreas[1], Ranganath Narasappa[1], Taylor Thomas[2], Adam Wolf[2], Christian Gueymard[3]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Arable Labs, Princeton, NJ, United States, [3]Solar Consulting Services, Colebrook, NH, United States

I8 A Solar Radiation Prediction Model Using Weather Forecast Data And Regional Atmospheric Data

Jinsoo Han, Wan-Ki Park

Electronics and Telecommunications Research Insttitute, Daejeon, South Korea

I9 24300 Simulations &Ndash; The Influence Of Irradiance Modelling On The Pv Yield

Martin Hofmann, Rainer Hunfeld, Steffen Lindemann

Valentin Software GmbH, Berlin, Germany

I10 Forecasting Solar Power Uncertainty And Variability For Grid Integration

Stephen D Jascourt, Christopher Cassidy, Eric Wertz, Travis Hartman

Radiant Solutions, Gaithersburg, MD, United States

I11 Toward Improved Solar Irradiance Forecasts: Evaluation Of Operational Numerical Weather Prediction Model For Solar Irradiance Over The Korean Peninsula

Chang K. Kim, Hyun-Goo Kim, Yong-Heack Kang, Chang-Yeol Yun

Korea Institute of Energy Research, Daejeon, Korea

I12 Photovoltaic Output Prediction Using Monotonic Fuzzy System

Jinwook Kim, Gyeonghun Kim, Wanbin Son, Gilsung Byeon

Korea Electrotechnology Research Institute, Changwon, South Korea

I13 The Relative Contributions Of Cloud And Aerosol On The Clearness Index Derived From Global Solar And Uv Radiation Observations In Korea

Yun Gon Lee, Jaemin Kim

Department of Atmospheric Sciences, Chungnam National University, Daejeon, Korea

I14 Evaluation Of Irradiance Transposition Models When Utilized With Single Axis Tracking Pv Systems In The Southwestern United States

Sara M. MacAlpine, Owen W. Westbrook

juwi, Inc., Boulder, CO, United States

I15 Investigation Of Solar Spectral Irradiance Measurements Using The Spectral Matching Ratio

Vasiliki Paraskeva, Michalis Florides, Marios Theristis, George E. Georghiou

University of Cyprus, Nicosia, Cyprus

I16 Direct Spectral Irradiance Measurements From Rotating Shadowband Eko Grating Spectroradiometer

M疵io P□, Kees Hoogendijk, Will Beuttell, Shibayama Kazunori, Eiji Takeuchi

EKO Instruments, Tokyo, Japan

I17 Localized Solar Power Prediction Based On Weather Data From Local History And Global Forecasts

Chaitanya Poolla, Abe Ishihara

Carnegie Mellon University (SV), Moffett Field, CA, United States

I18 Broad-Time-Horizon Solar Power Prediction And Pv Performance Degradation Research At The University Of Arizona

Barrett G Potter, Kelly Simmons-Potter, William F Holmgren

University of Arizona, Tucson, AZ, United States

I19 Power Generation And Safety Performance Of Photovoltaic System When Mixing Photovoltaic Modules With Different Installation Angles

Mitsuhuko Suetsugu, Yasuhito Takahashi, Koji Fujiwara

Doshisha University, 1-3 Tataramiyakodani, Kyotanabe, Kyoto, Japan

I20 Title: Convolutional Neural Network For Short-Term Solar Panel Output Prediction. Category: Sub-Area 9.6: Solar Forecasting For Pv-Integration.

Yuchi Sun, Adam Brandt, Vignesh Venugopal

Stanford University, Stanford, CA, United States

J1 Development And Practical Use Of Prediction System For Pv Output In An Electric Power Company In Japan.

Kiyoshi Takigawa

Shikoku Research Institute Inc., Takamatsu, Japan

J2 Efficient, Real-Time Global Spectral And Broadband Irradiance Acquisition

Viktar Tatsiankou[1,2], Karin Hinzer[1], Henry Schriemer[1], Patrick Mcvey-White[2], Richard Beal[2]

[1]University of Ottawa, Ottawa, ON, Canada, [2]Spectrafy Inc., Ottawa, ON, Canada

J3 Day-Ahead Forecasting Of Solar Power Output From Photovoltaic Systems Utilising Gradient Boosting Machines

Spyros Theocharides, Venizelos Venizelou, George Makrides, George E. Georghiou

University of Cyprus, Nicosia, Cyprus

J4 Evaluation Of Photodiode-Based Pyranometers And Reference Solar Cells On A Two-Axis Tracking System

Frank Vignola[1], Josh Peterson[1], Rich Kessler[1], Mike Dooraghi[2], Manajit Sengupta[2], Fotis Mavromatakis[3]

[1]University of Oregon, Eugene, OR, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States, [3]3Technological Educational Institute of Crete, Herkalion, Greece

J5 Designing Tandem Photovoltaics For Energy Production

Emily C Warmann[1], Harry A Atwater[1,2]

[1]California Institute of Technology, Pasadena, CA, United States, [2]Kavli Nanosciences Institute, Pasadena, CA, United States

J6 Validation Of The Fast All-Sky Radiation Model For Solar Applications With Narrowband Irradiances On Tilted Surfaces (Farms-Nit)

Yu Xie, Manajit Sengupta

National Renewable Energy Laboratory, Golden, CO, United States

J7 Solar Potential Analysis In Korea Using Gis-Based Information

ChangYeol Yun[1], ChangKi Kim[1], JinYoung Kim[1], HyunGoo Kim[1], YongHeack Kang[1], YongIl Kim[2]

[1]Korea Institute of Energy Research, Daejeon, South Korea, [2]Seoul National University, Seoul, South Korea

11:00 – 12:30 PM	Poster 7
PV Deployment and Sustainability	

Chair(s): Dr. Keiichiro Sakurai

J8 Accelerating Solar For Decelerating Climate Change In Time

Alexander Lagaaij

Solar C I, Breukelen, Netherlands

J9 Photovoltaic Energy Conversion Smart Irrigation System–Dubai Case Study (Goodbye Overwatering & Waste Energy, Hello Water & Energy Saving)

Shamma A. Ali, Hamda S. Alfalasi, Hasa R. Alsuwaidi, Hend A. Alketbi, Ammar N. Natsheh

Higher Colleges of Technology, Dubai, United Arab Emirates

J11 Economic Viability Of Roof Leasing For Rooftop Photovoltaic Systems From A Leasing Company&Rsquo;S Perspective

Muhammad Adnan Hayat, Farhad Shahnia, GM Shafiullah

School of Engineering & Information Technology, Murdoch University, Perth, Australia

J12 Market Potential For Upv, Bapv, Bipv, Tipv And _Ipv Applications In Europe Using A Simplified Integrated Energy Approach Until 2030 And 2050.

Ga•an Masson, Philippe Mac□, Carlotta Cambi□, Ilkem Gurcan

Becquerel Institute, Brussels, Belgium

J13 The Influence Of Interannual Variation And Long– Term Effects Of Pv Energy Yields On Financial Models

Bj n M•ler[1], Peter Bostock[2], Boris Farnung[1]

[1]Fraunhofer ISE Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany, [2]VDE Americas, San Jose, CA, United States

J14 Bringing Solar Pv Technologies For Reliable Off–Grid Power In Rural India

Rohit Sharma, Chetan Singh Solanki, Amruta P Joshi, Jayendran Venkateswaran, Deepak

Indian Institute of Technology, Bombay, Mumbai, India

J15 Solar Study Lamps Target To Brighten 1 Million Lives: Experimental Evidence From Pilot Project In India

Rohit Sharma, Deepak , Chetan Singh Solanki, Jayendran Venkateswaran, Nikita Arora

Indian Institute of Technology, Bombay, Mumbai, India

J16 A Novel Dynamic Feed–In Tariff For Residential Rooftop Pvs

Muhammad Adnan Hayat, Farhad Shahnia, GM Shafiullah

School of Engineering & Information Technology, Murdoch University, Perth, Australia

J17 Defining The Value Of Iecre Certifications For Providing Confidence In Pv System Performance

George J Kelly[1], Adrian Haering[2], Steve Hogan[3], Greg Ball[4], Ingrid Repins[5], Masaaki Yamamichi[6]

[1]Sunset Technology, Mount Airy, MD, United States, [2]SolarEdge, Munich, Germany, [3]ARESCA, Norwich, VT, United States, [4]Tesla, San Rafael, CA, United States, [5]NREL, Golden, CO, United States, [6]RTS Corp., Tokyo, Japan

J18 The Prospect For Accelerating Solar Home Lighting System In Africa: Lessons From Early Adopters In Rwanda

Fydess Khundi–Mkomba[1,2], Umaru G. Wali[3]

[1]African Center of Excellence in Energy for Sustainable Development, University of Rwanda, College of Science & Technology, Kigali, Rwanda, [2]Department of Agricultural & Applied Economics, Faculty of Development Studies, Lilongwe University of Agriculture & Natural Resources (LUANAR), Lilongwe, Malawi, [3]3. Professor of Water and Environmental Engineering, Dean, School of engineering University of Rwanda, College of Science & Technology, Kigali, Rwanda

J19 Political Affiliation And Rooftop Solar Adoption In New York And Texas

Deborah A. Sunter[1,2,3], John Dees[3], Sergio Castellanos[3,4,5], Duncan Callaway[3], Daniel M. Kammen[3,6]

[1]Department of Mechanical Engineering, Tufts University, Medford, MA, United States, [2]Berkeley Institute for Data Science, University of California, Berkeley, CA, United States, [3]Energy and Resources Group, University of California, Berkeley, CA, United States, [4]Berkeley Energy and Climate Institute, University of California, Berkeley, CA, United States, [5]Escuela de Gobierno y Transformaci P炻lica, Tecnol ico de Monterrey, San Pedro Garza Garc□, Mexico, [6]Goldman School of Public Policy, University of California, Berkeley, CA, United States

J20 Smart Metering And Time-Varying Pricing Deployment &Ndash; Cost-Benefit Analysis From A Real Pilot-Implementation

Venizelos I. Venizelou[1], Spyros Theocharides[1], George Makrides[1], Panikos Georgiou[2], Nicholas Ayiomamitis[2], Venizelos Efthymiou[1], George E. Georghiou[1]

[1]University of Cyprus, Nicosia, Cyprus, [2]Deloitte Limited, Limassol, Cyprus

K1 A Review Of China&Rsquo;S Pv-Generated Electricity Pricing Policy

Yachun Zhang[1], Zhaoning Song[2]

[1]Wayne State University, Department of Political Science, Detroit, MI, United States, [2]University of Toledo, Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States

K2 Area 10: Grid Integration, Policy, Deployment & Sustainability Sub-Area 10.2: Government , Policy And Financing Title Microgrid Application Of Solar Rooftop In Thailand A Method For Implementation And Policy

Sophon Mr. Puninagoon, Phetlada Ms. Phoengaksorn

Green Energy 15W1, Bangkok, Thailand

K3 More Complex Financing Options Being Developed In The System Advisor Model

Nate Blair, Steven Janzou, Paul Gilman, Michael Elchinger, Nicholas A. DiOrio, Janine M. Freeman

National Renewable Energy Laboratory, Golden, CO, United States

K4 Sustainable Silicon Photovoltaics Manufacturing In A Global Market: A Techno-Economic, Tariff And Transportation Framework With An Applied Case For Mexico

Sergio Castellanos[1,2,3], Jos□ E. Santiba z-Aguilar[4], Benjamin B. Shapiro[5], Douglas M. Powell[6], Ian M. Peters[6], Tonio Buonassisi[6], Daniel M. Kammen[2,5], Antonio Flores-Tlacuahuac[4]

[1]Berkeley Energy & Climate Institute, Berkeley, CA, United States, [2]Energy and Resources Group, Berkeley, CA, United States, [3]Escuela de Gobierno y Transformación Pública, Tecnol ico de Monterrey, Monterrey, Mexico, [4]Escuela de Ingenier傲 y Ciencias, Tecnol ico de Monterrey, Monterrey, Mexico, [5]Goldman School of Public Policy, Berkeley, CA, United States, [6]Massachusetts Institute of Technology, Cambridge, MA, United States

K5 Life Cycle Assessment On Hydrogenation Processes On Silicon Solar Modules

Marina M. Lunardi[1], Juan Pablo Alvarez-Gaitan[2], Nathan L. Chang[1], Richard Corkish[1]

[1]The Australian Centre for Advanced Photovoltaics (ACAP), School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Sydney, Australia, [2]School of Civil and Environmental Engineering, University of New South Wales, Sydney, Australia

K6 Comparative Evaluation Of Small-Scale Residential Pv System Applications In A Developed And A Developing Economy

Kala Meah[1], Md. Hasan Ali[2]

[1]Department of Engineering and Computer Science, York College of Pennsylvania, York, PA, United States, [2]Local Government Engineering Department (LGED), Executive Engineer痴 Office, Cox's Bazar, Bangladesh

K7 Implementation Of A Circular Economy Based On Recycled, Reused And Recovered Indium, Silicon And Silver Materials For Photovoltaic And Other Applications – Latest News From Cabriss (Eu Collaborative Project)

Wolfram Palitzsch

Loser Chemie GmbH, Zwickau, Germany

K8 Photovoltaic Recycling With The Help Of Water And Light – It Does Not Get Greener

Wolfram Palitzsch, Arvid Killenberg, Petra Sch herr, Ulrich Loser

Loser Chemie GmbH, Zwickau, Germany

K9 Transitioning To Solar Cell And Wind Power Before Climate Change Threatens World Civilization

Larry D. Partain[1,2], Shirley Hansen[2], Allan Newlands[2], Lewis Fraas[3], Joeseph Stagner[4], James Stack[5], Richard Hansen[2]

[1]Solar Cell Electricity, Los Altos, CA, United States, [2]BridgePoint Consortium, Los Altos, CA, United States, [3]JX Crystals, Inc., Issaquah, WA, United States, [4]Stanford University, Stanford, CA, United States, [5]City of Palo Alto Utilities, Palo Alto, CA, United States

K10 Photovoltaic Toy Cars Racing Circuits As Hands-On Learning Solar Energy: Results From A Problem Based Learning (Pbl) Experience For Undergraduates

Manuel Fuentes[1], Marta Vivar[1], Ascensi L ez-Vargas[2], Natalia Pichel[2]

[1]University of Ja駭, Linares, Spain, [2]IMDEA Water, Alcal de Henares, Spain

K11 Innovative Skill Development Techniques For Solar Power Plants And Solar Pv Job Creation In India

SANJAY A KHOT[2], DHARMAPPA T BARKI[1], VINAY TIWARI[3]

[1]Photon Energy Systems Ltd, Hyderabad, India, [2]SIT College of Engineering, Ichaikaranji, India, [3]Photon Energy Systems Ltd, Hyderabad, India

K12 An E-Learning Platform To Increase Photovoltaic Technology Community Outreach And To Train Technicians And System Designers

Leonardo Palma, Luis Garc儆, Daniel Sbarbaro

Universidad de Concepcion, Concepcion , Chile

K13 Development Of Building-Integrated Photovoltaic (Bipv) Innovative Courseware For Higher Education And Professionals

Momir Tabakovic[1], Hubert Fechner[1], Wilfried van Sark[2], Atse Louwen[2], Joost van Leeuwen[2], Eelke Bontekoe[2], Ingrid Weiss[3], Sofia Arancon[3], George Georghiou[4], George Makrides[4], Maria Hadjipanayi[4], Eliza Loucaidou[5], Monica Ioannidou[5]

[1]FH Technikum Wien, Vienna, Austria, [2]Utrecht University, Utrecht, Netherlands, [3]WIP-Renewable Energies, Munich, Germany, [4]University of Cyprus, Cyprus, Cyprus, [5]Deloitte Ltd, Cyprus, Cyprus

K14 Solar Energy Outreach Activities For Schoolchildren: Hands-On Experiments On Photovoltaics, Solar Thermal And Solar Water Disinfection

Marta Vivar[1], Manuel Fuentes[1], Natalia Pichel[2], Ascensi L ez-Vargas[2]

[1]University of Ja駭, Linares, Spain, [2]IMDEA Water, Alcal de Henares, Spain

K15 Solar Energy Research Institute For India And The Us (Seriius): A Focused Solar Consortium

David Ginley[1], Marisa Howe[1], William Tumas[1], Pradip Dutta[2], Clifford Ho[3], Juzer Vasi[4], Maikel van Hest[1], Aimee Curtright[5], Parveen Kumar[6], Kamanio Chattopadhyay[2]

[1]NREL, Golden, CO, United States, [2]IISC, Bangalore, India, [3]Sandia Laboratories, Albuquerque, NM, United States, [4]IITB, Mumbai, India, [5]Rand Corp, Pittsburgh, PA, United States, [6]CSTEP, Bangalore, India

K17 A Novel Approach For Using Solar To Drive Desalination To Achieve Low-Cost, Large-Scale Generation

Andrew Skumanich[1], Paula Mints[2]

[1]SolarVisionCo, Los Gatos, CA, United States, [2]SPV Market Research, San Jose, CA, United States

K18 International Development Of A Distributed Energy Resource Test Platform For Electrical And Interoperability Certification

Jay Johnson[1], Alexandre Prieur[2], Nayeem Ninad[2], Estefan Apablaza-Arancibia[2], Dave Turcotte[2], Roland Br･dlinger[3], Changhee Cho[4], R. Sudhir Kumar[5], Jeykishan Kumar[5], Jun Hashimoto[6], Maurizio Verga[7], Julio Braslavsky[8], Tim Moore[8], Jos Luis Silva Farias[9], Jos Gerardo Montoya Tena[9], Franz Baumgartner[10]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]CanmetENERGY, Varennes, Canada, [3]Austrian Institute of Technology, Vienna, Austria, [4]Korea Electrotechnology Research Institute, Changwon, South Korea, [5]Central Power Research Institute, Bangalore, India, [6]Fukushima Renewable Energy Institute, AIST, Koriyama, Japan, [7]Ricerca sul Sistema Energetico S.P.A., Milano, Italy, [8]Commonwealth Scientific and Industrial Research

Organisation, Newcastle, Australia, [9]Instituto Nacional de Electricidad y Energ傚s Limpias, Cuernavaca, Mexico, [10]Zurich University of Applied Sciences, Winterthur, Switzerland

K19 Closing The Photovoltaic Supply Chain Loop &Ndash; Invest Now For Future Returns

ERIKA L MARSILLAC

OLD DOMINION UNIVERSITY, NORFOLK, VA, United States

K20 Energy And Environmental Analysis Of Large Deployment Of Pv And Wind Electricity In Chile

Enrica Leccisi[1], Marco Raugei[2], Vasilis Fthenakis[1]

[1]Columbia University, New York, NY, United States, [2]Brookes–Oxford, Wheatley, United Kingdom

12:30 – 1:30 PM	Kona 4
PV Job Search Seminar	

Chair(s): Peter Bermel

12:30 – 2:00 PM	Grand Promenade
Lunch on Your Own	

2:00 – 3:30 PM	Kona 5
Novel Material Systems	

Chair(s): Ulrich Paetzold

2:30 Two-Dimensional Wse_2/Mos_2 P-N Heterojunction Based Transparent Photovoltaic Cell And Its Performance Enhancement By Passivation

Ah-Jin Cho[1,2], Jang-Yeon Kwon[1,2]

[1]School of Integrated Technology, Yonsei University, Incheon, South Korea, [2]Yonsei Institute of Convergence Technology, Incheon, South Korea

2:45 Investigation On Phase Equilibria In The Mg-P-Zn System Concerning Mg(Mg*X*Zn1-*X*) 2P2/Zn3P2-Based Photovoltaics

Ryoji Katsube, Yoshitaro Nose

Kyoto University, Kyoto, Japan

3:15 Control Surface Templates For Solution-Processed Hybrid Pedot: Pss &Ndash; Silicon Solar Cell

You-Lan Li[1], Li-Wei Zheng[1], Hsin-Fei Meng[2], Peichen Yu[1]

[1]Department of Photonics, National Chiao-Tung University, Hsinchu, Taiwan, [2]Department of Electrophysics, National Chiao-Tung University, Hsinchu, Taiwan

2:00 – 3:30 PM	Queen 5,6
Defects Characterization	

Chair(s): Giovanna Sozzi

2:00 Modeling Of Light-Induced Instabilities In Cigs Solar Cells Due To Deep Levels And Comparison With Experiment

Aaron R Arehart[1], Pran K Paul[1], Rouin Farshchi[2]

[1]Department of Electrical and Computer Engineering, The Ohio State University, Columbus, OH, United States, [2]Miasole Hi-Tech Corp., Santa Clara, CA, United States

2:15 Spatially Resolved Recombination Analysis Of $Cuingase_2$ Absorbers With Alkali Post-Deposition Treatments

Harvey Guthrey[1], John Moseley[1], Jiro Nishinaga[2], Hajime Shibata[2], Hideki Takahashi[2], Mowfak Al-Jassim[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Advanced Institute for Industrial Science and Technology, Tsukuba, Japan

2:30 Spectroscopic And Microscopic Defect And Carrier Lifetimes Analysis In Cadmium Telluride And Cdte Solar Cells

Darius Kuciauskas[1], Dmitry Krasikov[2]

[1]NREL, Golden, CO, United States, [2]First Solar, Perrysburg, OH, United States

2:45 Analysis Of High-V_{Oc} Single-Crystal Cztse Solar Cells *Via* Admittance Spectroscopy

Michael A Lloyd[1,2], Brian E McCandless[2], Robert Birkmire[1,2]

[1]University of Delaware, Newark, DE, United States, [2]Institute of Energy Conversion, Newark, DE, United States

3:00 Fluctuations In Net Doping And Lifetime In $Cu(In,Ga)Se_2$ Solar Cells

Aleksandra Nikolaeva[1], Maximilian Krause[1], Jose Marquez[1], Charles Hages[1], Sergej Levcenko[1],

Thomas Unold[1], Wolfram Witte[2], Dimitrios Hariskos[2], Daniel Abou-Ras[1]
[1]Helmholtz-Zentrum Berlin, Berlin, Germany, [2]Zentrum f• Sonnenenergie- und Wasserstoff-Forschung Baden-W•ttemberg (ZSW), Stuttgart, Germany

3:15 Interpretation Of Admittance Signatures In Cu(In,Ga)Se_2 Solar Cells

Giovanna Sozzi[1], Simone Di Napoli[1], Roberto Menozzi[1], Thomas P. Weiss[2], Stephan Buecheler[2], Ayodhya N. Tiwari[2]
[1]Department of Engineering and Architecture, University of Parma, PARMA, Italy, [2]Laboratory for Thin Films and Photovoltaics, Empa – Swiss Federal Laboratories for Materials Science and Technology, Duebendorf, Switzerland

2:00 – 3:30 PM	Monarchy
Silicon Material, Feedstock and Wafers: Analysis	

Chair(s): Martin Schubert

2:00 Accurate Defect Recombination Parameters: What Are The Limitations Of Current Analyses?

Fiacre Emile Rougieux[1], Chang Sun[2], Yan Zhu[1], Daniel Harold Macdonald[2]

[1]The University of New South Wales, Sydney, Australia, [2]The Australian National University, Canberra, Australia

2:15 Insights Into Bulk Defects In *N*-Type Monocrystalline Silicon Wafers Via Temperature-Dependent Micro-Photoluminescence Spectroscopy

Robert A. Lee Chin, Yan Zhu, Gianluca Coletti, Simona Binetti, Michael Pollard, Ziv Hameiri

Best Student Presentation Award Finalist

2:30 Investigating The Different Degradation Behavior Of Multicrystalline Silicon Perc And Al-Bsf Solar Cells

Mallory A. Jensen[1], Hannu S. Laine[1], Yan Zhu[2], Carlos Vargas[2], Zhe Liu[1], Joel B. Li[3], Ziv Hameiri[2], Tonio Buonassisi[1]

[1]Massachusetts Institute of Technology, Cambridge, MA, United States, [2]University of New South Wales, Sydney, Australia, [3]Solar Energy Research Institute of Singapore, Singapore, Singapore

2:45 Cell And Module Fabrication Options For Kerfless Thin (< 50 &Micro;M) Epitaxial Silicon Foils: Recent Progress And Challenges

Hariharsudan Sivaramakrishnan Rad[1], Jinyoun Cho[1,2], Menglei Xu[1,2], Julius R h[3], Twan Bearda[1], Val駸ie Depauw[1], Kris Van Nieuwenhuysen[1], Ivan Gordon[1], Jozef Szlufcik[1], Jef Poortmans[1,2,4]

[1]imec, Leuven, Belgium, [2]KU Leuven, Leuven, Belgium, [3]Hochschule Anhalt, K hen, Germany, [4]University of Hasselt, Hasselt, Belgium

3:00 Electrical Limitations In Epitaxially Grown Kerfless Silicon Wafers For Solar Cells

Patrick Beu, Florian Schindler, Friedemann D. Heinz, Diana Amiri, Elke Gust, Bernd Steinhauser, Stefan Janz, Martin C. Schubert

Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany

3:15 Dynamics Of Crack Propagation During Silicon Spalling

Pablo Guimera Coll[1], Tine Uberg Naerland[1], Nathan Stoddard[2], Michael Stuckelberger[1], Rico Meier[3], Mariana Bertoni[1]

[1]Arizona State University, Tempe, AZ, United States, [2]Solar World, Hillsboro, OR, United States, [3]Fraunhofer, Halle, Germany

2:00 – 3:30 PM	Kona 4
Characterization of Perovskites	

Chair(s): Sarah Wieghold

2:00 Investigation Of In-Depth Transport And Absorption Properties Of Various Perovskite Materials Using Luminescence Imaging

Adrien Bercegol[1,2], F. Javier Ramos[1], Amelle Rebai[1], Daniel Ory[1,2], Jean Rousset[1,2], Laurent Lombez[1,3]

[1]IPVF (Institut Photovolta･ue d'Ile-de-France), Palaiseau, France, [2]EDF R&D, Palaiseau, France, [3]CNRS, UMR 9006, Palaiseau, France

2:15 Best Practices And Common Pitfalls In The Measurement And Analysis Of Perovskite Photovoltaics With Tof-Sims

Steven P. Harvey[1], Yanfa Yan[2], Joseph M. Luther[1], Joe Berry[1]

[1]National Renewable Energy Laboratoroy (NREL), Golden, CO, United States, [2]University of Toledo, Toledo, OH, United States

2:30 Nanoscale Variations In Halide Perovskite Structure And Stability: Insights Via Nano-Diffraction

Xueying Li[1], Yanqi Luo[1], Martin Holt[2], Zhonghou Cai[2], David Fenning[1]

[1]University of California,San Diego, San Diego, CA, United States, [2]Advanced Photon Source, Argonne National Laboratory, Argonne, IL, United States

Best Student Presentation Award Finalist

2:45 Quantitative Local Loss Analysis Of Blade Coated Perovskite Solar Cells

Laura E. Mundt[1], Wolfram Kwapil[1,2], Mohammed A. Yakoob[1,2], Markus Kohlst膜t[1,2], Uli W･fel[1,2], Martin C. Schubert[1], Stefan W. Glunz[1,2]

[1]Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany, [2]Albert-Ludwig University Freiburg, Freiburg, Germany

3:00 Influence Of Organic Cations On The Structural Instability Of Cubic Hybrid Perovskites

Shijing Sun[1], Zeyu Deng[2], Federico Brivio[2], Fengxia Wei[3], Paul Bristowe[2], Anthony Cheetham[2], Tonio Buonassisi[1]

[1]Massachusetts institute of technology, CAMBRIDGE, MA, United States, [2]University of Cambridge, Cambridge, United Kingdom, [3]Agency for Science, Technology and Research, Singapore, Singapore

3:15 Engineering Grains Of Mixed Halide Perovskites For High Efficiency Solar Cells

Sarah Wieghold[1], Juan-Pablo Correa-Baena[1], Lea Nienhaus[1], Shijing Sun[1], Jason S. Tresback[2], Zhe Liu [1], Seong Sik Shin[1], Moungi G. Bawendi[1], Tonio Buonassisi[1]

[1]Massachusetts Institute of Technology, Cambridge, MA, United States, [2]Center for Nanoscale Systems, Harvard University, Cambridge, MA, United States

2:00 – 3:30 PM	Queens 4

Building Integrated PV and PV System Modeling

Chair(s): Kurt Barth

2:00 Determining Series Resistance For Equivalent Circuit Models Of A Pv Module

Clifford W Hansen, Bruce H King
Sandia National Laboratories, Albuquerque, NM, United States

2:15 Review Of Open Source Tools For Pv Modeling

William F. Holmgren[1], Clifford W. Hansen[2], Joshua S. Stein[2], Mark A. Mikofski[3]
[1]University of Arizona, Tucson, AZ, United States, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]DNV-GL, Oakland, CA, United States

2:30 Robust Glass-Free Lightweight Photovoltaic Modules With Improved Resistance To Mechanical Loads And Impact

Ana C. Martins[1], Valentin Chapuis[2], Alessandro Virtuani[1], Christophe Ballif[1, 2]
[1]/cole Polytechnique F鍼駻ale de Lausanne (EPFL), Institute of Microengineering (IMT), Photovoltaics and Thin Film Electronics Laboratory (PV-Lab), Neuch穰el, Switzerland, [2]CSEM, PV-center, Neuch穰el, Switzerland

Best Student Presentation Award Finalist

2:45 Statistical Clear Sky Fitting Algorithm

Bennet E. Meyers[1], Emre C. Kara[2], Michaelangelo D. Tabone[3]
[1]Department of Electrical Engineering, Stanford University, Palo Alto, CA, United States, [2]SLAC National Accelerator Laboratory, Menlo Park, CA, United States, [3]Department of Civil and Environmental Engineering, Stanford University, Palo Alto, CA, United States

3:00 Bipv Modules: Critical Requirements And Customization In Manufacturing

Jorg Palm[1], Ren□ Kalio[2], Mirko Stollberg[2], Nicole Schmidt[2], Peter Borowski[1], Lutz Tautenhahn[2], Jochen Weick[2], Franz Karg[1]
[1]AVANCIS GmbH, Munich, Germany, [2]AVANCIS GmbH, Torgau, Germany

3:15 Online Simulation Tools For Global Photovoltaic Performance: Purdue University Meteorological Tool (Pumet) And Bifacial Module Calculator (Pub)

Binglin Zhao, Xingshu Sun, Muhammad Ashraful Alam
Purdue University, West Lafayette, IN, United States

2:00 – 3:30 PM	King 2,3

Solar Resource

Chair(s): Jeff Newmiller

2:00 Improved Model Of Solar Resource Variability Based On Aggregation By Region And Climate Zone

Gregory M Kimball[1], Chetan Chaudhari[1], Patrick Keelin[2], John Dise[2], Mark Grammatico[2], Ben Bourne[1]

[1]SunPower Corporation, Richmond, CA, United States, [2]Clean Power Research, Napa, CA, United States

2:15 Reducing Uncertainties In Large-Scale Solar Resource Data: The Impact Of Aerosols

Christian A Gueymard[1], Aron Habte[2], Manajit Sengupta[2]

[1]Solar Consulting Services, Colebrook, NH, United States, [2]NREL, Golden, CO, United States, [3]NREL, Golden, CO, United States

2:30 Direct Beam And Diffuse Spectral Irradiance Measurements In A Nordic Country Analyzed With The Average Photon Energy Parameter

Nicholas Riedel, Anders Thorseth, Sune Thorsteinsson, Peter B. Poulsen, Adrian Santamaria Lancia, Beniamino Iandolo, Rasmus Davidsen, Gisele A. dos Reis Benatto

Technical University of Denmark (DTU), Roskilde, Denmark

2:45 The Impact Of Fine Particular Matter (Pm2.5) On Photovoltaic Energy Yield – A Study On The Example Of New Delhi

Ian Marius Peters[1], Shravan Karthnik[2], Tonio Buonassisi[3], Andre Nobre[4]

[1]Massachusetts Institute of Technology, Cambridge, MA, United States, [2]Cleantech Energy Corporation, Singapore, Singapore, [3]Massachusetts Institute of Technology, Cambridge, MA, United States, [4]Cleantech Energy Corporation, Singapore, Singapore

3:00 Spectroradiometry In Pv: How Inter-Laboratory Comparison May Improve Measurement Accuracy

Mauro Pravettoni[1], Roberto Galleano[2], Diego Alonso Alvarez[3], Giorgio Belluardo[4], Ian R. Cole[5], Jose M. Vilaplana[6], Nicoletta Ferretti[7], Dirk Friedrich[8], Raffaele Fucci[9], Trinidad J. Gomez[10], Martin Halwachs[11], Erik Haverkamp[12], Alessandro Minuto[13], Ruben Roldan Molinero[15], Nicholar Riedel[16], Marios Theristis[14]

[1]National University of Singapore, Solar Energy Research Institute of Singapore, Singapore, Singapore, [2]European Commission, Joint Research Centre, Directorare C for Energy, Transport and Climate, Ispra, Italy, [3]Imperial College, London, United Kingdom, [4]EURAC, Bolzano, Italy, [5]Loughborough University, Loughborough, United Kingdom, [6]INTA, Mazagon, Spain, [7]Photovoltaik-Institut Berlin AG, Berlin, Germany, [8]PTB, Braunschweig, Germany, [9]ENEA, Portici, Italy, [10]INTA, Torrejon de Ardoz, Spain, [11]AIT, Vienna, Austria, [12]Radbound University, Nijmegen, Netherlands, [13]RSE, Piacenza, Italy, [14]University of Cyprus, Nicosia, Cyprus, [15]SUPSI, Canobbio, Switzerland, [16]Technical University of Denmark, Roskilde, Denmark

3:15 Estimating Ultraviolet Radiation From Global Horizontal Irradiance

Aron Habte[1], Manajit Sengupta[1], Christian Gueymard[2], Ranganath Narasappa[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Solar Consulting Services, Colebrook, NH, United States

2:00 – 3:30 PM	King 1
Sustainability	

Chair(s): Dr Garvin Heath

2:00 Recycling Of Pv Modules And Its Environmental Impacts

Keiichi Komoto, Shohei Oyama, Takafumi Sato, Hiroyuki Uchida

Mizuho Information & Research Institute, Inc., Tokyo, Japan

2:15 Photovoltaic Recycling Processes

Cara Libby[1], Stephanie Shaw[1], Garvin Heath[2], Karsten Wambach[3]

[1]Electric Power Research Institute (EPRI), Palo Alto, CA, United States, [2]National Renewable Energy Laboratory (NREL), Golden, CO, United States, [3]Wambach Consulting, Aindling OT Hausen, Germany

2:30 Developing Ecological Life Cycle Impact Assessment Characterization Factors For Cdte

Parikhit Sinha[1], Anna Kounina[2], Michael Spielmann[3]

[1]First Solar, Tempe, AZ, United States, [2]Quantis, Lausanne, Switzerland, [3]Quantis, Berlin, Germany

Best Student Presentation Award Finalist

2:45 An Ecological Perspective To Analyze Food/Energy/Water Nexus Of Integrated Photovoltaic–Agricultural Systems

Ilke Celik[1], Adam Phillips[2], Ramez Hosseinian Ahangharnejhad[3], Yanfa Yan[4], Michael Heben[5], Defne Apul[6]

[1]Civil and Environmental Engineering, Toledo, OH, United States, [2]Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States, [3]Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States, [4]Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States, [5]Wright Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, Toledo, OH, United States, [6]Civil and Environmental Engineering, Toledo, OH, United States

3:00 Ecodesign, Ecolabeling And Green Procurement Policies &Ndash; Enabling More Sustainable Photovoltaics?

Andreas Wade[1], Parikhit Sinha[2], Karen Drozdiak[2], Dustin Mulvaney[3], Jessica Slomka[4]

[1]First Solar GmbH, Mainz, Germany, [2]First Solar Inc., Tempe, AZ, United States, [3]San Jose State University, San Jose, CA, United States, [4]NSF International, Ann Arbor, MI, United States

3:15 Evaluating Pv Module Sample Removal Methods For Tclp Testing

Govindasamy Tamizhmani[1], Cara Libby[2], Stephanie Shaw[2], Raghav Krishnamurthy[1], Joswin Leslie[1], Raginee Yadav[1], Sai Tatapudi[1], Bulent Bicer[1]

[1]Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States, [2]Electric Power Research Institute, Palo Alto, CA, United States

3:30 – 4:00 PM	Grand Promenade
Coffee Break	

4:00 – 5:30 PM	Queen 5,6
Degradation	

Chair(s): Takeaki Sakurai

4:00 Impact Of Growth Temperature And Selenization On Dark Heat Stability In Cu(In,Ga)Se_2 Solar Cells

Rouin Farshchi, Dmitry Poplavskyy

MiaSole Hi-Tech Corp, Santa Clara, CA, United States

4:15 Investigating Pid Shunting In Polycrystalline Thin-Film Devices Via Multi-Scale, Multi-Technique Characterization

Steven P Harvey, Harvey Guthrey, Christopher P. Muzzillo, Lorelle Mansfield, Glenn Teeter, Steve Johnston, Peter Hacke, Mowafak Al-Jassim

National Renewable Energy Laboratoroy (NREL), Golden, CO, United States

4:30 Accelerated Aging Of Cu(In,Ga)Se_2 Solar Cells Under Dark Anneal And Electrical Bias Conditions

Oliver Kiowski[1], Jonas Hanisch[1], Thomas Ott[2], Thomas Walter[2]

[1]Zentrum f• Sonnenenergie- und Wasserstoff-Forschung Baden-W•ttemberg (ZSW), 70563 Stuttgart, Germany, [2]University of Applied Sciences, 89081 Ulm, Germany

4:45 Switching Substrates Reduces Potential-Induced Degradation Of Cu(In,Ga)Se_2 Solar Cells

Christopher P. Muzzillo, Stephen Glynn, Peter Hacke, Helio R. Moutinho, Matthew R. Young, Glenn Teeter, Ingrid L. Repins, Lorelle M. Mansfield

National Renewable Energy Laboratory, Golden, CO, United States

5:00 Impact Of Moisture Ingress On The Degradation And Trap Spectrum In Cu(In,Ga)Se_2 Solar Cells

Pran Krishna Paul[1], Shankar Karki[2], Grace Rajan[2], Sylvain X. Marsillac[2], Aaron R. Arehart[1]

[1]Electrical and Computer Engineering, The Ohio State University, Columbus, OH, United States, [2]Electrical and Computer Engineering, Old Dominion University, Norfolk, VA, United States

5:15 Positron Annihilation Studies On As-Deposited And Damp Heat Degraded Cigs Solar Cells With A Zno:Al Transparent Conductive Oxide Layer

Wenqin Shi[1], Mirjam Theelen[2], Andrea Illiberi[2], Nicolas Barreau[3], Maik Butterling[1], Henk Schut[1], Werner Egger[4], Marcel Dickmann[5], Christoph Hugenschmidt[5], Miro Zeman[6], Ekkes Br•k[1], Stephan Eijt[1]

[1]Delft University of Technology, Radiation Science and Technology, Delft, Netherlands, [2]TNO - Solliance, Thin Film Technology, Eindhoven, Netherlands, [3]Universit□ de Nantes, Institut des Mat駻iaux Jean Rouxel, Nantes, France, [4]Universit舩 der Bundeswehr M•chen, Institut f• Angewandte Physik und Messtechnik, Neubiberg, Germany, [5]Technische Universit舩 M•chen, Physics Department & Heinz Maier-Leibnitz Zentrum, Garching, Germany, [6]Delft University of Technology, Photovoltaic Materials and Devices, Delft, Netherlands

4:00 – 5:30 PM	Queens 4

Hybrid Tandems: Components and Subcells

Chair(s): Adele Tamboli

4:00 Nanocrystalline Silicon Oxide Interlayer In Monolithic Perovskite/Silicon Heterojunction Tandem Solar Cells With Total Current Density >39 Ma/Cm&Sup2;

Bernd Stannowski[1], Luana Mazzarella[1], Yen-Hung Lin[2], Simon Kirner[3], Anna B Morales-Vilches[1], Lars Korte[1], Steve Albrecht[1], Ed Crossland[3], Chris Case[3], Henry Snaith[2], Rutger Schlatmann[1]

[1]Helmholtz-Zentrum Berlin, Berlin, Germany, [2]Helmholtz-Zentrum Berlin, Berlin, Germany, [3]Univ. Oxford, Oxford, United Kingdom, [4]Oxford PV, Oxford, United Kingdom, [5]Helmholtz-Zentrum Berlin, Berlin, Germany, [6]Helmholtz-Zentrum Berlin, Berlin, Germany, [7]Helmholtz-Zentrum Berlin, Berlin, Germany, [8]Oxford PV, Oxford, United Kingdom, [9]Oxford PV, Oxford, United Kingdom, [10]Univ. Oxford, Oxford, United Kingdom, [11]Helmholtz-Zentrum Berlin, Berlin, Germany

4:15 High Performance Metamorphic Tunnel Junctions For Gaasp/Si Tandem Solar Cells Grown Via Mocvd

Daniel J. Chmielewski, Daniel L. Lepkowski, Jacob T. Boyer, John A. Carlin, Tyler J. Grassman, Steven A. Ringel

The Ohio State University, Columbus, OH, United States

4:30 P+/N+ Polysilicon-On-Oxide Tunneling Junctions As An Interface Of P-Type Perc Cells For Tandem Applications

Robby Peibst[1,2], Michael Rien臘ker[1], Byungsul Min[1], Christina Klamt[1], Raphael Niepelt[1], Tobias Wietler[1], Thorsten Dullweber[1], Eduard Sauter[3], Jens H▪ner[3], Michael Oestreich[3], Rolf Brendel[1,3]

[1]Institute for Solar Energy Research Hamelin (ISFH), Emmerthal, Germany, [2]Institute of Electronic Materials and Devices, Leibniz Universit舩 Hannover, Hannover, Germany, [3]Institute for Solid State Physics, Leibniz Universit舩 Hannover, Hannover, Germany

4:45 Co-Sublimated Polycrystalline $Cd_{1-x}Zn_xTe$ Films For Multi-Junction Solar Cells

Tushar Shimpi[1], Drew Swanson[2], Carey Reich[1,2], Jason Kephart[1], Anna Kindvall[1], Ramesh Pandey[3], Zachary Holman[2], Kurt Barth[1], Walajabad Sampath[1]

[1]Department of Mechanical Engineering, Colorado State University, Fort Collins, CO, United States, [2]School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ, United States, [3]Department of Physics, Colorado State University, Fort Collins, CO, United States

5:00 Investigation Of Rear Emitter Gaasp Top Cells For Use In Iii-V/Si Tandem Photovoltaics

Daniel L. Lepkowski, Jacob T. Boyer, Daniel J. Chmielewski, Amber C. Silvaggio, Steven A. Ringel, Tyler J. Grassman

The Ohio State University, Columbus, OH, United States

5:15 Operating Principles Of Three-Terminal Solar Cells

Emily L. Warren[1], Michael Rienaecker[2], Michael G. Deceglie[1], Manuel Schabel[1], Robby Peibst[2], Adele C. Tamboli[1], Paul Stradins[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Institute for Solar Energy Research in Hamelin, Emmerthal, Germany

4:00 – 5:30 PM	Monarchy
Device Physics and Simulation	

Chair(s): Johnson Wong

4:00 The Role Of Inhomogeneities For Understanding Current–Voltage Characteristics Of Solar Cells

Otwin Breitenstein

Max Planck Institute of Microstructure Physics, Halle, Germany

4:30 Scattering And Light Trapping Of Industrial Black Silicon

Malcolm D. Abbott[1,2], David N. R. Payne[2], Tsun H. Fung[2], Muhammad U. Khan[2], Jose L. Cruz-Campa[3], Keith R. McIntosh[1]

[1]PV Lighthouse, Coledale, Australia, [2]UNSW, Sydney, Australia, [3]1366 Technologies, Bedford, MA, United States

4:45 Evaluation Of Diffused Phosphorus Emitters Using Griddler–Pc1D

Divya Ananthanarayanan[1], Johnson Wong[2], Jian Wei Ho[1], Abhishek Kumar[1], Rainer Lee[1], Halvard Haug[3], Armin Aberle[1]

[1]Solar Energy Research Institute of Singapore, Singapore, Singapore, [2]Aurora Solar Technologies Inc, Vancouver, BC, Canada, [3]Institute for Energy Technology (IFE), Kjeller, Norway

5:00 Reduction Of Thermal Caused Extra Light Induced Degradation By Redefined Regeneration Conditions

Chun-Ping Lin, Kuo-Yi Yen, Jun-Rui Huang, Sean H.T. Chen

Motech Industries INC. Taoyuan Branch, Taoyuan, Taiwan

5:15 Impact Of Uncertainties Of Fundamental Models On Simulated Silicon Solar Cell Efficiencies

Sven Wasmer, Andreas Fell, Johannes M. Greulich

Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

4:00 – 5:30 PM	Kona 4
Metallization, Contact Formation and Module Integration	

Chair(s): Alison Lennon

4:00 Fluence Of Additives In The Electrode Paste For Crystalline Si Solar Cells On Potential-Induced Degradation

Sachiko Jonai[1], Aki Tanaka[2], Kazuo Muramatsu[2], Kyotaro Nakamura[3], Atsushi Ogura[3], Yoshio Ohshita[4], Atsushi Masuda[1]

[1]National Institute of Advanced Industrial Science and Technology, Ibaraki, Japan, [2]Namics Corporation, Niigata, Japan, [3]Namics Corporation, Niigata, Japan, [4]Meiji University, Tokyo, Japan, [5]Meiji University, Tokyo, Japan, [6]Toyota Technological Institute, Aichi, Japan, [7]National Institute of Advanced Industrial Science and Technology, Ibaraki, Japan

4:15 The Effect Of Ag Powder Surface Topography On The Viscoelastic Behavior Of Thick-Film Ag Gridlines And Solar Cell Performance

Mohamed M. Hilali[1,2]

[1]Pharos Materials, Inc, Fremont, CA, United States, [2]Ningbo Institute of Industrial Technology, CAS, Ningbo, China

4:30 19.5%-Efficient Back-Contact Silicon Heterojunction Solar Cell With Self Aligned Metallization Using Multilayer Aluminum Foils

David H. Levy[1], David E. Carlson[2], Kathryn C. Fisher[3], Joe V. Carpenter III[3], Zachary C. Holman[3]

[1]Natcore Technology, Rochester, NY, United States, [2]CarlsonPV, Williamsburg, VA, United States, [3]School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ, United States

4:45 Insight Into Metal Induced Recombination Losses And Contact Resistance In Industrial Silicon Solar Cells

Valentin Dan Mihailetchi, Haifeng Chu, Radovan Kopecek

International Solar Energy Research Center Konstanz e.V., Konstanz, Germany

5:00 Low-Resistivity Screen-Printed Contacts On Indium Tin Oxide Layers For Silicon Solar Cells With Passivating Contacts

J g Schube[1], Leonard Tutsch[1], Tobias Fellmeth[1], Martin Bivour[1], Frank Feldmann[1,2], Thibaud Hatt[1], Florian Maier[1], Roman Keding[1], Florian Clement[1], Stefan Glunz[1,2]

[1]Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, [2]Albert-Ludwigs-University , Freiburg, Germany

5:15 Influence Of The Paste Volume On The Contact Formation In Fine Line Metallization

Dominik Rudolph[1], Adrian Adrian[1], Jan Lossen[1], Pablo Ferrada[2], Carlos Portillo[2], Valeria del Campo[3]

[1]ISC Konstanz, Konstanz, Germany, [2]2Centro de Desarrollo Energ騨ico Antofagasta, Universidad de Antofagasta, Antofagasta, Chile, [3]Universidad T旨nica Frederico Santa Maria, Valpara箋o, Chile

4:00 – 5:30 PM	King 1

Advances in Organic Solar Cells

Chair(s): Alexander Zakhidov

4:00 Magnetic Field Modulation Of Recombination Processes In Organic Photovoltaics
Edward P Booker[1], Sam L Bayliss[1], Alex Jen[2], Neil C Greenham[1]
[1]University of Cambridge, Cambridge, United Kingdom, [2]University of Washington, Seatlle, WA, United States

4:30 Microstructure Instabilities In Solution–Processed Organic Bulk–Heterojunction Solar Cells
Ning Li[1], Chaohong Zhang[1], Christoph J. Brabec[1,2]
[1]FAU Erlangen–N•nberg, Erlangen, Germany, [2]ZAE Bayern, Erlangen, Germany

4:45 Drift–Diffusion And Analytical Modeling Of The Recombination Mechanisms In Organic Solar Cells: Effect Of The Non–Constant Charge Distribution Inside The Active Layer
Lorenzo Torto[1], Andrea Cester[1], Nicola Wrachien[1], Mirko Seri[2], Michele Muccini[2]
[1]University of Padova, Padova, Italy, [2]National Research Council, Bologna, Italy

5:00 Colorful Organic Solar Cells Employing FÖRster Resonance Energy Transfer Dye Molecule
Jaemin Kong[1], Megan M Beromi[2], Nilay Hazari[2], Andr□ D Taylor[1]
[1]Department of Chemical and Biomolecular Engineering, New York University, Brooklyn, NY, United States, [2]Department of Chemistry, Yale University, New Haven, CT, United States

4:00 – 5:30 PM	Kona 5
PV System Design, Optimization and Performance	

Chair(s): Joshua Stein

4:00 Advanced Modelling Of E/Uipv Systems From Location To Load
Olindo Isabella, Rudi Santbergen, Hesan Ziar, Andres Calcabrini, Juan Camilo Ortiz Lizcano, Elias Garcia Goma, Pramod Nepal, Veikko Schepel, Miro Zeman
Delft University of Technology, Delft, Netherlands

4:15 Analysis Of The Solar Energy Collection For In-Plane Rotation Two Axes Micro-Tracking Systems
Riccardo Leto, Nanu Brates, Carlton Brule, Zhou (Joe) Lu, Xinbing Liu
panasonic, Newton, MA, United States

Best Student Presentation Award Finalist

4:30 Photovoltaic Module To Module Monitoring System
Eneko Ortega[1], Gerardo Aranguren[1], Maria J Saenz[2], Ruben Gutierrez[2], Juan C Jimeno[2]
[1]Electronic Design Group. University of the Basque Country, Bilbao, Spain, [2]Technological Institute of Microelectronics. University of the Basque Country, Bilbao, Spain

4:45 Commercial Test Of Anti-Reflective Coating On First Solar Cadmium Telluride Pv Modules
Kendra L Passow
First Solar, San Francisco, CA, United States

5:00 Validating Energy Yield Modelling With The Nrel Outdoor Dataset
Steve J Ransome
Steve Ransome Consulting Ltd, Kingston Upon Thames, United Kingdom

5:15 Passive Desiccant Cooling Of Photovoltaics
Lin J Simpson[1], Meghan Taunton[2], Jason Woods[1], Nicolas Valderrama[3], Alex Hill[4], Nina Vincent[5], Timothy Silverman[1]
[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]University of North Dakota, Grand Forks, ND, United States, [3]University of Florida, Gainesville, FL, United States, [4]University of Denver, Denver, CO, United States, [5]Scripps College, Clremont, CA, United States

4:00 – 5:30 PM	King 2,3
Forecasting	

Chair(s): Chris Gueymard

4:00 A New Version Of The Suny Solar Forecast Model: A Scalable Approach To Site-Specific Model Training

Richard R Perez[1], James Schlemmer[1], Sergey Kivalov[1], John Dise[2], Mark Grammatico[2], Patrick Keelin[2], Thomas Hoff[2], Aidan Tuohy[3]

[1]ASRC University at Albany, Albany, NY, United States, [2]Clean Power Research, Kirkland, WA, United States, [3]EPRI, Palo Alto, CA, United States

4:15 Modeling And Simulation Of High Frequency Solar Irradiance

Wenqi Zhang[1], William Kleiber[1], Anthony Florita[2], Bri-Mathias Hodge[2], Barry Mather[2]

[1]University of Colorado, Boulder, Boulder, CO, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

4:30 Solar Forecast Reconciliation And Effects Of Improved Base Forecasts

Gokhan M. Yagli[1], Dazhi Yang[2], Dipti Srinivasan[1], Monika [3]

[1]National University of Singapore, Singapore, Singapore, [2]Singapore Institute of Manufacturing Technology, Singapore, Singapore, [3]Solar Energy Research Institute of Singapore, Singapore, Singapore

4:45 Sensitivity Analysis Of Pv Power Simulations For Different Temporal Resolutions And Spatial Aggregation Levels

Sven Killinger[1], Daniel Lassahn[2], Philipp Guthke[3], Jamie M. Bright[4], Benhard Wille-Haussmann[1]

[1]Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, [2]Meteocontrol, Augsburg, Germany, [3]TransnetBW GmbH, Stuttgart, Germany, [4]Fenner School of Environment and Society, The Australian National University, Canberra, Australia

Best Student Presentation Award Finalist

5:00 Probabilistic Clear-Sky Index Forecasts Using Gaussian Process Ensembles

Dennis van der Meer, Joakim Munkhammar, Joakim Wid駭

Uppsala University, Uppsala, Sweden

5:15 Deep Learning Solution For Intra-Day Solar Irradiance Forecasting In Tropical High Variability Regions

Zibo Dong[1], Dazhi Yang[2], Jianfeng Yan[1], Colin Yu[1]

[1]Envision Digital, Singapore, Singapore, [2]Singapore Institute of Manufacturing Technology , Singapore, Singapore

6:00 – 7:30 PM	Kona 4
PV Jobs Fair	

Chair(s): Peter Bermel

Thursday, June 14, 2018

8:30 – 10:00 AM	Kona 1
IEA-PVPS Workshop: Towards a R&D Roadmap for Crystalline Silicon Module Recycling	

Click Here To View the Detailed Agenda

Chair(s): Garvin Heath

8:30 – 10:00 AM	Kona 5
Quantum-well, Wire, and Dot-Architectured Devices	

Chair(s): Ian Sellers

8:30 Experimental Analysis Of Open-Circuit Voltage Drop In Quantum-Dot Solar Cells Via Absolute Electroluminescence Measurement

Lin Zhu[1,2,3], Yuji Hazama[2,3], Changsu Kim[2,3], Michael Slocum[4], Zachary Bittner[4], Seth Hubbard[4], Hidefumi Akiyama[2,3]

[1]Institute for Solar Energy Systems, Sun Yat-sen University, Guangzhou, China, [2]Institute for Solid State Physics, University of Tokyo, Kashiwa, Japan, [3]AIST-UTokyo OPERANDO-OIL, University of Tokyo, Kashiwa, Japan, [4]Nano Power Research Lab, Rochester Institute of Technology, Rochester, NY, United States

8:45 Design And Fabrication Of Inas/Gaas Qd Based Intermediate Band Solar Cells By Quantum Engineering

Neil Beattie[1], Stanko Tomic[2]

[1]University of Northumbria, Newcastle, United Kingdom, [2]University of Salford, Manchester, United Kingdom

Best Student Presentation Award Finalist

9:00 Photoluminescence And Reflectance Spectroscopy Analysis Of The Carrier Escape And Recombination Mechanism In Gaasn/Gaas Symmetric And Asymmetric Quantum Solar Cells

Khim Kharel, Alexandre Freundlich

University of Houston, Houston, TX, United States

9:15 Improving Hole Extraction For Pbs Quantum Dot Solar Cells

Shujuan Huang

UNSW Sydney, Sydney, Australia

9:30 The Influence Of Direct, Delta, And Modulation Qd Si Doping On Inas/Gaas Quantum Dot Solar Cells

Dongyoung Kim, Shun Chan, Mingchu Tang, Jiang Wu, Huiyun Liu

University College London, London, United Kingdom

9:45 Graded Superlattice And Resonantly Coupled Quantum Wells For Dilute Nitride Solar Cells With Open Circuit Voltages That Exceed That Of The Absorber&Rsquo;S Radiative Limit

Kaveh Shervin, Wei Wang, Khim Kharel, Michael P. Fitchette, Alexandre Freundlich

University of Houston, Houston, TX, United States

8:30 – 10:00 AM	Queen 5,6
Electro-optical Characterization	

Chair(s): Darius Karciauskas

8:30 Voltage-Induced Charge Redistribution In Cu(In,Ga)Se2 Devices Studied With High-Speed Capacitance-Voltage Profiling

Jeff Bailey[1], Dmitry Poplavskyy[1], Geordie Zapalac[1], Lorelle Mansfield[2], William Shafarman[3]

[1]MiaSole Hi-Tech, Santa Clara, CA, United States, [2]NREL, Golden, CO, United States, [3]IEC, Newark, DE, United States

8:45 Evaluating Back Surface Recombination Influence And Electron Reflector Efficacy In Cdte Photovoltaics

Joel N. Duenow, Wyatt K. Metzger

National Renewable Energy Laboratory, Golden, CO, United States

9:00 Distinguishing Interface From Bulk Recombination In Band Gap Graded Absorbers Using Pl With Pulsed Supercontinuum Excitation

Charles J. Hages, Hannes Hempel, Sergiu Levcenko, Jose Marquez, Christian A. Kaufmann, Thomas Unold

Helmholtz-Zentrum Berlin, Berlin, Germany

9:15 Interfaces Between Cdte And Ald Al_2O_3

Craig L Perkins[1], Tursun Ablekim[1], Teresa M Barnes[1], Darius Kuciauskas[1], William Nemeth[1], Kelvin G Lynn[2], Matthew O Reese[1], Santosh K Swain[2], Wyatt K Metzger[1]

[1]NREL, Golden, CO, United States, [2]WSU, Pullman, WA, United States

9:30 Temperature-Light-Dependent Jv And Tpv Analysis Of Pure Sulfide Based Cu_2Znsns_4 Solar Cells

Zhengfei Wei[1], Adam Pockett[1], James D. Mcgettrick[1], Chung M. Fung[2], Owen J. Guy[2], Matthew J. Carnie[1], Trystan M. Watson[1]

[1]SPECIFIC, College of Engineering, Swansea University, Bay Campus, Swansea, United Kingdom, [2]Centre of NanoHealth (CNH), College of Engineering, Swansea University, Singleton Campus, Swansea, United Kingdom

9:45 Analysis For Efficiency Potential Of Chalcopyrite And Kesterite Solar Cells

Masafumi Yamaguchi[1], Hitoshi Tampo[2], Hajime Shibata[2], Kan-Hua Lee[1], Kenji Araki[1], Nobuaki Kojima[1]

[1]Toyota Tech. Inst., Nagoya, Japan, [2]AIST, Tsukuba, Japan

8:30 – 10:00 AM	Queens 4
Low-Cost III-V Epitaxy and Processing	

Chair(s): Takeyoshi Sugaya

8:30 Multijunction $Ga_{0.5}In_{0.5}P$/Gaas Solar Cells Grown By Hydride Vapor
Kevin L Schulte, John Simon, Aaron J. Ptak
National Renewable Energy Laboratory, Golden, CO, United States

Best Student Presentation Award Finalist

8:45 Improving Gaas Solar Cell Performance And Growth Efficiency At Movpe Growth Rates Of 100 &Micro;M/H
Robin Lang, Jonas Sch , David Lackner, Frank Dimroth
Fraunhofer ISE, Freiburg, Germany

9:00 Improvement Of Heterointerface Properties Of Gaas Solar Cells Grown With Ingap Layers By Hydride Vapor-Phase Epitaxy
Ryuji Oshima[1], Kikuo Makita[1], Akinori Ubukata[2], Takeyoshi Sugaya[1]
[1]National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, [2]Taiyo Nippon Sanso Corporation, Tsukuba, Japan

9:15 Gaas Solar Cells With High Carrier Collection Grown On Unpolished, Spalled Ge Substrates
Alessandro Cavalli[1], Brett Ley[2], John Simon[1], Kevin Schulte[1], Corinne E. Packard[1,2], David Young[1], Aaron J. Ptak[1]
[1]NREL, Golden, CO, United States, [2]Colorado School of Mines, Golden, CO, United States

9:30 Hvpe Vs. Mocvd: A Comparison Of Gaas//Si Tandem Device Performance
Kaitlyn VanSant[1], Manuel Schnabel[2], John Simon[2], John Geisz[2], Aaron Ptak[2], Michelle Young[2], David Guiling[2], Waldo Olavarria[2], Michael Rienaecker[3], Henning Schulte-Huxel[3], Raphael Niepelt[3], Sarah Kajari- Schroeder[3], Rolf Brendel[3], Robby Peibst[3], Adele Tamboli[2]
[1]Colorado School of Mines, Golden, CO, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States, [3]Institute for Solar Energy Rsearch, Hamelin, Germany

9:45 Photovoltaics On Transfer Printed Iii-V Virtual Substrates
Kenneth J Schmieder[1], Matthew P Lumb[2,1], Mitchell F Bennett[2,1], Stephanie Tomasulo[1], Michael K Yakes[1], Shawn Mack[1], James E Moore[2,1], Robert J Walters[1]
[1]U.S. Naval Research Laboratory, Washington, DC, United States, [2]George Washington University, Washington, DC, United States

8:30 – 10:00 AM	Monarchy
Interface Studies and Surface Passivation	

Chair(s): Bram Hoex

Best Student Presentation Award Finalist

8:30 Analysis Of Sin_X Srv Injection– And Temperature–Dependence And Its Degradation Via Tidls Measurements

Simone Bernardini[1], Yan Zhu[2], Shuai Nie[2], Ziv Hameiri[2], Mariana I. Bertoni[1]

[1]Arizona State University, Tempe, AZ, United States, [2]University of New South Wales, Sydney, Australia

8:45 Passivation Of Crystalline Silicon Wafers By Ultrathin Oxide Layers: Comparison Of Wet–Chemical, Plasma And Thermal Oxidation Techniques

Bert Stegemann[1], Patrice Balamou[1,2], Thomas Lussky[2], Karim M. Gad[3], Daniel V sing[3], Martin Kasemann[3], Heike Angermann[2]

[1]HTW Berlin – University of Applied Sciences, Berlin, Germany, [2]Helmholtz–Zentrum Berlin f• Materialien und Energie, Berlin, Germany, [3]University of Freiburg, Department of Microsystems Engineering IMTEK, Freiburg, Germany

9:00 Process Development For Mcce Textured Solar Cells On Multicrystalline Dws Wafer

Wolfgang Jooss[1], Ihor Melnyk[1], Jan Jung–Koenig[1], Faramarz Binaie[1], Andreas Teppe[1], Sukumar Reddy Madugula[1], Oliver Voigt[1], Peter Fath[1], Bird Hu[2], Quisheng Zang[2], Iron Wang[2], Peiyi Tian[2]

[1]RCT Solutions GmbH, Konstanz, Germany, [2]RCT Automation Equipment, Suzhou, China

9:15 Industrially Compatible Techniques For Tailoring Field Effect Passivation In High Efficiency Silicon Solar Cells

Katherine A. Collett[1], Siyao Du[1], Gabrielle Bourret–Sicotte[1], Phillip Hamer[1,2], Brett Hallam[2], Ruy S. Bonilla[1], Peter R Wilshaw[1]

[1]University of Oxford, Oxford, United Kingdom, [2]University of New South Wales, Sydney, Australia

9:30 Evaluating The Impact Of Thermal Annealing On Al_2O_3/C–Si Interface Properties By Non–Destructive Measurements

Chang–Yeh Lee, Xin Cui, Tian Zhang, Rong Deng, Kyung Kim, Bram Hoex

The University of New South Wales, Sydney, Australia

9:45 Impact Of Substrate Thickness On The Surface Passivation In High Performance N–Type Solar Cells

Andr Augusto, Pradeep Balaji, Joseph Karas, Stuart G Bowden

Solar Power Laboratory, Arizona State University, Tempe, AZ, United States

8:30 – 10:00 AM	King 1

Methods for Scale-Up of Perovskite Devices

Chair(s): Giles Eperon

8:30 Large Area (>140 Cm^2) Perovskite Solar Modules Made By Sheet To Sheet And Roll To Roll Fabrication With 14.5% Efficiency

Francesco Di Giacomo[1], Henri Fledderus[1], Harrie Gorter[1], Gerwin Kirchner[1], Ike de Vries[1], Ilker Dogan[1], Wiljan Verhees[2], Valerio Zardetto[1], Mehrdad Najafi[2], Dong Zhang[2], Herbert Lifka[1], Yuila Galagan[1], Tom Aernouts[3], Sjoerd Veenstra[2], Pim Groen[1], Ronn Andriessen[1]

[1]Holst Centre/TNO – Solliance, Eindhoven, Netherlands, [2]ECN □ Solliance, Eindhoven, Netherlands, [3]imec – Solliance, Leuven, Belgium

Best Student Presentation Award Finalist

8:45 One-Step High-Throughput Blade Coating Of Perovskite Solar Cell

Benjia Dou[1,2], David T. Moore[1], James B. Whitakar[1], Sean E. Shaheen[2,3], Frank S. Barnes[2], Kai Zhu[1], Maikel F.A.M van Hest[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Department of Electrical, Computer and Energy Engineering, University of Colorado Boulder, Boulder, CO, United States, [3]Renewable and Sustainable Energy Institute, University of Colorado Boulder, Boulder, CO, United States

Best Student Presentation Award Finalist

9:00 Towards Inexpensive And Stable All-Evaporated Perovskite Solar Cells For Industrial Large-Scale Fabrication

Tobias Abzieher[1], Jonas A. Schwenzer[1], Florian Suttertuetti[1], Michael Pfau[1], Erwin Lotter[2], Michael Hetterich[1], Uli Lemmer[1,3], Michael Powalla[1,2], Ulrich W. Paetzold[1,3]

[1]Karlsruhe Institute of Technology (KIT) – Light Technology Institute, Karlsruhe, Germany, [2]Zentrum fuer Sonnenenergie- und Wasserstoff-Forschung (ZSW), Stuttgart, Germany, [3]Karlsruhe Institute of Technology (KIT) – Institute of Microstructure Technology, Karlsruhe, Germany

9:15 Scalable Deposition Of Polycrystalline Perovskite Thin Films Towards High-Efficiency And Large-Area Perovskite Photovoltaics

James B. Whitaker, Talysa R. Klein, Dong Hoe Kim, Zhen Li, Benjia Dou, Joseph J. Berry, Maikel F.A.M. van Hest, Kai Zhu

National Renewable Energy Laboratory, Golden, CO, United States

9:30 Observation Of Pbi_2 Residuals After P2 Nanosecond Laser Ablation Of Perovskite Absorber Layers

Bert Stegemann[1], Christof Schultz[1], Felix Schneider[1,5], Antje Neubauer[2], Andreas Bartelt[1], Marko Jost[3], Bernd Rech[4], Rutger Schlatmann[1,5], Steve Albrecht[3]

[1]HTW Berlin – University of Applied Sciences, Berlin, Germany, [2]Becker & Hickl GmbH, Berlin, Germany, [3]Young Investigator Group for Perovskite Tandem Solar Cells, Helmholtz-Zentrum Berlin f• Materialien und Energie, Berlin, Germany, [4]Institute for Silicon Photovoltaics, Helmholtz-Zentrum Berlin f• Materialien und Energie, Berlin, Germany, [5]PVcomB, Helmholtz-Zentrum Berlin f• Materialien und Energie, Berlin, Germany

Best Student Presentation Award Finalist

9:45 Stable Perovskite Solar Cell Architectures: Robustness Against Temperature Variations Under Real World Conditions

Jonas A. Schwenzer[1], Lucija Rakocevic[2,3], Tobias Abzieher[1], Diana Rueda-Delgado[1], Robert Gehlhaar[2], Bryce S. Richards[1,4], Uli Lemmer[1,4], Ulrich W. Paetzold[1,4]

[1]LTI, Karlsruhe Institute of Technology, Karlsruhe, Germany, [2]imec, Leuven, Belgium, [3]ESAT, KUL, Leuven, Belgium, [4]IMT, Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany

8:30 – 10:00 AM	Kona 4
PV Module Developments	

Chair(s): Michael Kempe

8:30 Historical Analysis For Estimating Future Module Efficiency And Manufacturing Cost Of Industrial Crystalline Silicon And Thin Film Technologies

Yifeng Chen, Daming Chen, Pietro Altermatt, Xueling Zhang, Guanchao Xu, Yang Yang, Yongqian Wang, Zhiqiang Feng, Pierre Verlinden

State Key Laboratory of PV Science and Technology, Trina Solar, Changzhou, China

8:45 Compressive Stress Strategies For Reduction Of Cracked Cell Related Degradation Rates In New Solar Panels And Power Recovery In Damaged Solar Panels

Andrew M. Gabor[1], Jason Lincoln[2], Eric J. Schneller[2], Hubert Seigneur[2], Rob Janoch[1], Andrew Anselmo[1], Duncan J. Harwood[3], Michael W. Rowell[3]

[1]BrightSpot Automation LLC, Westford, MA, United States, [2]Florida Solar Energy Center, Cocoa, FL, United States, [3]D2Solar, San Jose, CA, United States

9:00 Detection Of Sub-Millimeter Micro-Cracks In Silicon Wafers To Enable Reliable Pv Module Manufacturing

Zhe Liu, Sarah Wieghold, Luke Meyer, Loewen Cavill, Emanuel Sachs, Tonio Buonassisi

Massachusetts Institute of Technology, Cambridge, MA, United States

9:15 Reducing Photovoltaic Module Temperature Using Improved Backsheet Materials

Jaewon Oh[1], Balamurali Rammohan[1], Ashwini Pavgi[1], Sai Tatapudi[1], Govindasamy Tamizhmani[1], George Kelly[2], Michael Bolen[3]

[1]Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States, [2]Sunset Technology, Mount Airy, MD, United States, [3]Electric Power Research Institute, Charlotte, NC, United States

9:30 Potential Of White Eva As Pv Encapsulant: Performance And Reliability Study

Min Hsian Saw[1], Peng Dong[2], Jai Prakash Singh[1], Tian Shen Liang[1], Jing Chai[1], Yanan Wei[2], Yan Wang[1], Yong Sheng Khoo[1]

[1]Solar Energy Research Institute of Singapore (SERIS), National University of Singapore (NUS), Singapore, Singapore, [2]State Power Investment Corporation (SPIC), Xi誕n Solar Power Co, Ltd.,, Xi'an, China

9:45 Conductive Paste Based Low Temperature Tabbing Process For Photovoltaic Modules With Thin C-Si Cells

Hyung-Jun Song, Woo Gyun Shin, Hee Sang Yoon, Hye Mi Hwang, Young Chul Ju, Suk Whan Ko, Min Gu Kang, Jeong In Lee, Hee-eun Song, Gi Hwan Kang

Korea Institute of Energy Research, Daejeon, Korea

8:30 – 10:00 AM	King 2,3
Soiling 1	

Chair(s): Elisabeth Klimm

8:30 Optical Microscopy Study Of Soiling On Pv Glass: Evaluation Of Possible Mitigation Strategies

Asher Einhorn[1], Leonardo Micheli[1], David Miller[1], Lin J. Simpson[1], Matthew Muller[1], Sarah Toth[2], Jim J. John[3], Anil Kottantharayl[4], Chaiwat Engtrakul[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]University of Colorado, Boulder, CO, United States, [3]Dubai Electricity and Water Authority, Dubai, United Arab Emirates, [4]India Institute of Technology, Bombay, Mumbai, India

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8:45 Hydrophobic–Hydrophilic Surfaces Exhibiting Dropwise Condensation For Anti–Soiling Applications

Illya Nayshevsky[1,2], Qianfeng Xu[1,3], Alan Lyons[1,2,3]

[1]College of Staten Island, City University of New York, New York, NY, United States, [2]The Graduate Center, City University of New York, New York, NY, United States, [3]ARL Designs LLC, New York, NY, United States

Best Student Presentation Award Finalist

9:00 Dew As A Detrimental Influencing Factor For Soiling Of Pv Modules

Klemens Konstantin Ilse[1,2], Benjamin W. Figgis[3], Volker Naumann[1], Christian Hagendorf[1]

[1]Fraunhofer Center for Silicon–Photovoltaics CSP, Halle, Germany, [2]Anhalt University of Applied Sciences, K hen, Germany, [3]Qatar Environment & Energy Research Institute, Doha, Qatar

9:15 Mapping Photovoltaic Soiling Using Spatial Interpolation Techniques

Leonardo Micheli[1], Michael G. Deceglie[1], Matthew Muller[1,2]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Leidos, Denver, CO, United States

9:30 Strong Electric Field Attraction And Adhesion Forces Of Dust Particles On Photovoltaic Modules

C.–S. Jiang, H.R. Moutinho, B. To, C. Xiao, C. Perkins, M. Muller, M.M. Al–Jassim, L.J. Simpson

National Renewable Energy Laboratory, Golden, CO, United States

9:45 Mitigation Of Soiling By Vertical Mounting Of Bifacial Modules

Sonali Bhaduri[1,2], Anil Kottantharayil[1,3]

[1]National Centre for Photovoltaic Research and Education, Mumbai, India, [2]Centre for Research in Nanotechnology and Science, Mumbai, India, [3]Department of Electrical Engineering, Mumbai, India

10:00 – 10:30 AM	Grand Promenade
Coffee Break	

10:30 – 12:00 PM	Kona 1
IEA-PVPS Workshop: Forecasting the Market and Technology – How We Underestimated PV Potential	

Click Here To View the Detailed Agenda

Chair(s): Arnulf Jaeger Waldau

10:30 – 12:00 PM	Poster 1
Quantum-well, Wire, and Dot-Architectured Devices / Advanced Light Management and Spectral Shaping	

Chair(s): Gavin Conibeer

A1 Metal/Polymer Back Reflectors With Diffraction Gratings For Light Trapping In Iii-V Solar Cells

Timo Aho[1], Mircea Guina[1], Farid Elsehrawy[2], Federica Cappelluti[2], Marianna Raappana[1], Antti Tukiainen[1], A B M Khairul Alam[3], Ismo Vartiainen[4], Markku Kuittinen[3], Tapio Niemi[1]

[1]Optoelectronics Research Centre, Laboratory of Photonics, Tampere University of Technology, Tampere, Finland, [2]Department of Electronics and Telecommunications, Politecnico di Torino, Torino, Italy, [3]Institute of Photonics, University of Eastern Finland, Joensuu, Finland, [4]Dispelix Oy, Espoo, Finland

A2 Deposition And Characterization Of Si Quantum Dot Multilayers Prepared By Plasma Enhanced Chemical Vapor Deposition Using Sih4 And Co2 Gases

Ryushiro Akaishi[1], Kouhei Kitazawa[1], Satoshi Ono[1], Kazuhiro Gotoh[1], Eiji Ichihara[2], Shinya Kato[2], Noritaka Usami[1], Yasuyoshi Kurokawa[1]

[1]Nagoya University, Nagoya, Japan, [2]Nagoya Institute of Technology, Nagoya, Japan

A3 Comparison Of Effective Carrier Mobility Between Wire On Well And Multiple Quantum Well By Time Of Flight Measurement

Meita Asami[1], Kasidit Toprasertpong[1], Kentaroh Watanabe[2], Yoshiaki Nakano[1,2], Yoshitaka Okada[1,2], Masakazu Sugiyama[1,2]

[1]School of Engineering, The University of Tokyo, Bunkyo, Japan, [2]Research Center for Advanced Science and Technology, Meguro, Japan

A4 Thin Films For Enhanced Photon Recycle In Thermophotovoltaics

Tobias Burger[1], Dejiu Fan[2], Kyusang Lee[3], Stephen R. Forrest[2], Andrej Lenert[1]

[1]Department of Chemical Engineering, University of Michigan, Ann Arbor, MI, United States, [2]Department of Electrical Engineering, University of Michigan, Ann Arbor, MI, United States, [3]Department of Electrical & Computer Engineering and Materials Science & Engineering, University of Virginia, Charlottesville, VA, United States

A5 Evaluation Of Luminescent Downshifting Effect Of Perovskite Quantum Dots On Semiconductor Solar Cells

Chun-Hong Chen[1], Chung-Ping Yu[2], Yu-Ming Huang[2], Yueh-Lin Chan[2], Chung-Ping Huang[3], Shu-Hsiu Chang[1], Shun-Chieh Hsu[2], Jia-Jhen Liou[4], Teng-Ming Chen[4], Chien-Chung Lin[2]

[1]Institute of Imaging and Biomedical Photonic, National Chiao-Tung University, Tainan, Taiwan, [2]Institute of Photonic System, National Chiao-Tung University, Tainan, Taiwan, [3]Institute of Lighting and Energy Photonics, National Chiao-Tung University, Tainan, Taiwan, [4]Department of Applied Chemistry, National Chiao-Tung University, Hsinchu, Taiwan

A6 Enhanced Upconversion Performance In Alloyed Cdse(Te)/Cds1-Xsex/Cdse Core/Rod/Emitter Nanostructures

Eric Y. Chen, Christopher C. Milleville, Kyle R. Lennon, Jill M. Cleveland, Joshua M. O. Zide, Matthew F. Doty

University of Delaware, Newark, DE, United States

A7 Ingan/Gan Quantum Dot Nanowires On Silicon For Intermediate Band Solar Cells

Ross Cheriton[1], Sharif Sadaf[2], Zetian Mi[2], Karin Hinzer[1]

[1]University of Ottawa, Ottawa, ON, Canada, [2]University of Michigan, Ann Arbor, MI, United States

A8 Enhanced Optical Absorption In An Ultra-Thin Textured Solar Cell Using Nanosphere Natural Photolithography

Erin Cleveland[1], Louise Hirst[1], Sarah Brittman[2], Stephanie Tomasulo[1], Mitchell Bennett[3], Phillip Jenkins[1], Robert Walters[1], Michael Yakes[1]

[1]Naval Research Laboratory, Washington, DC, United States, [2]NRC postdoctoral Fellow Residing at NRL, Washington, DC, United States, [3]George Washington University, Washington, DC, United States

A9 Formation Of Si Nanowire Solar Cells By Transition Metal Oxides

Weijie Du, Guoliang Ma, Rui Du, Qi'ang Zhou, Cen Shen, Yiwen Liu, Xudan Gao, Qiuping Chen, Yiwen Zhang

Key Laboratory of Optoelectronic Material and Device, Department of Physics, Shanghai Normal University, Shanghai, China

A10 Fabrication Of Plasmonic Luminescent Down-Shifting Layers Comprising Of Organic Dyes And Quantum Dots

Sarah E Gilligan, Hind Ahmed, Subhash Chandra, Sarah J McCormack

Trinity College Dublin, Dublin, Ireland

B1 Ageing Evaluation Of Different Polymeric Er^{3+} Downshifters Exposed To Harsh Outdoor Conditions

Benjam匡 Gonz疝ez-D僦z[1], Cecilio Hern疣dez-Rodr劭uez[2], David Ca dillas[2], Joaqu匡 Sanchiz[3], Ricardo Guerrero-Lemus[2]

[1]Departamento de Ingenier僦 Industrial. Universidad de La Laguna, San Crist al de La Laguna, Spain, [2]Departamento de F婆ica. Universidad de La Laguna, San Crist al de La Laguna, Spain, [3]Departamento de Qu匆ica. Universidad de La Laguna, San Crist al de La Laguna, Spain

B2 The Spectral Conversion Layer Incorporated With Species Of Lds And Uc Phosphors On Single-Junction Gaas Solar Cells To Enhance Photovoltaic Performance

Wen-Jeng Ho[1], Zong-Xian Lin[1], Wen-Bin Bai[1], Jheng-Jie Liu[1], Guan-Yu Chen[1], Jhih-Ciang Chen[1], Chun-Yen Wei[1], Wei-Chen Lin[1], Hung-Pin Shiao[2]

[1]National Taipei University of Technology, Taipei, Taiwan, [2]Win Semiconductor Corp., , Taoyuan, Taiwan

B3 The Spectral Conversion Layer Incorporated With Species Of Lds And Uc Phosphors On Single-Junction Gaas Solar Cells To Enhance Photovoltaic Performance

Wen-Jeng Ho[1], Zong-Xian Lin[1], Wen-Bin Bai[1], Jheng-Jie Liu[1], Guan-Yu Chen[1], Jhih-Ciang Chen[1], Chun-Yen Wei[1], Wei-Chen Lin[1], Hung-Pin Shiao[2]

[1]National Taipei University of Technology, Taipei, Taiwan, [2]Win Semiconductor Corp., Taoyuan, Taiwan

B4 Current Collection Enhancement In Ultra-Thin Cdte Photovoltaic Device By Implementation Of Plasmonic Back Reflectors

Ramez Hosseinian Ahangharn[1,2], Nafsika Theodoropoulou[1,2], Geethika K. Liyanage[1,2], Jacob M. Gibbs[1,2], Adam B. Phillips[1,2], Michael J. Heben[1,2]

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B5 Fundamental Study Of Si/Sio_2 Quantum Well Structure For Wide Bandgap Si Solar Cells

Yukimi Ichikawa, Masakazu Hirai, Makoto Konagai

Tokyo City University, Tokyo, Japan

B6 An Electrophoretic-Deposited Low-Cost Carbon Nanotube (Cnt) Thermophotovoltaic Emitter

Albert Lin[1], Parag Parashar[1], Chien-Chih Yang[1], Hao-Ming Chou[1], Yi-Shiuan Lin[1], Dong-Han Wu[2], Yu-Bin Chen[2], Tseung-Yuen Tseng[1]

[1]National Chiao-Tung University, Hsinchu, Taiwan, [2]National Tsing-Hua University, Hsinchu, Taiwan

B7 Simulation Of Light Trapping In Ultra-Thin Crystalline Silicon Absorber With Silver Nanodisc Back Reflector

James E Moore[1,2], Woojun Yoon[2], Phillip P Jenkins[2], Robert Walters[3]
[1]The George Washington Univesity, Washington, DC, United States, [2]US Naval Research Lab, Washington, DC, United States, [3]Packet Digital, Fargo, ND, United States

B9 Modeling Of Practical Light Management For Absorption Enhancement In Iii-V Multi-Junction And Quantum-Dot Solar Cells

George T Nelson[1], Julia D'Rozario[1], Stephen J. Polly[1], Rao Tatavarti[2], Seth M. Hubbard[1]
[1]Rochester Insitute of Technology, Rochester, NY, United States, [2]Microlink Devices, Niles, IL, United States

B10 Quantifying Parasitic Losses From Metal Scattering Structures In Solar Cells: How Uncertainty In Optical Constants Affects Simulation Results

Phoebe M Pearce[1], Alexander V Mellor[1], Nicholas J Ekins-Daukes[1, 2]
[1]Department of Physics, Imperial College London, South Kensington Campus, London, United Kingdom, [2]School of Photovoltaic and Renewable Energy Engineering, UNSW, Sydney, Australia

B11 Incorporation Of Photonic Structures For Improved Radiation Tolerance Of Lattice Matched Triple Junction Solar Cells

Stephen J. Polly[1], George Nelson[1], Julia D'Rozario[1], Elisabeth McClure[1], Rao Tatavarti[2], Seth M. Hubbard[1]
[1]Rochester Institute of Technology, Rochester, NY, United States, [2]MicroLink Devices, Inc., Niles, IL, United States

B12 Demonstration Of Photovoltaic Effects In Hybrid Type-I Inas/Gaas Quantum Dots And Type-Ii Gasb/Gaas Quantum Dots

Thanaphat Rakpaises[1], Nanthaphop Sridumrongsak[1], Chanyanuch Chevintulak[2], Supachok Thainoi[2], Suwit Kiravittaya[3], Noppadon Nuntawong[4], Suwat Sopitpan[5], Songphol Kanjanachuchai[2], Somchai Ratanathammaphan[2], Aniwat Tandaechanurat[1], Somsak Panyakeow[2]
[1]International School of Engineering (ISE), Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand, [2]Semiconductor Device Research Laboratory, Department of Electrical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand, [3]Department of Electrical and Computer Engineering, Faculty of Engineering, Naresuan University, Phitsanulok, Thailand, [4]National Electronics and Computer Technology Center (NECTEC), National Science and Technology Development Agency, Pathumthani, Thailand, [5]Thai Microelectronics Center (TMEC), National Science and Technology Development Agency, Chachoengsao, Thailand

B13 Designing Spectrally-Selective Mirrors For Photovoltaic Module Thermal Management

Ian M. Slauch[1], Michael G. Deceglie[2], Timothy J Silverman[2], Vivian E. Ferry[1]
[1]University of Minnesota Department of Chemical Engineering and Materials Science, Minneapolis, MN, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

B14 Diffusion Of Phosphorous In Black Silicon

Andreas R. Stilling-Andersen, Olga Solodovnikova, Rasmus S. Davidsen, Ole Hansen, Beniamino Iandolo
Technical University of Denmark, Kgs. Lyngby, Denmark

B15 Photoluminescence Mapping Of In-Plane Ultrahigh-Density Inas Quantum Dots For Solar Cell Applications

Sho Tatsuki, Ryo Sugiyama, Tomoe Kato, Tomah Sogabe, Koichi Yamaguchi
The University of Electro-Communications, Tokyo, Japan

B16 Analytic Approach For Global Structure Optimization Of Multiple Quantum Well Solar Cells

Kasidit Toprasertpong[1], Yoshiaki Nakano[1], Masakazu Sugiyama[1,2]
[1]School of Engineering, the University of Tokyo, Tokyo, Japan, [2]Research Center for Advanced Science and Technology, Tokyo, Japan

B17

Comparison Of &Lsquo;Shallow&Rsquo; And &Lsquo;Deep&Rsquo; Junction Architectures For Mbe-Grown Inas/Gaas Quantum Dot Solar Cells

Antti Tukiainen[1], Jari Lyytik臺nen[1], Timo Aho[1], Eero Halonen[1], Marianna Raappana[1], Federica Cappelluti[2], Mircea Guina[1]

[1]Optoelectronics Research Centre, Laboratory of Photonics, Faculty of Natural Sciences, Tampere University of Technology, FI-33720, Tampere, Finland, [2]Department of Electronics and Telecommunications, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129, Torino, Italy

B18 *High Efficient Ultrathin Gaas Optical Absorption Devices With Ring-Shaped Nanohole Arrays*

yonggang wu, xuefei qin, jian zhou, zihuan xia, zongyi zhang

Tongji University, Shanghai, China

B19 Progress Toward A Flexible, Ultrathin Gaas Solar Cell

Michael K. Yakes[1], Louise C. Hirst[1], Mitchell F. Bennett[2], Erin. R. Cleveland[1], Stephanie Tomasulo[1], Jeffrey H. Warner[1], Sergey I. Maximenko[1], James E. Moore[2], Robert J. Walters[1], Phillip P. Jenkins[1]

[1]Naval Research Laboratory, Washington, DC, United States, [2]George Washington University, Washington, DC, United States

B20 The In Situ Linker-Assisted Deposition Of Oil Soluble Cdse Quantum Dots On Tio_2 Mesoporous Film

Di Zhang[1,2], Pin Ma[1,2], Mingpeng Xia[1,2], Shuo Wang[3], Xiaowen Zhou[1,2], Yuan lin[1,2]

[1]Institute of Chemistry, Chinese Academy of Sciences, Beijing, China, [2]University of Chinese Academy of Sciences, Beijing, China, [3]Beijing University of Chemical Technology, Beijing, China

C1 Selectively Transparent Down-Shifting Conversion Layer For Flexible Pv Applications

Katarzyna Znajdek, Natalia Szczecińska, Aleksandra Sosna, Maciej Sibiński, Aleksandra Kudelska, Przemysław Czarnecki

Lodz University of Technology, Lodz, Poland

C2 Evaluation Of Polymer Based Zinc Oxide Nanoparticle Layers For Down-Conversion Application In Thin-Film Photovoltaic Structures

Katarzyna Znajdek, Natalia Szczecińska, Przemysław Czarnecki, Gabriela Wiosna-Sałyga, Zbigniew Lisik, Maciej Sibiński

Lodz University of Technology, Lodz, Poland

10:30 – 12:00 PM	Poster 2
Contacts/Window	

Chair(s): Takeaki Sakurai

C4 Study Of Cds Nanowires For Use As Window Material In Cds/Cdte Solar Cells.

P. G. Zayas-Baz疣[1], K. Gutierrez. Z-B[1], O. de Melo[2], J.R. Aguilar-Hern疣dez[1], G. Santana-Rodr劭uez[3], M. Tufi -Vel痙quez[1], G. Contreras-Puente[1]

[1]Escuela Superior de F嫠ica y Matem疽ica del IPN, Ciudad de M騙ico, Mexico, [2]Facultad de F嫠ica, Universidad de La Habana, La Habana, Cuba, [3]Instituto de Investigaci en Materiales, Universidad Nacional Aut oma de M騙ico, Ciudad de M騙ico, Mexico

C5 Co-Sputtered $Mg_xZn_{1-x}O$ Window Layers For Cdte And $Cdte_{(1-x)}Se_x$ Based Photovoiltaics

Tom Baines, Ken Durose, Jonathan Major

University of Liverpool, Liverpool, United Kingdom

C6 Surface Reactivity Of Cigs Absorber On Soda-Lime And Flexible Substrates Studied By Xps: A Global Approach Of Deoxidation, Ageing And Alkali Elements Distribution

Sol鈰e B旭hu[1,2], Ana・ Loubat[1,2], Muriel Bouttemy[1,2], Matteo Balestrieri[1], Sofia Gaiaschi[3], Thibaud Hildebrandt[1,4], Valentin Achard[1,4], Mathieu Fr馮naux[1,2], Damien Aureau[1,2], Jackie Vigneron[1,2], Fr馼駈ique Donsanti[1,4], Marie Jubault[1,4], Patrick Chapon[3], Daniel Lincot[1,5], Jean-Fran輟is Guillemoles[1,5], Arnaud Etcheberry[1,2]

[1]Institut Photovolta・ue d棚lle-de-France (IPVF), Palaiseau, France, [2]ILV, Institut Lavoisier de Versailles, Versailles, France, [3]HORIBA Scientific, Palaiseau, France, [4]EDF, IPVF, Palaiseau, France, [5]CNRS,IPVF, UMR 9006, Palaiseau, France

C7 Co-Sputtering And Properties Of Ta Doped Sno_2 As A Potential Transparent Electrode For Thin Film Photovoltaics

TJ Feathrstone[1], JEN Swallow[1], BAD Williamson[2,3], DO Scanlon[2,3], JD Major[1], K Durose[1], TD Veal[1]

[1]University of liverpool, Liverpool, United Kingdom, [2]University College London, London, United Kingdom, [3]Diamond Light Source, Didcot, United Kingdom

C3 Novel Window Layer Proposal On Cadmium Reduced Cdte Solar Cell

Uziel Galarza Gutierrez[1], Maria de Lourdes Albor Aguilera[1], Miguel Angel Gonzalez Trujillo[2], Jose Manuel Flores Marquez[3], Maria de Los Angeles Hernandez Perez[3], Cesar Hernandez Vasquez[2], Gerardo Contreras Puente[1]

[1]Instituto Polit旭nico Nacional-ESFM, CDMX, Mexico, [2]Instituto Polit旭nico Nacional-ESCOM, CDMX, Mexico, [3]Instituto Polit旭nico Nacional-ESIQIE, CDMX, Mexico

C8 Activation Of Thin Film Cdte Solar Cells Using A Cadmium Bromide Treatment

Rachael C. Greenhalgh[1], Ali Abbas[1], Amit H. Munshi[2], Tushar M. Shimpi[2], Kurt Barth[2], Walajabad S. Sampath[2], Jake W. Bowers[1], John M. Walls[1]

[1]CREST, Loughborough University, Loughborough, United Kingdom, [2]NSF I/UCRC for Next Generation Photovoltaics, Colorado State University, Fort Collins, CO, United States

C9 Copper-Doped Zinc Telluride Thin-Films As A Back Contact For Cadmium Telluride Photovoltaics

Anna E. Kindvall, Amit H. Munshi, Tushar M. Shimpi, Adam H. Danielson, Walajabad S. Sampath

Colorado State University, Department of Mechanical Engineering, Fort Collins, CO, United States

C10 Impact Of Structure On Carrier Transport Behavior At The Interface Between Electrode And Znsnp2 Absorber

Taro Kuwano, Shigeru Nakatsuka, Yoshitaro Nose

Kyoto University, Kyoto, Japan

C11 Improved Device Models Of Cztse: Nanolayer Ge Solar Cells With Quantum Efficiency

Sanghyun Lee[1], Kent Price[2], Edgardo Saucedo[3], Sergio Giraldo[3]

[1]Indiana State University, Terre Haute, IN, United States, [2]Morehead State University, Morehead, KY, United States, [3]Catalonia Institue for Energy Research, Barcelona, Spain

C12 Enhanced Efficiency Of Cu(In,Ga)Se_2 Solar Cells With A Thin Cds Buffer Layer Via A (Zn,Mg)O Second Buffer Layer

Hui Li[1,2], Fei Qu[1], Xinlu Lin[1,2], Hongwei Gu[1,2], Wenjing Wang[1,2]

[1]Institute of Electrical Engineering, Chinese Academy of Sciences, Beijing 100190, China, Beijing, China, [2]University of Chinese Academy of Sciences, Beijing 100049, Beijing, China

C13 Cu(In,Ga)Se_2 Thin Film Solar Cell With Zn(S,O) Buffer Layer Fabricated By A Chemical Bath Deposition Method

Xinlu Lin[1,2], Hui Li[1,2], Fei Qu[1], Hongwei Gu[1,2], Wenjing Wang[1,2]

[1]Institute of Electrical Engineering, Chinese Academy of Sciences, Beijing 100190, China, Beijing, China, [2]University of Chinese Academy of Sciences, Beijing 100049, Beijing, China

C14 Investigation Of Sputtered Oxides And P^+ Back-Contact For Polycrystalline Cdte And Cdsete Photovoltaics

Amit H. Munshi, Adam H. Danielson, Anna Kindvall, Kurt L. Barth, Walajabad S. Sampath

Colorado State University, Fort Collins, CO, United States

C15 Carbon Nanotube Networks To Enable Novel Passivating Back Contacts

Sanjini. U. Nanayakkara, Andrew Ferguson, Tursun Ablekim, Sadia R. Rab, Katherine Hurst, Teresa Barnes, Mathew Reese, Jeffrey Blackburn, Wyatt K. Metzger

National Renewable Energy Laboratory, Golden, CO, United States

C16 Baseline Models For Three Types Of Cigs Cells: Effect Of Buffer Layer And Na Content

Marco Nardone[1], Yasas Patikirige[1], Curtis Walkons[2], Shubhra Bansal[2], Theresa Friedlmeier[3], Kyoung Kweon[4], Joel Varley[4], Vince Lordi[4]

[1]Bowling Green State University, Bowling Green, OH, United States, [2]University of Nevada Las Vegas, Las Vegas, NV, United States, [3]Zentrum f• Sonnenenergie- und Wasserstoff-Forschung Baden-W•ttemberg, Stuttgart, Germany, [4]Lawrence Livermore National Laboratory, Livermore, CA, United States

C17 Analysis Of Post-Heat Treatment Characteristics Of Zno: Al Transparent Electrode For Cigs Thin Film Solar Cell

Jung Hoon Park[1], Jeong Eun Park[2], Sang Yong Park[1], Jackson Bweupe[1], So Mang Park[1], Donggun Lim[1,2]

[1]Department of IT convergence, Korea National University of Transportation, Chungju, South Korea, [2]Department of Electronic Engineering, Korea National University of Transportation, Chungju, South Korea

C18 Optical And Structural Properties Of Zns Thin Films With Various Complexing Agents

Sang Yong Park[1], Jeong Eun Park[2], Jeong Hun Park[1], Jackson Bweupe[1], So Mang Park[1], Chaehwan Jeong[3], Donggun Lim[1,2]

[1]Department of IT convergence, Korea National University of Transportation, CHUNGJU, Korea, [2]Department of Electronic Engineering, Korea National University of Transportation, CHUNGJU, Korea, [3]Applied Optics and Energy Research Group, Korea Institute of Industrial Technology, GWANGJU, Korea

C19 Optical And Structural Analysis According To Complexing Agent In Zns Thin Film Deposition

So Mang Park[1], Jeong Eun Park[2], Sang Yong Park[1], Jung Hoon Park[1], Jackson Bweupe[1], Chaehwan Jeong[3], Donggun Lim[1,2]

[1]Department of IT convergence, Korea National University of Transportation, Chungju, South Korea, [2]Department of Electronic Engineering, Korea National University of Transportation, Chungju, South Korea, [3]Applied Optics and Energy Research Group, Korea Institute of Industrial Technology, Gwangju, South Korea

C20 Oxygen Annealing And Zn/Hcl Etching Effects On Czts Devices

Elizabeth Pogue[1], Ludovic Arzel[2], Nicolas Barreau[2], Angus Rockett[3]

[1]University of Illinois, Urbana, IL, United States, [2]Uppsala University, Uppsala, Sweden, [3]Univsersit□ de Nantes, Nantes, France, [4]Colorado School of Mines, Golden, CO, United States

D1 Study Of Instabilities And Degradation Due To Moisture Ingress In The Molybdenum Back Contact Of Cu(In,Ga)Se_2 Solar Cells

Grace Rajan[1], Shankar Karki[1], Deewakar Poudel[1], Tyler J. Grassman[2,3], Angus Rockett[4], Sylvain Marsillac[1]

[1]Virginia Institute of Photovoltaics, Old Dominion University, Norfolk, VA, United States, [2]Dept. of Materials Science & Engineering, The Ohio State University, Columbus, OH, United States, [3]Dept. of Electrical & Computer Engineering, The Ohio State University, Columbus, OH, United States, [4]Dept. of Metallurgical and Material Engineering, Colorado School of Mines, , Golden, CO, United States

D2 Cd-Reduced Cds/Zn(O,S) Hybrid Buffer For Cigs Solar Cell

Tanka R Rana[1], SeongYeon Kim[1], JunHo Kim[1], Kihwan Kim[2], Jae Ho Yun[2]

[1]Incheon National University, Incheon, South Korea, [2]KIER, Daejeon, South Korea

D3 Optical And Structural Properties Of Rf-Sputtered Zns:Cr Thin Films

Cheikh Samba Vall, Abdelkader Outzouhrit, Aggour Mohammed

D4 Exploration Of Copper-Free Znte Buffer Layers For Cdte-Based Solar Cells

Yegor Samoilenko, Colin A. Wolden

Colorado School of Mines, Golden, CO, United States

D5 Revisit To Understanding Of Ito/Cigs Interface Characteristics For Cigs Solar Cell Employing Ito Back Contact

Yu-Seung Son[1], Sung Bin Choi[1], Won Mok Kim[1], Jong-Keuk Park[1], David J. Hwang[2], Jeung-hyun Jeong[1]

[1]Korea Institute of Science and Technology, Seoul, South Korea, [2]Department of Mechanical Engineering, State University of New York, Stony Brook, NY, United States

D6 Insulating Layer Formation Using Self-Oxide Film On Sus Substrate For A Flexible Cztse Solar Cell

YuJin Song[1], JiA Oh[1], HyeonJi Baek[1], ChanWook Jeon[1]

[1]Yeungnam University, Gyeongsan, Korea, [2]Yeungnam University, Gyeongsan, Korea, [3]Yeungnam University, Gyeongsan, Korea, [4]Yeungnam University, Gyeongsan, Korea

D7 Assessing The Impact Of Rear Point-Contact/Passivation On Cigs Cells With Different Absorber Thickness And Grading

Giovanna Sozzi, Simone Di Napoli, Martina Carrisi, Roberto Menozzi

Department of Engineering and Architecture, University of Parma, PARMA, Italy

D8 Boosting The Efficiency Of Kesterite Cu_2Znsns_4 Solar Cells By Optimizing The Heterojunction Interface Quality

Kaiwen Sun, Chang Yan, Jialiang Huang, Fangyang Liu, Heng Sun, Aobo Pu, Martin Green, Xiaojing Hao

School of Photovoltaic and Renewable Energy Engineering, University of New South Wales , Sydney, Australia

D9 Mobility Limits Of F-Doped Sno_2 Transparent Conducting Oxides- A Hard Xps Study

Jack E. N. Swallow[1], Benjamin A. D. Williamson[2], Thomas J. Featherstone[1], Alex Abbott[3], Mark Farnworth[3], Kieran J. Cheetham[1], Paul Warren[3], Anna Regoutz[4], Tien-Lin Lee[5], David O. Scanlon[2, 5], Vin R. Dhanak[1], Tim. D. Veal[1]

[1]Stephenson Institute for Renewable Energy and Department of Physics, University of Liverpool, Liverpool, United Kingdom, [2]Department of Chemistry and Thomas Young Centre, University College London, London, United Kingdom, [3]NSG Group, European Technical Centre, Lancashire, United Kingdom, [4]Department of Materials, Imperial College London, London, United Kingdom, [5]Diamond Light Source Ltd., Harwell Science and Innovation Campus, Didcot, United Kingdom

D10 Understanding The Ald Virtual Buffer For Cigs Solar Cell With Numerical Simulation

W.L. Xu[1], W.C. Huang[1], J.C Huang[2,3], C.H. Lai[1]

[1]Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan, [2]Center for Nanotechnology, Materials science, and Microsystem, Hsinchu, National Tsing Hua University, Hsinchu, Taiwan, [3]Center for Nano-Science and Technology, University System of Taiwan, Hsinchu, Taiwan

D11 Restraining The Band Fluctuation Of Cbd-Zn(O,S) Layer: Modifying The Hetero-Junction Interface For High Performance $Cu_2Znsnse_4$ Solar Cells With Cd-Free Buffer Layer

Yi Zhang[1], Jianjun Li[1,2], Xiaoru Liu[1], Li Wu[1], Jianping Ao[1], Yun Sun[1]

[1]Nankai University, Tianjin, China, [2]Jinan University, Guangzhou, China

10:30 – 12:00 PM	Poster 3
Surface Passivation, Optical Coating and Light Management	

Chair(s): Shubham Duttagupta

D12 Efficient Light Trapping In Silicon Heterojunction Solar Cells Via Nanoimprint Periodic Texturing

Samia Ahmed Nadi, Alaaeldin Gad, Florian Lentz, Yael Augarten, Karsten Bittkau, Andreas Lambertz, Do Yun Kim, Li Ding, Andrew Wrigley, Uwe Rau, Kaining Ding
IEK5- Photovoltaik, Forschungszentrum Juelich GmbH, D □ 52425 Juelich, Germany

D13 Uv-Ozone Oxide For Effective Surface Clean And High-Quality Passivation

Sara Bakhshi[1], Ngwe Zin[1], Marshall Wilson[2], Ismail Kashkoush[3], Kristopher Davis[1], Winston Schoenfeld[1]
[1]University of Central Florida, Orlando, FL, United States, [2]Semilab SDI LLC, Tampa, FL, United States, [3]Akrion Systems, Allentown, PA, United States

D14 Xps Profiling Study Of Al_2O_3 Passivation Layers For High Efficiency N-Pert And Perc Solar Cells

Sol鉀e B殖hu[1,2], Ana・ Loubat[1,2], Muriel Bouttemy[1,2], Yves Marot[3], Thomas Bl雖in[1], Jonathan Langlois[1], Andy Zauner[3], Mathieu Fr馮naux[1,2], Damien Aureau[1,2], Jackie Vigneron[1,2], Peter Uhlig[3], Sylvain Pouliquen[3], Arnaud Etcheberry[1,2]
[1]Institut Photovolta・ue d栅le-de-France (IPVF), Palaiseau, France, [2]ILV, Institut Lavoisier de Versailles, Versailles, France, [3]Air Liquide, Centre de recherche Paris-Saclay, Jouy-en-Josas, France

D15 Widening Bandgap Of I/N-A-Si:H Window Layers Via Hydrogen Injection In Cat-Cvd For Shj Solar Cells

Renfang Chen[1,2], Liping Zhang[1,2], Zhuopeng Wu[1,2], Zhenfei Li[1,2], Junlin Du[1], Fanying Meng[1,2], Zhengxin Liu[1,2]
[1]Shanghai Institute of Microsystem and Information Technology (SIMIT), Chinese Academy of Sciences, Shanghai, China, [2]University of Chinese Academy of Sciences, Beijing, China

D16 Passivation Mechanism Of The Printed-Sio_2 Dl Cap In Perc-Type Solar Cell Application

Tsung-Cheng Chen[1,2], Chen-Hao Ku[2], Ing-Song Yu[3], Zu-Po Yang[1]
[1]Institute of Photonic System, National Chiao Tung University, Tainan, Taiwan, [2]E-Ton Solar Tech Co., LTD., Tainan, Taiwan, [3]Department of Materials Science and Engineering, National Dong Hwa University, Hualien, Taiwan

D17 Highly Transparent Conductive Cerium Oxide And Hydrogen Co-Doped In_2O_3 Thin Films For Crystalline Silicon Solar Cells

Xinliang Chen, Zhongxin Zhou, Changchun Wei, Ying Zhao, Xiaodan Zhang
Institute of Photo-electronic Thin Film Devices and Technology, Nankai University, Tianjin, China

D18 Si Surface Passivation By Sulfur And Reduction Of Interface Defect Recombination

Ujjwal Das, Lei Zhang, Hsiang-Yu Liu, Robert Birkmire, Steven Hegedus
Institute of Energy Conversion, University of Delaware, Newark, DE, United States

D19 Performance Optimization Techniques For The Front And Back Of Nanostructured &Lsquo;Black Silicon&Rsquo; Solar Cells

Wenqi Duan, Bingtao Gao, KASM Ehteshamul Haque, Fatima Toor
University of Iowa, Iowa City, IA, United States

D20 Effect Of Koh Textured Pyramid Size On Surface Passivation Of Silicon Solar Cells

Rameshwari Ghimire, Xiong Zhang, Som N Dahal, Trevor Thornton, Stuart Bowden
Arizona State University, Tempe, AZ, United States

E1 High Troughput And Enhanced Pecvd Passivation Tool Concepts For Improved Perc Cells

Thomas Grosse[1], Mirko Meyer[1], Hans-Peter Sperlich[1], Gunnar Koehler[1], Marcel Koenig[1], Dirk Landgraf[1], Phedon Palinginis[2], Holger Neuhaus[2], Christian Kuesterer[2], Rene Koehler[2], Stefan Steckemetz[2]

[1]Meyer Burger (Germany) GmbH, Hohenstein-Ernstthal, Germany, [2]2SolarWorld Industries GmbH, Freiberg, Germany

E2 Application Of Light Trapping Structure Using Ge Dot Mask By Alkaline Etching To Heterojunction Solar Cell

Atsushi Hombe, Yasuyoshi Kurokawa, Kazuhiro Gotoh, Noritaka Usami

Nagoya University, Nagoya-shi, Japan

E3 Advanced Light Scattering Through Textured Glass Surface Morphologies With High Transmittance And Haze Ratio In Thin-Film Silicon Solar Cells

Shahzada Qamar Hussain[1, 3], Anh Huy Tuan Le[2], Kumar Mallem[2], Hyeongsik Park[2], Minkyu Ju[2], Jaehyun Cho[2], Jinjoo Park[2], Eun-chel Cho[2], Young Hyun Cho[2], Youngkuk Kim[2], Junsin Yi[2]

[1]Department of Energy Science, Sungkyunkwan University, 440-746, , Suwon, South Korea, [2]College of Information and Communication Engineering, Sungkyunkwan University, 440-746, , Suwon, South Korea, [3]Department of Physics, COMSATS Institute of Information and Technology, Lahore, Pakistan

E4 Study On Hydrogen Passivation Behavior Of Sinx Film And Its Thermal Annealing Effect

Ji Yeon Hyun[1], Se Jin Park[1], Soohyun Bae[1], HyunJung Park[1], Dongkyun Kang[1], Seung Hoon Lee[1], Yoonmook Kang[2], Hae-Seok Lee[2], Donghwan Kim[1]

[1]Korea University, Seoul, South Korea, [2]Graduate School of Energy and Environment, Korea University, Seoul, South Korea

E5 Single And Double Side Textured Black Silicon Require Different Annealing Conditions For Optimal Passivation With Ald Al2O3

Beniamino Iandolo, Rasmus S. Davidsen, Ole Hansen

Technical University of Denmark, Kgs. Lyngby, Denmark

E6 Hydrogeneted Silicon Suboxide Film For An Effective And Thermal Stable Silicon Surface Passivation

Massimo Izzi[1], Luca Serenelli[1,2], Mario Tucci[1], Luca Martini[2,1], Francesca Menchini[1], Paola Delliveneri[1], Eugenia Bobeico[1], Juri Usatii[1], Rita Asquini[2], Domenico Caputo[2], Giampiero De Cesare[2]

[1]Enea, Rome, Italy, [2]Universit□ La Sapienza, Rome, Italy

E7 The Influences Of Acid-Processing To The Diamond Wire Sawn M-Si Black Silicon Solar Cell&Rsquo;S Performances

Rui Jia[1], Guoyu Su[1,2,3], Xiaowan Dai[1] , Ke Tao[1], Hengchao Sun[1], Chao Zhang[1]

[1]Institute of Microelectronics, Chinese Academy of Sciences, Beijing, China, [2]Jiangsu R&D Center for Internet of Things, Jiangsu, China, [3] University of Chinese Academy of Sciences, Beijing, China

E8 Improved Phosphorus Emitter Passivation Using Chemically Grown Sio_2 Layer For Industrial-Sized Selective Emitter Perc

Supawan Joonwichien, Yasuhiro Kida, Masaaki Moriya, Satoshi Utsunomiya, Katsuhiko Shirasawa, Hidetaka Takato

AIST, Fukushima, Japan

E9 Local Evaluation Of Al_2O_3 Passivation Layers For Crystalline Silicon Solar Cells By Super-Higher-Order Scanning Nonlinear Dielectric Microscopy

Kento Kakikawa[1], Yuji Yamagishi[1], Katsuto Tanahashi[2], Hidetaka Takato[2], Yasuo Cho[1]

[1]RIEC, Tohoku Univ., Sendai, Japan, [2]Fukushima Renewable Energy Institute, National Institute of Advanced Industrial Science and Technology, Koriyama, Japan

E10 A Study On Optimization Of Optical Receiving Using Optical Properties Of N Uc-Siox:H Front Surface Field Layer For High Efficiency Silicon Heterojunction Rear Emitter Cells

Sangho Kim[1], Jinjoo Park[2], Pham Duy Phong[2], Jonghoon Shin[1], Youngseok Lee[1], Youngkuk Kim[2], Junsin Yi[2]

[1]Department of Energy Science, Sungkyunkwan University, Suwon, South Korea, [2]School of Information and Communication Engineering, Sungkyunkwan University, Suwon, South Korea

E11 The Damage Mitigation Process For Si Nanopillar Structure Using Silica Nanosphere Lithography And Metal Assisted Chemical Etching

Sangpyeong Kim, Som Dahal, Andre Augusto, Stuart Bowden, Christiana B. Honsberg
Arizona State University, Tempe, AZ, United States

E12 A Study On Interface Characteristics Of Al_2O_3/Si Under O_2 Plasma Exposure Time During Deposition Of Al_2O_3 Using Pa-Ald

Jeong In Lee, Kwan Hong Min, Sungjin Choi, Min Gu Kang, Sungeun Park, Hye Mi Hwang , Hee-eun Song
Korea Institute of Energy Research, Daejeon, South Korea

E13 Growth And Composition Of Atomic Layer Deposited Titanium Oxide Films For C-Si Solar Cell Applications

Baochen Liao[1], Neeraj Dwivedi[2], Reuben J. Yeo[3], Shubham Duttagupta[1], Rolf Stangl[1], Armin G. Aberle[1], Charanjit S. Bhatia[2], Aaron Danner[2]
[1]Solar Energy Research Institute of Singapore, Singapore, Singapore, [2]Department of Electrical and Computer Engineering, National University of Singapore, Singapore, Singapore, [3]Institute of Materials, Ecole Polytechnique F鋸駸ale de Lausanne (EPFL), Lausanne, Switzerland

E14 Temperature Effects On Dc Sputtered Ito

F Menchini[1], L Serenelli[1,2], G Stracci[1], M Izzi[1], E Salza[1], D Caputo[2], G de Cesare[2], M Tucci[1]
[1]ENEA, Casaccia, Rome, Italy, [2]DIET, University of Rome , Rome, Italy

E15 Enhancing Silicon Solar Cell Performance Via Colloidal Quantum Dots

Thomas Mercier[1], Chirenjeevi Krishnan[1], Tasmiat Rahman[1], Michael Pollard[2], Alexander To[2], Stuart Boden[1], Martin Charlton[1]
[1]University of Southampton, Southampton, United Kingdom, [2]University of New South Wales, Kensington, Australia

E16 Hydrogen Selective Emitter On N-Type Industrial Solar Cells

Khaja H. Mohammed[1], Larry C. Cousar[1], Sergiu C. Pop[2], Douglas A. Hutchings[1]
[1]Picasolar Inc., Fayetteville, AR, United States, [2]SCP Sys LLC, San Francisco, CA, United States

E17 Improvement In The External Quantum Efficiency Response Of Silicon Solar Cell Using Sin_X/Pm-Si Bilayer

Elis Mon-P駸ez[1], Ateet Dutt[1], Rogelio Mendoza-P駸ez[2], Guillermo Santana[1]
[1]Instituto de Investigaciones en Materiales, Universidad Nacional Aut oma de M騨ico, M騨ico, Mexico, [2]Universidad Aut oma de la Ciudad de M騨ico, M騨ico City, M騨ico, M騨ico, Mexico

E18 Characterizing High-Mobility Indium Zinc Oxide For The Front Transparent Conductive Oxide Layer In Silicon Heterojunction Solar Cells

David Quispe[1,2], Syeda Mohsin[1,3], Ashling Leilaeioun[1], Zachary C. Holman[1]
[1]Arizona State University, Tempe, AZ, United States, [2]Lamar University, Beaumont, TX, United States, [3]Saint Mary's College of California, Moraga, CA, United States

E19 Monte Carlo Ray Tracing Modelling Of Multi-Crystalline Silicon Photovoltaic Device Enhanced By Luminescent Material

Mehran Rafiee, Hind Ahmed, Subhash Chandra , Arunima Sethi, Sarah J. McCormack
Dept. of Civil, Structural and Environmental Engineering, Trinity College Dublin, Dublin 2, Dublin, Ireland

E20 Silicon Heterojunction Solar Cell With Intrinsic Hydrogenated Amorphous Silicon Layer Deposited By Facing Target Sputtering

Yuta Shiratori, Jinwoo Kim, Kazuyoshi Nakada, Shinsuke Miyajima
Tokyo Institute of technology, Meguro-ku Oookayama, Japan

F1 Nano-Rod Antireflection Film Hf-Doped In2O3 Thin Films And Its Application To Silicon Heterojunction Solar Cells

Guanghong Wang
Key Laboratory of Solar Thermal Energy and Photovoltaic System of Chinese Academy of Sciences, Institute of Electrical Engineering, the Chinese Academy of Sciences, Beijing, China

F2

Selective Deposition Of A-Si:H: A Proof-Of-Concept Study

Menglei Xu[1,2], Twan Bearda[2], Mahmudul Hasan[2], Hariharsudan Sivaram Radhakrishnan [2], Ivan Gordon[2], Jozef Szlufcik[2], Jef Poortmans[1,2,3]

[1]KU Leuven , Heverlee , Belgium, [2]IMEC, Heverlee , Belgium, [3]Universiteit Hasselt, Hasselt, Belgium

F3 Importance Of Nanocrystallites In A-Si:H Passivation Layer In Improving The Performance Of Silicon Heterojunction Solar Cells

Liping Zhang[1], Renfang Chen[1], Jian Bao[2], Zhuopeng Wu[1], Zhenfei Li[1], Junlin Du[1], Fanying Meng[1], Zhengxin Liu[1]

[1]Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai, China, [2]State Key Laboratory of PV Science and Technology, Trina Solar Co. Ltd, Changzhou, China

F4 Spectral Response Optimization Of Polycrystalline Black Silicon Solar Cell By Reactive Ion Etching Combined With Perc Technology

Shude Zhang[1], Hongqiang Qian[1], Jiaqi Peng[1,2], Qingzhu Wei[1,2], Zhichun Ni[1,2]

[1]Suzhou Talesun Solar Technologies Co., Ltd., Changshu, China, [2]Nanjing University of Aeronautics & Astronautics, Nanjing, China

10:30 – 12:00 PM	Poster 4
Device Physics, Simulation and Power Loss Analysis	

Chair(s): Oliver Kunz

F7 Auger Transport Of Noninteracting Carriers

Luigi Abenante

ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Roma, Italy

F8 Diffusivity-Consistent Coulomb-Enhanced Auger Lifetime In C-Si

Luigi Abenante

ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Roma, Italy

F9 Equivalent Optical Models For Light-Trapping Si Solar Cells

Luigi Abenante

ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Roma, Italy

F10 Analysis Of Smearing And Evaluation Of Its Influence In Luminescence Imaging

Nekane Azkona, Federico Recart, Pedro Rodr孤uez, Juan Carlos Jimeno

UPV/EHU, Bilbao, Spain

F11 Different Recombination In Pid-Affected Solar Modules From The Field

Xiaoli Cheng[1], Chuanke Chen[1], He Wang[1], Hong Yang[1], Pan Zhao[2], Mingchang Ding[3], Shuangqing Zhang[3]

[1]Xi'an Jiaotong University, Xi'an, China, [2]SPIC Xi'an Solar Power Co., Ltd, Xi'an, China, [3]China Electric Power Research Institute, Beijing, China

F12 Location Of P-N Defects By Electroluminescence

Vanesa Fano, Eneko Cereceda, Alo Otaegi, Nekane Azkona, Lourdes P駻ez, Jos□ Rub駸 Guti駻rez, Juan Carlos Jimeno

Technological Institute of Microelectronics(TiM) (UPV/EHU), Bilbao, Spain

F13 Effects Of Solar Cell Materials And Geometries On Thermally Induced Interfacial Stresses

James Y Hartley, Scott A Roberts

Sandia National Laboratories, Albuquerque, NM, United States

F14 Comprehensive Library Of Photovoltaic Functions On Python For Academic And Educational Purposes

Christiana Honsberg, Stuart Bowden, Richard King, Pedro Reguera, Andrew Shaw, Sean Babcock

Arizona State University, Tempe, AZ, United States

F15 Analysis Optical Contribution Of Rear Passivation Layer To C-Si Solar Cell With Numerical Simulation(Tcad)

sujeong Jeong[1], Soo Min Kim[2], Soohun Bea[1], Yoonmook Kang[3], Hae-seok Lee[3], Donghwan Kim[1]

[1]Department of Materials Science and Engineering, Seoul, Korea, [2]Solar Energy Test-bed Center, Gumi Electronics & Information Technology Research Institute(GERI), Gumi, Korea, [3]KU必IST Green School, Graduate School of Energy and Environment, Seoul, Korea

F16 Electrical Characterization Of C-Si Solar Cells Fabricated With Various Doping Profiles

Sangmuk Kang[1], Jeong eun Park[2], Hye Kwon Hong[1], Young Ho Cho[1], Dong Sik Kim[1], Donggun Lim[1, 2]

[1]Department of IT convergence, Korea National University of Transportation, Chungju-si, Korea, [2]Department of Electronic Engineering, Korea National University of Transportation, Chungju-si, Korea

F17 A Unified Parameter Set Designed For Typical 2D/3D Simulations Of Homo-/Hetero-/Single-/Multi-Junction Solar Cells In Various Simulation Programs

Fajun Ma, Jing Zhao, Chuqi Yi, Aobo Pu, Ziv Hameiri

University of New South Wales, Sydney, Australia

F18 Approach For A Holistic Optimization From Wafer To Pv System
Max Mittag, Christian Reise, Nico W rle, Martin Schubert, Rebekka Eberle, Martin Heinrich
Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany

F19 A Multiscale Model To Study Transport In Silicon Heterojunction Solar Cells
Pradyumna Muralidharan, Stuart Bowden, Stephen M Goodnick, Dragica Vasileska
Arizona State University, Tempe, AZ, United States

F20 Electrothermal Simulation Of Si Cells With Defects
Marco Nardone, Henry C. Lee
Bowling Green State University, Bowling Green, OH, United States

G1 A Simplified Mathematical Model For Pv Cell Simulation
Paththayame Uditha Perera, Lili He
San Jose State University, San Jose, CA, United States

G2 Cell Temperature Model Using Relative Humidity As An Input Variable
Michel Piliougine[1], Manuel L ez-Salvatierra[2], Jesus Carretero[3], Mariano Sidrach-de-Cardona[3]
[1]Dpto. de Lenguajes y Ciencias de la Computacion, Universidad de Malaga, Malaga, Spain, [2]Dpto. de Electricidad y Electronica, I.E.S. Zurbaran, Navalmoral de la Mata – Caceres, Spain, [3]Dpto. de Fisica Aplicada II, Universidad de Malaga, Malaga, Spain

G3 Development Of 1/F Noise In Mixed-Phase Silicon Films
Chonghoon Shin[Sungkyunkw], Duy Phong Pham[Sungkyunkw], Jinjoo Park[Sungkyunkw], Sangho Kim[Sungkyunkw], Junsin Yi[Sungkyunkw]
[1]Sungkyunkwan University, Gyeonggi-do, Korea, [2]Sungkyunkwan University, Gyeonggi-do, Korea, [3]Sungkyunkwan University, Gyeonggi-do, Korea, [4]Sungkyunkwan University, Gyeonggi-do, Korea, [5]Sungkyunkwan University, Gyeonggi-do, Korea

G4 Optical Evaluation Of Perc Cell Reflectance For Thermal Management
Indra Subedi[1], Timothy J Silverman[2], Michael G Deceglie[2], Nikolas J Podraza[1]
[1]Department of Physics & Astronomy and Wright Center for Photovoltaics Innovation & Commercialization, University of Toledo, Toledo, OH, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

F5 Influence Of Doping Concentration And Contact Geometry On The Performance Of Interdigitated Back-Contact Silicon Heterojunction Of Liquid Phase Crystalline Silicon On Glass
Cham Thi Trinh[1], Matev Bokalič[2], Natalie Preissler[1,3], Martina Trahms[1], Rutger Schlatmann[3], Daniel Amkreutz[2], Marko Topič[1]
[1]Institute for Silicon Photovoltaics,Helmholtz Zentrum Berlin f Materialen und Energie GmbH, Berlin, Germany, [2]Faculty of Electrical Engineering, University of Ljubljana, Ljubljana, Slovenia, [3]PVcomB, Helmholtz Zentrum Berlin f Materialen und Energie GmbH, Berlin, Germany

F6 Role Of Doping Dependent Radiative And Non-Radiative Recombinations In Determining The Limiting Efficiencies In Silicon Solar Cells
Sisir Yalamanchili, Nathan S Lewis, Harry A Atwater
California Institute of Technology, Pasadena, CA, United States

10:30 – 12:00 PM	Poster 5
Optical and Electrical Characterization Techniques	

Chair(s): Mowafak Al-Jassim

G5 Glancing Angle Deposited Cdte: Optical Properties And Structure

Dipendra Adhikari, Prakash Koirala, Maxwell M. Junda, Robert W. Collins, Nikolas J. Podraza

University of Toledo, Toledo, OH, United States

G6 Time-Resolved Fluorescence Imaging As A Self-Consistent Characterization Method For Photovoltaic Materials

Adrien Bercegol[1,2], Daniel Ory[1,2], Gilbert El-Hajje[1,2], Laurent Lombez[1,3]

[1]IPVF, Palaiseau, France, [2]EDF R&D, Palaiseau, France, [3]CNRS, Palaiseau, France

G7 Correlative Characterization Of Dislocation Defects And Defect Clusters In Gaas And Cdte Solar Cells By Spatially Resolved Optical Techniques And High-Resolution Tem

Qiong Chen[1], Brandom S. McKeon[2], Jacob J. Becker[2], Calli M. Campbell[2], Sunny Zhang[1], Changkui Hu[1,3], Timothy H. Gfroerer[4], Mark W. Wanlass[5], Yong-Hang Zhang[2], David J. Smith[2], Yong Zhang[1]

[1]University of North Carolina at Charlotte, Charlotte, NC, United States, [2]Arizona State University, Tempe, AZ, United States, [3]Wuhan University of Technology, Wuhan, China, [4]Davidson College, Davidson, NC, United States, [5]National Renewable Energy Laboratory, Golden, CO, United States

G9 Secondary Ion Mass Spectrometry Sputter Rate Of Cu(In, Ga)Se2 And A Point By Point Correction Method For More Accurate Depth Characterization Of Cu(In, Ga)Se2 Absorber Layers

Jesse Claypoole[1], Steve Novak[1], Mark Altwerger[1], Dan Dwyer[1], Matthew Eisaman[2], Pradeep Haldar[1], Harry Efstathiadis[1]

[1]Suny Polytechnic Institute, Albany, NY, United States, [2]Stonybrook, Stonybrook, NY, United States

G10 Optical Path-Length Enhanced Photo-Generated Current Density For Pv Devices In The Atacama Desert

Daniel E. Diaz Almeida[1], Pablo Ferrada[1], Aitor Marzo[1], Enrique Cabrera[2], Elias Urrejola[3], Dario Espinoza[4], Rodrigo Castillo[4], Jaime Llanos[4], Carlos Portillo[1]

[1]Centro de Desarrollo Energ聘ico Antofagasta, Universidad de Antofagasta, Antofagasta, Chile, [2]International Solar Energy Research Center, Konstanz, Germany, [3]Laborelec Chile, Santiago, Chile, [4]Unversidad Catolica del Norte, Antofagasta, Chile

G11 Extracting Surface Saturation Current Density From Lifetime Measurements Of Samples With Metallized Surfaces

Robert Dumbrell, Mattias K. Juhl, Thorsten Trupke, Ziv Hameiri

University of New South Wales, Sydney, Australia

G12 Inhomogeneous Electroluminescence For Characterizing Lateral Transport In Semiconductor Devices

Tim Gfroerer[1], Ben Stroup[1], Yong Zhang[2], Zhiqiang Liu[3]

[1]Davidson College, Davidson, NC, United States, [2]University of North Carolina at Charlotte, Charlotte, NC, United States, [3]Chinese Academy of Science, Beijing, China

G13 The Impact On The Performance Of A Pv Module As A Result Of The Encapsulant Fluorescence Induced By Weathering

Babak T. Hamzavy

Southern Research, BIRMINGHAM, AL, United States

G14 In-Field Electroluminescence Imaging: Methods, Comparison With Indoor Imaging, And Observed Changes In Modules Over One Year

William B. Hobbs[1], Babak Hamzavy[2], C. Birk Jones[3], Cara Libby[4], Olga Lavrova[3]

[1]Southern Company, Birmingham, AL, United States, [2]Southern Research, Birmingham, AL, United States, [3]Sandia National Laboratories, Albuquerque, NM, United States, [4]Electric Power Research Institute, Charlotte, NC, United States

G15 Determining The Spatial Profiles Of Electron And Hole Concentration, Radiative And Non-Radiative Recombination Rate Near A Dislocation Defect By Combining Raman And Photoluminescence Imaging

Changkui Hu[1,2], Qiong Chen[1], Fengxiang Chen[2], Heng Lv[2], T. H. Gfroerer[3], M. W. Wanlass[4], Yong Zhang[1]

[1]UNC-Charlotte, Charlotte, NC, United States, [2]Wuhan University of Technology, Wuhan, China, [3]Davidson College, Davidson, NC, United States, [4]NREL, Golden, CO, United States

G16 Electron And Proton Radiation Effects On Carrier Dynamics In Mbe And Mocvd Grown Photovoltaic Test Structures

Andrew I Hudson[1], William T Lotshaw[1], Adam C Scofield[1], Seth Hubbard[2], Michael Slocum[2], Baolai Liang[3], Mukul C Debnath[3], Bor-Chau Juang[4], Diana L Huffaker[4]

[1]The Aerospace Corporation, El Segundo, CA, United States, [2]Rochester Institute of Technology, Rochester, NY, United States, [3]California NanoSystems Institute, Los Angeles, CA, United States, [4]University of California, Los Angeles, Los Angeles, CA, United States

G17 Semiconductor Parameter Extraction Via Current-Voltage Characterization And Bayesian Inference Methods

Rachel C Kurchin[1], Jeremy R Poindexter[1], Daniil Kitchaev[1], Chris Roat[2], Sergiu Levcenco[3], Gerbrand Ceder[1,4], Ville V滅舅issi[5], Hannu S Laine[1,5], Tonio Buonassisi[1]

[1]MIT, Cambridge, MA, United States, [2]Google, Inc., Mountain View, CA, United States, [3]Helmholtz-Zentrum Berlin, Berlin, Germany, [4]UC Berkeley, Berkeley, CA, United States, [5]Aalto University, Espoo, Finland

G18 Simulating The Sun With A Supercontinuum Laser

Yao Y Lao, John C Nocerino, Don Walker

The Aerospace Corporation, El Segundo, CA, United States

G19 Area: Characterization Methods Title: Determining Limits Of Two-Photon Time-Resolved Photoluminescence For Measuring The Bulk Lifetime In Semiconductors

Robert A. Lee Chin, Michael E. Pollard, Thorsten T. Trupke, Ziv Hameiri

G20 Transmission Electron Microscopy Study On Degradation Mechanism Of Cdte Thin-Film Solar Cells

Jun Liu, Steve Johnston, Steven P. Harvery, David Albin, Peter Hacke, Mowafak Al-Jassim

National Renewable Energy Laboratory, Golden, CO, United States

H1 Photoluminescence Imaging And Characterization Of Single And Multi-Junction Solar Cells

J.R. Lorentzen, D.A. Scheiman, W.J. Yoon, R.J. Walters, P.P. Jenkins

US Naval Research Laboratory, Washington, DC, United States

H2 Snr Study Of Outdoor Electroluminescence Images Under High Sun Irradiation

Claire Mantel[1], Gisele A. dos Reis Benatto[1], Nicholas Riedel[1], Sune Thorsteinsson[1], Peter Behrensdorff Poulsen[1], Harsh Parikh[2], Sergiu Spataru[2], Dezso Sera[2], S en Forchhammer[1]

[1]DTU Fotonik, Kongens Lyngby, Denmark, [2]Aalborg University, Aalborg, Denmark

H3 New Field Data About Yield And Quality Improvements In Cell Production Lines Enabled By Aoi (Automatic Optical Inspection) Systems And Short Feedback Loops

Richard Moreth[1], Heiko Frohn[1], Christian Rosner[1], Jens Schoebel[1], Benson Lin[2]

[1]VITRONIC Dr.-Ing Stein GmbH, Wiesbaden, Germany, [2]Hauman Technologies Corp., Zhubei City, Taiwan

H4 Challenges And Structural Characterization Of The Solid Solution $Cu_2Zn(Ge_xSi_{1-x})Se_4$

Sara Niedenzu[1,2], Galina Gurieva[1], Susan Schorr[1,2]

[1]Helmholtz-Zentrum Berlin f・ Materialien und Energie, Berlin, Germany, [2]Freie Universit舩 Berlin, Berlin, Germany

H5 Effective I-V Measurement Techniques For Busbarless And Multi-Busbar Solar Cells

Samuel RAJ[1], Johnson WONG[3], Sumukh Ramprasad[1], Percis Teena[1], Ankit Khanna[1], Vinodh Shanmugam[1], Jian Wei HO[1], Armin Gerhard Aberle[1,2], Thomas Mueller[1]

[1]1, Singapore, Singapore, [2]2, Singapore, Singapore, [3]3, Vancouver, BC, Canada

H6

Electroluminescence Imaging And Automatic Defect Detection In Mass Production Of Silicon Solar Cells

Klaus Ramspeck, Stefan Schenk, Sabine Fischer, Milan Alt, Sebastian Zimmermann, Michael Meixner

h.a.l.m. elektronik GmbH, Frankfurt, Germany

H7 Deposition And Characterization Of Sns:Cu Thin Films By Ultrasonic Spray Pyrolysis Technique To Applications In Photovoltaic Devices.

Sergio Rodr孤uez Castro[1], Jorge Sergio Narro R卲s[2], Germ疣 Escalante Notario[3], Guillermo Santana Rodr孤uez[4], Aar S疣chez Ju疵ez[2], Carlos 扜lvarez Mac傚s[1,3]

[1]Instituto Tecnol ico de la Laguna. Tecnol ico Nacional de M騧ico., Torre , Mexico, [2]Instituto de Energ傚s Renovables., Temixco, Mexico, [3]Unidad Especializada en Energ傚s Renovables (UEER), Tecnol ico Nacional de M騧ico., Torre , Mexico, [4]Instituto de Investigaciones en Materiales. Universidad Nacional Aut oma de M騧ico., Ciudad de M騧ico, Mexico

H8 Photoluminescence Imaging Vs. Transient Photoconductance Characterization At High Injection: Case Of Mc-Si

Andrey Semichaevsky

Lincoln University, Lincoln University, PA, United States

H9 Minority Carrier Trapping In Czochralski Silicon: Influence Of Thermal Donors And The Doping Density

Manjula Siriwardhana[1], D. Macdonald[1], F. D. Heinz[2], F. E. Rougieux[1]

[1]Australian National University, Canberra, Australia, [2]Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany

H10 Advanced Characterization Of Solar Cells Using Led Solar Simulators Going Beyond Norm Testing

Kai Sporleder[1,2], Marko Turek[1], Tabea Luka[1,3]

[1]Fraunhofer Center for Silicon-Photovoltaics CSP, Halle Saale, Germany, [2]Leipzig University of Applied Sciences (HTWK), Leipzig, Germany, [3]Hochschule Anhalt, Koethen, Germany

H11 Band Profiling Of *P*-Si/Ito Interface By Kelvin Probe Force Microscopy Under Light Controlled Conditions

Fumihiko Yamada, Takefumi Kamioka, Yoshio Ohshita, Itaru Kamiya

Toyota Technological Institute, Nagoya, Japan

H12 Investigation Of Dark Heat And Light Soaking Treatment On Cu(In,Ga)Se2 Solar Cells Using Impedance Spectroscopy

Geordie Zapalac, Rouin Farshchi, Jeff Bailey, Dmitry Poplavskyy

Miasole Hi-Tech, Santa Clara, CA, United States

10:30 – 12:00 PM	Poster 6
Space PV Technologies	

Chair(s): Claus Zimmermann

H13 Development Of High-Performance Solar Cells For The Jupiter And Saturn Environments

Andreea Boca[1], Jonathan Grandidier[1], Paul Stella[1], Philip Chiu[2], Xing-Quan Liu[2], James Ermer[2], Claiborne McPheeters[3], Christopher Kerestes[3], Paul Sharps[3]
[1]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, United States, [2]Boeing Spectrolab Inc., Sylmar, CA, United States, [3]SolAero Technologies Corp., Albuquerque, NM, United States

H15 Evaluation Of Iii-V/Si Multi-Junction Solar Cells Potential For Space

Romain Cariou[1], Karim Medjoubi[1], Laura Vauche[1], Elias Veinberg-Vidal[1], Seonyong Park[2], J驛鶩ie Lef鑁re[2], Mathieu Baudrit[1], Philippe Voarino[1], Pierre Mur[1], Bruno Boizot[2]
[1]Univ. Grenoble Alpes, CEA, LETI, LITEN, INES, Grenoble, France, [2]Laboratoire des Solides Irradi駸, CNRS-UMR 7642, CEA-DRF-IRAMIS, Ecole Polytechnique, Universit Paris-Saclay, Palaiseau, France

H16 Evaluation Of Tri-Junction Lilt Solar Cells Response To Electrons And Protons Of The Juice Environment

Sophie Duzellier[1], Thierry Nuns[1], Jean-Pierre David[1], Claude Pons[1], Romain Rey[1], Cyril Cavel[2], Guilhem Chanteperdrix[2]
[1]ONERA, Toulouse, France, [2]AIRBUS Defence and Space, Toulouse, France

H17 Effects Of Proton Irradiation On Upright Metamorphic Gainp/Gainas/Ge Triple Junction Solar Cells

Liang Fang[1], Abuduwayiti Aierken[2], Qiming Zhang[1], Wei Gao[1], Hui Gao[1], Ronhua Wan[1], Heini Maliya[2], Xiaofan Zhang[2], Sailai Momin[2], Qi Guo[2], Bao Zhang[1], Qiang Sun[1]
[1]Tianjin Institute of Power Sources, Tianjin, China, [2]Xinjiang Technical Institute of Phys.& Chem.Chinese Academy of Sciences, Urumqi, China

H18 The Juice Photovoltaic Assembly

Emanuele Ferrando[1], Ed Bongers[2], Alain Calvel[3], Carsten Baur[4]
[1]Leonardo, Nerviano, Italy, [2]Airbus D&S NL, Leiden, Netherlands, [3]Airbus D&S, Toulouse, France, [4]ESA ESTEC, Noordwijk, Netherlands

H19 Uv Degradation Of Space Solar Cell Assemblies Under High Temperature And Irradiance

Edward Gaddy[1], Richard Stall[2], Matthew Schurman[2], Christopher Sulyma[3], Andrew Gerger[1]
[1]Johns Hopkins University Applied Physics Laboratory, Laurel, MD, United States, [2]Newforge Technologies, Hillsborough, NJ, United States, [3]SolAero Technologies, Albuquerque, NM, United States

H20 Development Of Lightweight And Flexible C-Si Photovoltaic Modules For The Stratobus Tm

Julien Gaume[1,2], Thomas Gu駻in[1,2], Herv Robin[1,2], F駘ix G駻enton[1,2], Samuel Harrison[1,2], Rodolphe Chaix[3], Yannick Veschetti[1,2]
[1]Univ.Grenoble Alpes, INES, F-73375 Le Bourget du Lac, France, [2]CEA, LITEN, Department of Solar Technologies, F-73375 Le Bourget du Lac, France, [3]THALES ALENIA SPACE, 5 All馥 des Gabians, 06150 Cannes, France

I1 Progress In The Development, Qualification, And Productization Of Imm α

Alexander W Haas, Claiborne McPheeters, Zachary Bittner, Benjamin Cho, Samantha Cruz, Daniel Derkacs, John Hart, Christopher Kerestes, Nate Miller, Pravin Patel, Michael Riley, Paul Sharps, Alex Stavrides, Jeff Steinfeldt, Claudia Struempel, Steven Whipple
SolAero Technologies Corp., Albuquerque, NM, United States

I2 Silicon Solar Arrays For Laser Power Transfer Applications

Phillip P. Jenkins[1], Raymond Hoheisel[2], Justin Lorentzen[1], David Scheiman[1], Robert Walters[1]
[1]Naval Research Lab, Washington, DC, United States, [2]George Washington, Univ., Washington, DC, United States

I3

Hybrid Solar Cells With A System For Sunlight Concentration

Vitaliy S. Kalinovskiy[1], Evgeniy V. Kontrosh[1], Alena V. Andreeva[1], Alexandra V. Malevskaya[1], Vyacheslav M. Andreev[1], Viktoriya B. Malutina-Bronskaya[2], Valeri B. Zalesski[2], Alla M. Lemeshevskaya[3], Vladimir I. Kuzoro[4], Vladimir I. Khalimanovich[4], Marina K. Zayceva[5]

[1]Ioffe Institute, St.Petersburg, Russia, [2]State Scientific – Production Association of Optics, Minsk, Belarus, [3]2STC 鈥Elmikrosystemy□ of the JSC 的Integral□, Minsk, Belarus, [4]Joint-Stock Company 鄭cademician M.F.Reshetnev□ 祈NFORMATION SATELLITE SYSTEMS□, Zheleznogorsk, Russia, [5]Space Systems Research Institute – the branch of Khrunichev State Research and Production Space Center, Moskow, Russia

I4 Radiation Evaluation From The Carrier Life Time And Structure Studied Of Perovskite Solar Cells For Space Application

Shusaku Kanaya[1], Dayna Erdmann[2], Gyu Min Kim[3], Masashi Ikegami[3], Youhei Numata[3], Tsutomu Miyasaka[3], Yuji Hazama[4,5], Hidefumi Akiyama[4,5], Kohtaku Suzuki[6], Kanta Osonoe[7], Tomoyuki Yamamoto[7], Yu Miyazawa[1], Hiroyuki Toyota[1], Kazuyuki Hirose[1]

[1]JAXA, Kanagawa, Japan, [2]Massachusetts Institute of Technology, Cambridge, MA, United States, [3]Toin University of Yokohama, Yokohama, Japan, [4]The Institute for Solid State Physics, the University of Tokyo, Chiba, Japan, [5]AIST-UTokyo OPERANDO-OIL, Chiba, Japan, [6]The Wakasa Wan Energy Research Center, Fukui, Japan, [7]Waseda University, Tokyo, Japan

I5 Ultralight Energy Converter Tile For The Space Solar Power Initiative

Michael D Kelzenberg, Pilar Espinet Gonzalez, Nina Vaidya, Emily C. Warmann, Ali Naqavi, Samuel P. Loke, Tatiana G. Vinogradova, Leclerc Christophe, Eleftherios E. Gdoutos, Harry A. Atwater, Fabien Royer, Austin Fikes, Florian Bohn, Ali Hajimiri, Sergio Pellegrino, Harry A. Atwater

California Institute of Technology, Pasadena, CA, United States

I6 Development Of Xtj-Targeted Environment (Te) Solar Cells For Specific Space Applications

Daniel C. Law, Philip T. Chiu, Christopher M. Fetzer, Moran Haddad, Shoghig Mesropian, Rob Cravens, Peter H. Hebert, James H. Ermer, Jeffrey P. Krogen

Spectrolab Inc., a wholly-owned subsidiary of The Boeing Company, Sylmar, CA, United States

I7 Ground Testing And Instrument Development For The Aerocube-10 Space Solar Cell Experiment

Justin H Lee, Colin J Mann, Don Walker, Drew L Turner, J Bernard Blake, William R Crain, David A Hinkley, Michael Mellick, Brian S Hardy, Simon H Liu

The Aerospace Corporation, El Segundo, CA, United States

I8 Calculation Method For Predicting Am0 Isc From High Altitude Aircraft Flight Data

Matthew G. Myers[1], David B. Snyder[2]

[1]NASA Glenn Research Center, Cleveland, OH, United States, [2]NASA Glenn Research Center (Retired), Cleveland, OH, United States

I9 Advanced Development Of Space Photovoltaic Concentrators Using Robust Lenses, Multi-Junction Cells, & Graphene Radiators

Mark O'Neill[1], A.J. McDanal[1], Michael Piszczor[2], Timothy Peshek[2], Matthew Myers[2], Paul Sharps[3], Claiborne McPheeters[3], Jeff Steinfeldt[3], Benjamin Heintz[3], Challa Kumar[4], Megan Puglia[4]

[1]Mark O'Neill, LLC, Keller, TX, United States, [2]NASA Glenn Research Center, Cleveland, OH, United States, [3]SolAero Technologies, Albuquerque, NM, United States, [4]University of Connecticut, Storrs, CT, United States

I10 Degradation By Irradiation With Low-Energy Electrons In Alingap Solar Cell

Yasuki Okuno[1], Akane Kitamura[1], Norito Ishikawa[1], Masafumi Akiyoshi[2], Hirokazu Ando[2], Masaki Harumoto[2], Yuichi Shibata[3], Mitsuru Imaizumi[3], Masafumi Yamaguchi[4]

[1]apan atomic energy agency, Naka-gun, Japan, [2]Osaka Prefecture University, Sakai, Japan, [3]Japan Aerospace Exploration Agency, Tsukuba, Japan, [4]Toyota Technological Institute, Nagoya, Japan

I11 Automated Pipelining Of I-V Curve Fitting Using The Lambert W Function And Applications For Space Pv Performance Modeling.

Timothy J. Peshek[1], Charity F.G. Sotero[2], Emily N. Mathur[3], Calvin R. Robinson[1], Herbert W. Schilling[1], Matthew G. Myers[1]

[1]Glenn Research Center, NASA, Cleveland, OH, United States, [2]Department and Mathematics and Statistics, California State University, Long Beach, CA, United States, [3]Department of Mathematics, University of Southern California, Los Angeles, CA, United States

I12 Development Of A Nano-Enabled Space Power System

Stephen J. Polly, Martin Dann, Anastasiia Fedorenko, Seth Hubbard, Brian Landi, Christopher Scheuerman, Matthew Ganter, Ryne Raffaelle

Rochester Institute of Technology, Rochester, NY, United States

I14 Smarts Modeling Of Solar Spectra At Stratospheric Altitude And Influence On Performance Of Selected Iii-V Solar Cells

Moritz Limpinsel, Dawei Kuo, Aarohi Vijh

Alta Devices, Inc., Sunnyvale, CA, United States

I15 Potential Analysis Of A Rear-Side Passivation For Multi-Junction Space Solar Cells Based On Germanium Substrates

Charlotte Weiss[1], Jonas Sch [1], Oliver H n[1], Christian Mohr[1], Rufi Kurstjens[2], Bruno Boizot[3], Stefan Janz[1]

[1]Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany, [2]Umicore Electro-optic Materials, Olen, Belgium, [3]Laboratoire des Solides Irradi駸, CNRS-UMR 7642, CEA- DRF-IRAMIS, Ecole Polytechnique, Universit Paris-Saclay, Palaiseau, France

I16 Reliability And Durability Of Foldable Pv Modules For Expeditionary Solar Power Generation

Woojun Yoon, David Scheiman, Justin Lorentzen, Phillip P Jenkins, Robert J Walters

U.S. Naval Research Laboratory, Washington, DC, United States

10:30 – 12:00 PM	Poster 7
Soiling	

Chair(s): Michael Deceglie

I18 New Experimental Results On The Impact Of Soiling On High Concentration Photovoltaic Module Performance

Abdelfettah BARHDADI[1], Wafae ANANA[1], Fatima CHAOUKI[1], Bouchra LAARABI[1], Vittorio GILIOLI[2], Daniele VERDILIO[2]

[1]PSES Reserach Team, Mohammed V University in Rabat, Rabat, Morocco, [2]BECAR s.r.l., Beghelli Group, Viale Della Pace, 1-40050, Monteveglio, BOLOGNA, Italy

I19 Modelling Daily Performance As A Function Of Soiling, Ambient Temperature, And Irradiation &Ndash; Applied To Pv Modules Operating In Maui

Severine Busquet

Hawaii Natural Energy Institute (HNEI), University of Hawaii, Honolulu, HI, United States

I20 Soiling Loss In Pv Modules For Various Climate Zones In Brazil: Monitoring, Soiling Ratios, And Pv Technology Differences

Suellen C.S. Costa[1], Antonia S ia A.C. Diniz[1], Daniel Sena Braga[1], Lawrence L. Kazmerski[1,2], Cristiana Brasil Maia[1], Vinicius Camatta[1], Cl疼dio Dias Campos[1], Sergio de Morais Hanriot[1]

[1]Pontificia Universidade Cat ica de Minas Gerais (PUC Minas), Belo Horizonte, Brazil, [2]University of Colorado Boulder, Boulder, CO, United States

J1 Design And Operation Of A Waterless Pv Soiling Monitoring Station

Telia Curtis, Sai Tatapudi, Govindasamy Tamizhmani

Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States

J2 Comparative Study Of Sand Erosion Of Backsheet Of Pv Modules

Umang Desai, Sudharm Rathore, Ankur Kumar Agrawal, Aparna Singh

Department of Metallurgical Engineering and Materials Science, Indian Institute of Technology Bombay, Mumbai, Maharashtra-400076, India., Mumbai, India

J3 Mars Soiling Sensor&Trade;

Michael Gostein, Stan Faullin, Keith Miller, Jason Schneider, Bill Stueve

Atonometrics, Austin, TX, United States

J4 Local Variability In Pv Soiling Rate

Michael Gostein[1], Kendra Passow[2], Michael G. Deceglie[3], Leonardo Micheli[3], Bill Stueve[1]

[1]Atonometrics, Austin, TX, United States, [2]First Solar, San Francisco, CA, United States, [3]NREL, Golden, CO, United States

J5 Dynamic Snow Loss Model In Pvsim: Modeling Impact Of Snow On Pv Production

Defne Gun, Mike Anderson

SunPower Corporation, Richmond, CA, United States

J6 Testing Of An Anti-Soiling Coating For Pv Module Cover Glass

Kenan Isbilir, Fabiana Lisco, Gerald Womack, John M Walls

CREST, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, Loughborough, United Kingdom

J7 Impact Of Non-Uniform Soiling On Pv System Performance And Soiling Measurement

Seth Kagan[1], Eric Giosa[1], Robert Flottemesch[1], Rob Andrews[2], James Rand[3], Mason Reed[3], Michael Gostein[4], Bill Stueve[4]

[1]Constellation Energy, Baltimore, MD, United States, [2]Heliolytics, Toronto, ON, Canada, [3]Core Energy Works, Newark, DE, United States, [4]Atonometrics, Austin, TX, United States

J8 Functional Coatings On Glass In Extreme Arid Climatic Conditions &Ndash; Investigation Of Surface Degradation Effects

Elisabeth Klimm, Karl-Anders Wei°, Markus Heck, Michael K l

Fraunhofer ISE, Freiburg, Germany

J9 Fundamental Characterization Of Anti-Soiling Coatings For Pv Glass: Application Of Small-Angle X-Ray Scattering

Stephanie L. Moffitt[1], Robert A. Fleming[2], Corey S. Thompson[2], Michael F. Toney[1], Laura T. Schelhas[1]

[1]Applied Energy Materials, SLAC National Accelerator Laboratory, Menlo Patk, CA, United States, [2]WattGlass Inc., Fayettevelle, AR, United States

J10 Effects Of Solar-Glass Coatings On The Adhesion Forces Related To Soiling

Helio Moutinho[1], Bobby To[1], Chun-Sheng Jiang[1], Chaiwat Engtrakul[1], Asher Einhorn[1], Alan Selling[2], Henok Yemam[2], Mowafak Al-Jassim[1], Lin Simpson[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Colorado School of Mines, Golden, CO, United States

J12 Testing Global Models Of Photovoltaic Soiling Ratios Against Field Test Data Worldwide

Sophie Pelland[1], Prathamesh Pawar[2], Aatmaram Veeramani[3], William Gustafson[2], Louise Leahy[2], Andrew Etringer[2]

[1]Vaisala Canada Inc., Richmond, BC, Canada, [2]Vaisala Inc., Seattle, WA, United States, [3]3TIER R&D India Private Ltd, Bangalore, India

J13 Optimization Of Optical Performance And Dust Removal Efficiency Of Electrodynamic Screen (Eds) Films For Improving Energy-Yield Of Solar Collectors

Annie Rabi Bernard[1], Ricci La La Centra[1], Eric Argentieri[1], Malay K Mazumder[1], Ryan S Eriksen[1], Sean Garner[2], Mark N Horenstein[1]

[1]Boston University, Boston, MA, United States, [2]Corning Research and Development Center, New York, NY, United States

J14 Indoor In-Situ Soil Deposition Chamber: Validation Of Anti-Soiling Coating Claims

Praveen Ravi[1], Matthew Muller[2], Lin Simpson[2], Darshan Choudhary[1], Shanmukha Mantha[1], Sai Gomath Subramanian[1], S Virkar[1], Telia Curtis[1], Govindasamy Tamizhmani[1]

[1]Arizona State University Photovoltaic Reliability Laboratory (ASU-PRL), Mesa, AZ, United States, [2]National Renewable Energy Laboratory , Golden, CO, United States

J15 Electric Field Induced Soiling Of Pv Modules

Lin J SImpson[1], Courtney Weston[2], Paul Ndione[1], Byron McDanold[1], Sarah Toth[3], C.S. Jiang[1], Matthew Muller[1], helio Mountinho[1], David Miller[1], Leonardo Micheli[1], Greg Perrin[1], Ryo Huntamer[4], Alfredo Martinez-Morales[4]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Saint Mary's College, Notre Dame, IN, United States, [3]University of Colorado, Boulder, CO, United States, [4]University of California, Riverside, Riverside, CA, United States

12:00 – 1:30 PM	Water's Edge Ballroom
Women in PV Luncheon (Ticket Required)	

12:00 – 1:30 PM	Grand Promenade
Lunch on Your Own	

1:30 – 3:00 PM	Kona 1
IEA-PVPS Workshop: PV Enablers – New Applications and Conditions for Further Deployment of PV	

Click Here To View the Detailed Agenda

Chair(s): Gaetan Masson

1:30 – 3:00 PM	Kona 5
Quantum-well, Wire, and Dot-Architectured Devices / Advanced Light Management and Spectral Shaping	

Chair(s): Ned Ekins-Daukes

1:30 Impact Of Antimony Spray On Performance Of Inas Quantum Dot Solar Cell With Alas Cap Layer.

Zewen Zhang, Peter Reece, Stephen Bremner

UNSW, Sydney, Australia

1:45 Carrier Collection Efficiency Of Intraband-Excited Carriers In Two-Step Photon Up-Conversion Solar Cells

Shigeo Asahi, Kenta Nishimura, Toshiyuki Kaizu, Kita Takashi

Kobe University, Kobe, Japan

2:00 Decoupled Textures For Broadband Absorption Enhancement Beyond Lambertian Light Trapping Limit In Thin-Film Silicon-Based Solar Cells

Robin Vismara[1], Dane N. P. Linssen[1], Ken X. Wang[2,3], Shanhui Fan[2], Olindo Isabella[1], Miro Zeman[1]

[1]Delft University of Technology, Photovoltaic Materials and Devices, Delft, Netherlands, [2]Department of Electrical Engineering, Stanford Unoversity, Stanford, CA, United States, [3]School of Physics, Huashong University of Science and Technology, Wuhan, China

2:15 New Limits For Light-Trapping With Multi-Resonant Absorption

St駱hane Collin[1,2], Maxime Giteau[2,3]

[1]Centre of Nanoscience and Nanotechnology, Marcoussis, France, [2]NextPV, Tokyo, Japan, [3]Research Center for Advanced Science and Technology, Univ. Tokyo, Tokyo, Japan

2:30 Strain-Balanced Type-Ii Superlattices For Efficient Multi-Junction Solar Cells

A. Gonzalo[1], A.D. Utrilla[1], U. Aeberhard[2], J.M. Llorens[3], B. Al駭[3], V. Braza[4], D.F. Reyes[4], D. Gonzalez[4], D. Fuertes Marron[5], A. Hierro[1], J.M. Ulloa[1]

[1]Institute for Systems based on Optoelectronics and Microtechnology (ISOM)-Universidad Polit馗nica de Madrid, Madrid, Spain, [2]Institut f・ Energie und Klimaforschung - Photovoltaik (IEK-5), Forschungszentrum J・ich, J・ich, Germany, [3]IMN, Instituto de Micro y Nanotecnologa (CNM, CSIC), Madrid, Spain, [4]University Research Institute on Electron Microscopy & Materials (IMEYMAT), Universidad de C疆iz, Puerto Real, Spain, [5]Instituto de Energ僘 Solar (IES), Universidad Polit馗nica de Madrid, Madrid, Spain

2:45 Metasurfaces As Wavelength Selective Mirrors In Tandem Luminescent Solar Concentrators

HC Bauser[1], DR Needell[1], CR Bukowsky[1], O Ilic[1], Z Nett[2], B Lee[3], JF Geisz[3], AP Alivisatos[2], HA Atwater[1]

[1]California Institute of Technology, Pasadena, CA, United States, [2]University Of California Berkeley, Berkeley, CA, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States

1:30 – 3:00 PM	Monarchy
Passivated Contacts, Carrier Selective Contacts: Fundamentals	

Chair(s): Christophe Ballif

1:30 A Study On The Charge Carrier Transport Of Passivating Contacts

Frank Feldmann[1,2], Gizem Nogay[3], Philipp L er[3], David Young[4], Benjamin G. Lee[4], Paul Stradins[4], Martin Hermle[1], Stefan W. Glunz[1,2]

[1]Fraunhofer ISE, Freiburg, Germany, [2]Laboratory for Photovoltaic Energy Conversion, Freiburg, Germany, [3]EPFL, Neuchatel, Switzerland, [4]NREL, Golden, CO, United States

1:45 Ito-Free Silicon Heterojunction Solar Cells With Zno:Al/Sio_2 Front Electrodes Reaching A Conversion Efficiency Of 23 %

Anna B. Morales-Vilches[1], Alexandros Cruz[1], Sebastian Pingel[1], Sebastian Neubert[1], Luana Mazzarella[1], Daniel Meza[2], Lars Korte[2], Rutger Schlatmann[1], Bernd Stannowski[1]

[1]Helmholtz Zentrum Berlin, PVcomB, Berlin, Germany, [2]Helmholtz Zentrum Berlin, Institut for Silicon Photovoltaics, Berlin, Germany

2:00 Development Of A Transparent Passivated Contact As A Front Side Contact For Silicon Heterojunction Solar Cells

Malte Koehler[1], Alexandr Zamchiy[2], Manuel Pomaska[1], Andreas Lambertz[1], Florian Lentz[1,3], Weiyuan Duan[1], Vladimir Smirnov[1], Friedhelm Finger[1], Uwe Rau[1], Kaining Ding[1]

[1]IEK-5 Photovoltaik, Forschungszentrum Juelich, Juelich, Germany, [2]Novosibirsk State University, Novosibirsk , Russia, [3]Helmholtz Nano Facility, Forschungszentrum Juelich, Juelich, Germany

Best Student Presentation Award Finalist

2:15 Tunneling Or Pinholes: Understanding The Transport Mechanisms In Sio_X Based Passivated Contacts For High-Efficiency Silicon Solar Cells

Abhijit S. Kale[1], William Nemeth[2], Sanjini U. Nanayakkara[2], Harvey Guthrey[2], Matthew Page[2], Mowafak Al-Jassim[2], Sumit Agarwal[1], Paul Stradins[2]

[1]Colorado School of Mines, Golden, CO, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

2:30 Chemical Stability And Performance Of Doped Silicon Oxide Layers For Use In Thin Film Silicon Solar Cells

Thierry de Vrijer[1], Fai Tong Si[1], Hairen Tan[1,2], Arno H.M. Smets[1]

[1]Delft University of Technology, Delft, Netherlands, [2]University of Toronto, Toronto, ON, Canada

2:45 23% N-Type Crystalline Silicon Solar Cells With Tio_X / Lif_X / Al Partial Rear Contacts

James Bullock[1], Yimao Wan[1,2], Xu Zhaoran[1], Di Yan[2], Pheng Phang[2], Mark Hettick[1], Chris Samundsett[2], Ziv Hameiri[3], Andres Cuevas[2], Ali Javey[1]

[1]University of California, Berkeley, Berkeley, CA, United States, [2]The Australian National University, Canberra, Australia, [3]University of New South Wales , Sydney, Australia

1:30 – 3:00 PM	Queen 5,6
Module/Cell Characterization 2	

Chair(s): Michael Gostein

1:30 Maximizing Process Insights From Metrology Data In Pv Manufacturing

Rhett Evans[1,2], Bonne Eggleston[3], Simeon Baker-Finch[4], Adrian Turner[5]

[1]UNSW, Sydney, Australia, [2]Solinno Pty Ltd, Bulli, Australia, [3]Exciton, Perth, Australia, [4]SBF Consulting, Werri Beach, Australia, [5]SunPeak, Sydney, Australia

1:45 Quantitative Assessment Of Humidity In Encapsulation Materials For Moisture-Sensitive Devices

Johannes Hepp[1,2,3], Andreas Vetter[1,2], Stefan Langner[2], Michael Woiton[2], Gordana Jovicic[2,3], Klaus Burlafinger[2], Christian Camus[1,2], Hans-Joachim Egelhaaf[1], Christoph J. Brabec[1,2]

[1]Bavarian Center for Applied Energy Research (ZAE Bayern), Erlangen, Germany, [2]Materials for Electronics and Energy Technology (iMEET), Erlangen, Germany, [3]Erlangen Graduate School in Advanced Optical Technologies (SAOT), Erlangen, Germany

2:00 Evaluating Performance Loss And Predicting Efficiency Gain Of Bifacial Silicon Solar Cells

Jian Wei Ho[1], Johnson Wong[2], Teena C S Percis[1], Samuel Raj[1], Kwan Bum Choi[1], Er-Chien Wang[1], Shubham Duttagupta[1], Armin G. Aberle[1]

[1]Solar Energy Research Institute of Singapore (SERIS), Singapore, Singapore, [2]Aurora Solar Technologies Inc., North Vancouver, BC, Canada

2:15 Application Of Machine Learning For Production Optimization

Bernhard Kl er

Hanwha Q CELLS Gmbh, Bitterfeld-Wolfen, Germany

2:30 Calibration Of Solar Cells Beyond Stc Using The Dsr Method

Ingo Kr er, Stefan Winter, Dirk Friedrich

Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

Best Student Presentation Award Finalist

2:45 Stress Analysis Of Encapsulated Silicon Solar Cells On Soldering, Lamination, Cell Thickness And Electrical Performance

Xiaodong Meng, Michael Stuckelberger, April Jeffries, Simone Bernardini, Mariana Bertoni

Arizona State University, Tempe, AZ, United States

1:30 – 3:00 PM	King 1
Examining Perovskite Stability	

Chair(s): Kevin Bush

Best Student Presentation Award Finalist

1:30 Design And Understanding Of Perovskite Solar Cells And Encapsulation For Damp Heat, Temperature Cycling, And Uv Stability

Rongrong Cheacharoen[1], Kevin Bush[1], Nicholas Rolston[1], Duncan Harwood[2], Reinhold Dauskardt[1], Michael McGehee[1]

[1]Stanford University, Stanford, CA, United States, [2]D2 solar, San Jose, CA, United States

1:45 *Perovskite&Mdash;A Wonder Material For Photovoltaic And Optoelectronic Applications*

Shengzhong Liu[1,2]

[1]Dalian National Laboratory for Clean Energy, iChEM, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, 457 Zhongshan Road, Dalian 116023, Dalian, China, [2]Key Laboratory of Applied Surface and Colloid Chemistry, Ministry of Education Shaanxi Engineering Lab for Advanced Energy Technology, School of Materials Science and Engineering, Shaanxi Normal University, Xi誕n 710119, Xi'an, China

2:00 Impact Of Light On The Thermal Stability Of Perovskite Solar Cells And Development Of Stable Semi-Transparent Cells

The Duong, YiLiang Wu, Heping Shen, Jun Peng, Nandi Wu, Thomas White, Klaus Weber, Kylie Catchpole

Research School of Engineering, Australian National University, Canberra, Australia

2:15 Effect Of Composition And Microstructure On The Mechanical Stability Of Perovskite Solar Cells

Nicholas J Rolston, Adam D Printz, Jared M Tracy, Reinhold H Dauskardt

Stanford University, Stanford, CA, United States

2:30 Atmospheric Pressure Spatial Ald Layer For Ambient, Thermally And Light Stable P-I-N Planar Perovskite Solar Cells

Valerio Zardetto[1], Alessia Senes[1], Merdhad Nafaji[2], Dong Zhang[2], Marco Chippari[1], Raoul Joly[1], Tom Arneouts[3], Paul Poodt[1], Sjoerd Veenstra[2], Ronn Andriessen[1]

[1]TNO-Solliance, Eindhoven, Netherlands, [2]ECN-Solliance, Eindhoven, Netherlands, [3]IMEC-Solliance, Leuven, Belgium

2:45 The Interaction Of Ion Migration With Shockley-Read-Hall Recombination In The Bulk Of Perovskite Solar Cells Explains Anomalous Voltage And Luminescence Transients

Daniel Walter[1], Andreas Fell[2,3], Yiliang Wu[1], The Duong[1], Klaus Weber[1]

[1]Australian National University, Canberra, Australia, [2]Fraunhofer Institute for Solar Energy Systems, Freiburg, Germany, [3]AF simulations, March, Germany

1:30 – 3:00 PM	Queens 4
Space PV Systems	

Chair(s): Geoff Bradshaw

1:30 Category: 7.2 Space Pv Systems Or 7.3 Flight Experience Power Systems Title: International Space Station (Iss) Roll-Out Solar Array (Rosa) Spaceflight Experiment Mission And Results

Brian R. Spence[1], Steve White[1], Matt LaPointe[1], Steve Kiefer[1], Peter LaCorte[1], Jeremy Banik[2], David Chapman[2], John Merrill[2]

[1]Deployable Space Systems, Inc. (DSS), Santa Barbara, CA, United States, [2]Air Force Research Laboratory, Kirtland AFB, NM, United States

1:45 Qualification And Insertion Of Deployable Space Systems Rosa (Roll-Out Solar Array) For Multiple Ssl Spacecraft Platforms

Harry A Yates[1], Bao Hoang[1], Alan Szeto[1], Brian R Spence[2], Steve White[2], Varouj Baghdasarian[1]

[1]SSL, Palo Alto, CA, United States, [2]DSS, Goleta, CA, United States

2:00 Lightweight Space Solar Arrays: Past, Present And Future

John L Gibb

LMSSC, Sunnyvale, CA, United States

Best Student Presentation Award Finalist

2:15 Lightweight Monolithic Microcell Cpv For Space

Christian J Ruud[1], Jared S Price[2], Brent Fisher[2], Noel C Giebink[3]

[1]Department of Materials Science and Engineering, The Pennsylvania State University, University Park, PA, United States, [2]School of Electrical Engineering and Computer Science, The Pennsylvania State University, University Park, PA, United States, [3]H-NU Systems LLC, Bethesda, MD, United States

2:30 Solar Technology Comparison For Wing Integration In Unmanned Aerial Vehicles

David A Scheiman[1], Raymond Hoheisel[2], Daniel Edwards[1], Andrew Paulsen[3], Justin Lorentzen[1], Woojun Yoon[1], Steve Carruthers[1], Sam Carter[1], Matthew Kelly[1], Phillip Jenkins[1], Robert Walters[4]

[1]U.S. Naval Research Laboratory, Washington , DC, United States, [2]George Washington University, Washington, DC, United States, [3]Packet Digital, Fargo, ND, United States, [4]former US Naval Research Laboratory , Washington DC, DC, United States

2:45 High-Efficiency, Lightweight, Flexible Solar Sheets With Very High Specific Power For Solar Flight

Raymond Chan, Mark Osowski, Andree Wibowo, Drew Cardwell, Alex Kirk, Chris Stender, Fran Tuminello, Martin Drees, Noren Pan

MicroLink Devices, Niles, IL, United States

1:30 – 3:00 PM	King 2,3
Adhesion and Corrosion	

Chair(s): Nancy Phillips

1:30 Framework For Modelling Interface Degradation In Photovoltaic Modules At The Molecular Level

Jared Tracy[1], Dagmar D'hooge[1,2], Nick Bosco[3], Reinhold Dauskardt[1]

[1]Stanford University, Stanford, CA, United States, [2]Ghent University, Ghent, Belgium, [3]National Renewable Energy Laboratory, Golden, CO, United States

1:45 Environmental Influence On Module Delamination Rate

Nick S Bosco[1], Jared Tracy[2], Reinhold H. Dauskardt[2]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Stanford University, Stanford, CA, United States

2:00 Finite Element Simulation Of Pv Encapsulant Mixed-Mode Delamination Based On Cohesive Zone Model

Xin He, Nick Bosco

National Renewable Energy Laboratory, Golden, CO, United States

2:15 Identification Of Degraded Site In Crystalline Silicon Photovoltaic Cells Exposed To Acetic Acid Vapor

Tadanori Tanahashi, Norihiko Sakamoto, Hajime Shibata, Atsushi Masuda

AIST, Tsukuba, Japan

2:30 Effect Of Soldering On The Module Degradation Along Bus Bar In Dh Test And Pct For Crystalline Si Pv Modules

Yuji Ino, Shuichi Asao, Katsuhiko Shirasawa, Hidetaka Takato

Fukushima Renewable Energy Institute (FREA), National Institute of Advanced Industrial Science and Technology (AIST), Koriyama, Japan

2:45 Using Module Leakage Current Modeling To Understand Corrosion Chemistry

Michael D Kempe[1], Peter Hacke[1], Jichao Li[2], Katherine Han[2], Yu-Chen Shen[2], Staffan Westerberg[2]

[1]NREL, Golden, CO, United States, [2]SunPower, San Jose, CA, United States

3:00 – 3:30 PM	Grand Promenade
Coffee Break	

3:30 – 5:00 PM	Queen 5,6
Industrial Aspects	

Chair(s): A. Bayman

3:30 Progress Of First Solar Cdte Cell Research And Module Manufacturing
Gang Xiong
First Solar Inc, Santa Clara, CA, United States

4:00 New World Record Efficiency Up To 22.9% For Cu(In,Ga)(Se,S)2 Thin-Film Solar Cells
Jyh-Lih Wu, Yoshiaki Hirai, Takuya Kato, Hiroki Sugimoto, Veronica Bermudez
Solar Frontier K.K., Atsugi Research Center, Japan

4:15 World Record 18.7% Thin Film Module Conversion Efficiency
Philipp Kratzert[1], Stefan Weeke[1], Martin Zimmer[1], Sebastian ten Haaf[1], Stefan Hartnauer[1], Sebastian Jander[1], Ralf Hunger[1], Markus Vogl[1], Olle Lundberg[2], Erik Wallin[2], Viktoria Gusak[2], Lars Stolt[2]
[1]Solibro HiTech GmbH, 06766 Bitterfeld Wolfen, Germany, [2]Solibro Research AB, 75651 Uppsala, Sweden

4:30 Determination Of The Influence Of Na Accumulation At The Localized Grain-Boundary In Cigs Absorbers
JinWoo Lee[1], Ryan Kaczynski[1], Jane van Alsburg[1], Yejiao Wang[1], Bo Sang[1], Jeffrey Britt[1], Daniel Goran[2]
[1]Global Solar Energy, Tucson, AZ, United States, [2]Bruker Nano GmbH, Berlin, Germany

4:45 Back End Monolithic Serial Interconnection Technology For Cigs With Shunt-Free Laser Scribing And Inkjet Printing
Veronique S. Gevaerts[1,2], Anne F.K.V. Biezemans[1,2], Hero H. 't Mannetje[1,3], Hans Linden[1,3], Johan Bosman[1,2]
[1]Solliance, Eindhoven, Netherlands, [2]ECN, Eindhoven, Netherlands, [3]TNO, Eindhoven, Netherlands

3:30 – 5:00 PM	Kona 5

Hybrid Tandems: Battle Royale, Part 2

Chair(s): Emily Warren

3:30 Progress Toward High-Performance Monolithic Epitaxial Gaasp/Si Tandem Solar Cells

Tyler J Grassman[1], Daniel J Chmielewski[1], Daniel L Lepkowski[1], Jacob T Boyer[1], Chuqi Yi[2], Hamid Mehrvarz[2], Fa-Jun Ma[2], Anita Ho-Baillie[2], Stephen P Bremner[2], Christopher Kerestes[3], Steven G Whipple[3], Alex P Stavrides[3], Paul R Sharps[3], Steven A Ringel[1]

[1]The Ohio State University, Columbus, OH, United States, [2]University of New South Wales, Sydney, Australia, [3]SolAero Technologies, Inc., Albuquerque, NM, United States

Best Student Presentation Award Finalist

3:45 Hybrid Sequential Deposition Process For Fully Textured Silicon/Perovskite Tandem Solar Cells

Florent Sahli[1], J駻騁ie Werner[1], Brett A. Kamino[2], Matthias Br舫ninger[1], Gizem Nogay[1], Rapha・ Monnard[1], Bertrand Paviet-Salomon[2], Laura Ding[2], Juan J. Diaz Leon[2], Davide Sacchetto[2], Mathieu Boccard[1], Matthieu Despeisse[2], Sylvain Nicolay[2], Quentin Jeangros[1], Bjoern Niesen[1,2], Christophe Ballif[1,2]

[1]Ecole polytechnique F馘駻ale de Lausanne (EPFL), Neuch穰el, Switzerland, [2]Centre d'駘ectronique et de microtechnique (CSEM), Neuch穰el, Switzerland

Best Student Presentation Award Finalist

4:00 Direct Growth Of Iii-V/Silicon Triple-Junction Solar Cells With 19.7 % Efficiency

Markus Feifel[1], Jens Ohlmann[1], David Lackner[1], Thomas Hannappel[2], Kerstin Volz[3], J・gen Belz[3], Beyer Andreas[3], Jan Benick[1], Andreas W. Bett[1], Martin Hermle[1], Frank Dimroth[1]

[1]Fraunhofer ISE, Freiburg, Germany, [2]TU Ilmenau, Ilmenau, Germany, [3]Philipps-Universit舩 Marburg, Marburg, Germany

4:15 Highly Near-Infrared-Transparent Perovskite Solar Cells And Their Application In High-Efficiency 4-Terminal Perovskite/C-Si Tandems

Dong Zhang[1], Mehrdad Najafi[1], Valerio Zardetto[2], Maarten Dorenkamper[1], Wiljan Verhees[1], Xuedong Zhou[1], Alessia Senses[3], Astrid Gutjahr[4], Ingrid Romijn[4], Sjoerd Veenstra[1], Bart Geerligs[4], Mariadriana Creatore[5], Tom Aernouts[6], Ronn Andriessen[3]

[1]ECN-Solliance, High Tech Campus 21, 5656 AE, Eindhoven, Netherlands, [2]TNO-Solliance, High Tech Campus 21, 5656 AE, Eindhoven, Netherlands, [3]Holst centre-Solliance, High Tech Campus 21, 5656 AE, Eindhoven, Netherlands, [4]ECN Solar Energy, P.O.Box 1, 1755 ZG, Petten, Netherlands, [5]Department of Applied Physics, Eindhoven University of Technology, P.O. Box 513, 5600 MB, Eindhoven, Netherlands, [6]IMEC-Solliance, Thin Film PV, Kapeldreef 75, B-3001, Leuven, Belgium

4:30 Three-Terminal Iii-V/Si Tandem Solar Cells Fabricated Using A Transparent, Conductive Adhesive

Manuel Schnabel[1], Henning Schulte-Huxel[1,2], Talysa R. Klein[1], Michael Rienaecker[2], John F. Giesz[1], Benjamin G. Lee[1], Raphael Niepelt[2], Sarah Kajari-Schroeder[2], Maikel F.A.M. van Hest[1], Emily L. Warren[1], Rolf Brendel[2], Robby Peibst[2], Pauls Stradins[1], Adele C. Tamboli[1]

[1]National Renewable Energy Lab, Golden, CO, United States, [2]Institute for Solar Energy Research in Hamelin, Hamelin, Germany

Best Student Presentation Award Finalist

4:45 Efficient, Large-Area Scalable Perovskite-Si And Perovskite-Cigs Tandem Solar Modules

Manoj Jaysankar[1], Stefan Paetel[2], Maarten Debucquoy[1], Erik Ahlswede[2], Robert Gehlhaar[1], Jef Poortmans[1]

[1]imec, Leuven, Belgium, [2]Zentrum f・ Sonnenenergie- und Wasserstoff-Forschung Baden-W・ttemberg (ZSW), Stuttgart, Germany

3:30 – 5:00 PM	Monarchy

Device Modeling and Power Loss Analysis

Chair(s): Otwin Breitenstein

3:30 The Power Of Basic Metal–Insulator–Semiconductor (Mis) Theory To Describe Passivating Contacts Within Numerical Solar Cell Modeling

Andreas Fell[1], Frank Feldmann[1,2], Christoph Messmer[1], Martin Bivour[1], Martin C. Schubert[1], Stefan W. Glunz[1,2]

[1]Fraunhofer ISE, Freiburg, Germany, [2]Albert Ludwigs University of Freiburg, Freiburg, Germany

4:00 Understanding Transport Mechanisms Of High Efficiency Ibc C–Si Solar Cells Based On Poly–Si Or Htj Carrier–Selective Passivating Contacts

Paul Procel, Guangtao Yang, Olindo Isabella, Miro Zeman

Delft University of Technology, Delft, Netherlands

4:30 Efficiency Potential Of P–Type Pert Vs. Perc Solar Cells

Sebastian Meier, Sven Wasmer, Andreas Fell, Nico Woehrle, Johannes Greulich, Andreas Wolf

Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

4:45 Simulations On Laser–Phosphorous–Doped Selective Emitters

Julian Weber, Sabrina Lohm•ler, Elmar Lohm•ler, Sven Wasmer, Jan Nekarda, Andreas Brand

Fraunhofer ISE, Freiburg, Germany

3:30 – 5:00 PM	Kona 4
Module/Cell Characterization 1	

Chair(s): Yoshihiro Hishikawa

3:30 Comparison Of Bifacial Module Measurement Methods With Optically Optimized Bifacial Modules

Bonna K. Newman[1], Anna J. Carr[1], Mark J. Jansen[1], Elias Garcia Goma[2], Mario J.H. Kloos[1], Astrid Gutjahr[1], Koen M. de Groot[1], Ian J. Bennett[3], Julien Gaury[3], Bas B. Van Aken[1]

[1]ECN, Petten, Netherlands, [2]Eternal Sun Spire Solar, Den Haag, Netherlands, [3]DSM, Geleen, Netherlands

3:45 Contactless Extraction Of Implied I–V Curves Of Individual Solar Cells In Fully Assembled Modules Using Photoluminescence

Raghavi Bhoopathy, Oliver Kunz, Robert Dumbrell, Thorsten Trupke, Ziv Hameiri

University of New South Wales, Kensington, Australia

4:00 Determining The Accuracy Of Solar Cell And Module Measurements On High–Capacitance Devices

Adrienne L. Blum, Ronald A. Sinton, Harrison W. Wilterdink

Sinton Instruments, Boulder, CO, United States

4:15 Application Of The Sandia Array Performance Model To Assess Multiyear Performance Of Fielded Cigs Pv Arrays

Bruce H King, Charles D Robinson, Craig Carmignani, Dan Riley, C Birk Jones

Sandia National Labs, Albuquerque, NM, United States

4:30 Stress Mapping By Confocal Raman Spectroscopy On Solar Cells And Modules

Andreas J. Beinert[1,2], Andreas B•hler[1], Pascal Romer[1], Martin Heinrich[1], Martin C. Schubert[1], Jarir Aktaa[2], Ulrich Eitner[1]

[1]Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany, [2]Karlsruhe Institute of Technology (KIT), Institute for Applied Materials, Karlsruhe, Germany

4:45 Quantitative Study Of The Effect Of Non–Uniform Irradiance On Module Performance Combining El And Dlit Imaging With Circuit Modeling

Tao Song[1], Steve Johnston[1], Felix Fruhauf[2], Jan Bauer[2], Otwin Breitenstein[2], Dean Levi[1]

[1]National Renewable Energy Labratory, Golden, CO, United States, [2]Max Planck Institute of Microstructure Physics, Halle,, Germany

3:30 – 5:00 PM	Queens 4

PV Modules: Back Contact cells and Partial Shading

Chair(s): Robert Kenny

3:30 Development Of Conductive Back-Sheet For Manufacture Of Pv Modules With Back-Contact Cells

Ian J Bennett[1], Robert HC Janssen[2], Frank van Duijnhoven[2], Jianjun Xu[2]

[1]DSM Advanced Solar, Sittard-Geleen, Netherlands, [2]DSM Materials Science Centre, Sittard-Geleen, Netherlands

3:45 Quantification Of System-Level Mismatch Losses Using Pvmismatch

Chetan Chaudhari, Gregory M. Kimball, Raymond Hickey, Ben Bourne

SunPower Corporation, Richmond, CA, United States

4:00 Understanding Partial Shading Effects On Shingled Pv Modules

Oliver Kunz, Rhett J. Evans, Mattias K. Juhl, Thorsten Trupke

University of New South Wales, Sydney, Australia

4:15 Optimization Methodology For Reconfigurable Pv Modules

Patrizio Manganiello[1,2], Pavlos Bosmalis[1,3], Maro Baka[4], Eszter Voroshazi[1], Dimitrios Soudris[4], Francky Catthoor[1,2], Jef Poortmans[1,2], Jozef Szlufcik[1]

[1]imec, Heverlee, Belgium, [2]ESAT, KU Leuven, Heverlee, Belgium, [3]Aristotle University of Thessaloniki, Thessaloniki, Greece, [4]National Technical University of Athens, Athens, Greece

4:30 Accurate Performance Predictions Of Large Pv Systems With Shading Using Submodule Mismatch Calculation

Mark A Mikofski, Matthew Lynn, James Byrne, Mike Hamer, Jeff Newmiller

DNV-GL, Oakland, CA, United States

4:45 Materials Development And Increased Module Efficiency For 15% Cost Reduction Of Back Contact Modules

Bonna K. Newman[1], Jan M. Kroon[1], Nicolas Guillevin[1], Lars A.G. Okel[1], Paul M. Sommeling[1], Maurice J.A.A. Goris[1], Wilma Eerenstein[2], Jorge Ortiz Gonzalez[2]

[1]ECN, Petten, Netherlands, [2]Exasun, Den Haag, Netherlands

3:30 – 5:00 PM	King 2,3
Soiling 2	

Chair(s): Larry Kazmerski

3:30 Chemical And Optical Characteristics Of Dust On Pv Modules Installed In United Arab Emirates (Uae)

Hebah M Y Rahal[1], Thies Thiemann[1], Anwar Almheiri[2], Jim J John[2], Tholkappiyan Ramachandran[1], Fathalla Hamad[1], Abbas Khaleel[1], Aaesha Alnuaimi[2], Marco Stefancich[2], Pedro Banda[2]

[1]United Arab Emirates University, Al Ain, United Arab Emirates, [2]Dubai Electricity and Water Authority (DEWA), Dubai, United Arab Emirates

3:45 Analysis Of Soiling Losses For Different Cleaning Cycles

Sonali Warade, Anil Kottantharayil

National Centre for Photovoltaic Research and Education, Mumbai, India

4:00 Uniform And Non-Uniform Soiling Of Pv Modules: A Comprehensive Study Of Performance And Temperature Effects

Daniel S. Costa[1], Antonia Sonia A.C. Diniz[1], Suellen C.S. Costa[1], Lawrence L. Kazmerski[1,2,3], Sonali Bhaduri[3], Cristiana Brasil Maia[1], Vinicius Camatta[1], Marcelo M. Viana[1], Elvis Mayk Barboso[1], Pedro P. Brito[1], Claudio Dias Campos[4], Sergio deMorais Hanriot[1]

[1]Pontificia Universidade Cat ica de Minas Gerais (PUC MInas), Belo Horizonte, Brazil, [2]University of Colorado Boulder, Boulder, CO, United States, [3]Indian Institute of Technology-Bombay, Mumbai, India, [4]Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil

4:15 Electrostatic Cleaning Equipment For Dust Removal From Solar Panels Of Mega Solar Power Generation Plants

Hiroyuki Kawamoto, Megumi Kato

Waseda University, Tokyo, Japan

4:30 Initial Results From A Simple Model For Predicting Time Series Soiling Of Photovoltaic Panels

Merissa Coello, Liza Boyle

Humboldt State University, Arcata, CA, United States

4:45 Atamos Tec Project: Soiling Impact On Bifacial Modules With Different Mounting Geometry In The Atacama Desert In Chile

Enrique Cabrera[1], Francisco Araya[2], Andreas Schneider[1], Aitor Marzo[2], Razvan Roescu[1], Jorge Rabanal[1], Pablo Ferrada[2], Paulo Ayala[3], Djaber Berrian[1], Joris Libal[1], Edward Fuentealba[2], Radovan Kopecek[1]

[1]International Solar Energy Research Center –ISC– Konstanz, Konstanz, Germany, [2]University of Antofagasta, Av. Angamos 601, 1270300 Antofagasta, Chile, Chile, [3]Fraunhofer Chile Research, Av. Vicu Mackenna 4860, Santiago, Chile, Chile

3:30 – 5:00 PM	King 1
Solar Variability and Hosting Capacity	

Chair(s): Dr. Arnulf J鳐er-Waldau

3:30 Implementation Of Synthetic Cloud Fields For Pv Modeling In Distribution Grid Simulations

Matthew Lave[1], Matthew Reno[2], Robert Broderick[2]

[1]Sandia National Laboratories, Livermore, CA, United States, [2]Sandia National Laboratories, Albuquerque, NM, United States

3:45 Pv Inverter Fault Response Including Momentary Cessation, Frequency-Watt, And Virtual Inertia

Brian J. Pierre[1], Mohamed E. Elkhatib[2], Andy Hoke[3]

[1]Sandia National Laboratories, Albuquerque, NM, United States, [2]S&C Electric Company, Chicago, IL, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States

4:00 Simulating High-Frequency Generation Profiles For Large Solar Pv Portfolios

William B. Hobbs[1], Matthew Lave[2], Christopher Smitherman[1]

[1]Southern Company, Birmingham, AL, United States, [2]Sandia National Laboratories, Livermore, CA, United States

4:15 Pumped Hydro Energy Storage To Support 100% Renewable Electricity

Andrew W Blakers, Matthew Stocks, Bin Lu, Kirsten Anderson, Anna Nadolny

Australian National University, Canberra, Australia

4:30 Beyond Hosting Capacity: Using Shortest Path Methods To Minimize Upgrade Cost Pathways

Nicolas Gensollen, Kelsey Horowitz, Bryan Palmintier, Fei Ding, Barry Mather

National Renewable Energy Laboratory, Golden, CO, United States

Best Student Presentation Award Finalist

4:45 Practical Data-Driven Methods To Improve The Accuracy And Detail Of Hosting Capacity Analysis

Jeremiah Deboever[1], Santiago Grijalva[1], Jouni Peppanen[2], Matthew Rylander[2], Jeff Smith[2]

[1]Georgia Institute of Technology, Atlanta, GA, United States, [2]Electric Power Research Institute, Palo Alto, CA, United States

6:30 – 9:30 PM	Ocean Terrace
Conference Banquet (Ticket Required)	

Friday, June 15, 2018

8:30 – 10:00 AM	Kona 4
Fundamental Conversion Mechanisms	

Chair(s): Pavel Dutta

Best Student Presentation Award Finalist

8:30 Control Of Hot Carrier Thermalization In Type-Ii Quantum Wells: A Route To Practical Hot Carrier Solar Cells

Hamidreza Esmaielpour[1], Vincent R. Whiteside[1], Herath P. Piyathilaka[2], Sangeetha Vijeyaragunathan[1], Bin Wang[3], Kenneth P. Roberts[4], Tetsuya D. Mishima[1], Matthew P. Lumb[5,6], Michael B. Santos[1], Alan D. Bristow[2], Ian R. Sellers[1]

[1]Department of Physics & Astronomy, University of Oklahoma, Norman, OK, United States, [2]Department of Physics & Astronomy, West Virginia University, Morgantown, WV, United States, [3]School of Chemical, University of Oklahoma, Norman, OK, United States, [4]Department of Chemistry and Biochemistry, University of Tulsa, Tulsa, OK, United States, [5]U. S. Naval Research Laboratory, 4555 Overlook Ave SW, Washington, DC, United States, [6]The George Washington University, Washington, DC, United States

Best Student Presentation Award Finalist

8:45 Pushing The Limits Of Thermophotovoltaic Efficiency

Zunaid Omair[1,2], Gregg Scranton[1,2], Luis M. Pazos-Outon[1], T. Patrick Xiao[1,2], Myles A. Steiner[3], Per F. Peterson[4], John Holzrichter[5], Eli Yablonovitch[1,2]

[1]Department of EECS, UC Berkeley, Berkeley, CA, United States, [2]Material Science Division, Lawrence Berkeley National Lab, Berkeley, CA, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States, [4]Department of Nuclear Engineering, UC Berkeley, Berkeley, CA, United States, [5]Physical Insight Associates, Berkeley, CA, United States

9:00 Resilient Intermediate Band Solar Cell Using An Electronic Ratchet

Amaury Delamarre[1,2], Daniel Suchet[1,3], Nicolas Cavassilas[1,4], Zacharie Jehl[1,2], Yoshitaka Okada[1,2], Masakazu Sugiyama[1,2], Jean-Francois Guillemoles[1,5]

[1]LIA NextPV, Tokyo, Japan, [2]RCAST, Tokyo, Japan, [3]LPICM, Palaiseau, France, [4]IM2NP, Marseille, France, [5]IPVF, Palaiseau, France

9:15 Opportunities For Increased Efficiency In Monochromatic Photovoltaic Light Conversion

Daixi Xia[1], Matthew M. Wilkins[1,2], Sanmeet S. Chahal[1], Christopher E. Valdivia[2], Karin Hinzer[1,2], Jacob J. Krich[1,2]

[1]Department of Physics, University of Ottawa, Ottawa, ON, Canada, [2]School of Electrical Engineering and Computer Science, University of Ottawa, Ottawa, ON, Canada

9:30 Improving The Performance Of Thermophotovoltaics Using Stabilized Porous Media Combustion Flame And Controlled Emission

Philippe A. Gentillon[1], Robert A. Taylor[1,2], N. J. Ekins-Daukes[1]

[1]School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Sydney, Australia, [2]School of Mechanical Engineering, University of New South Wales, Sydney, Australia

9:45 Solid-State Infrared-To-Visible Upconversion For Sub-Bandgap Sensitization Of Photovoltaics

Lea Nienhaus, Mengfei Wu, Nadav Geva, Sarah Wieghold, Juan-Pablo Correa-Baena, Tonio Buonassisi, Vladimir Bulovic, Troy Van Voorhis, Marc A. Baldo, Moungi G. Bawendi

Massachusetts Institute of Technology, Cambridge, MA, United States

8:30 – 10:00 AM	Queen 5,6
Interfaces	

Chair(s): Teresa Barnes

8:30 Interface Engineering For 25% Cdte Solar Cells
Tursun Ablekim, Eric Colegrove, Wyatt Metzger
National Renewable Energy Laboratory, Golden, CO, United States

Best Student Presentation Award Finalist

8:45 Front And Back Interface Recombination Of Mzo/Cdte/Te Solar Cells
Alexandra M. Huss, Jennifer A. Drayton, James R. Sites
Colorado State University, Fort Collins, CO, United States

9:00 Improved Back Contact Barrier Of Cztse Solar Cells By Incorporating Nanoscale Ge Bi-Layers
Sanghyun Lee[1], Kent Price[2], Edgardo Saucedo[3], Sergio Giraldo[3]
[1]Indiana State University, Terre Haute, IN, United States, [2]Morehead State University, Morehead, KY, United States, [3]Catalonia Institue for Energy Research, Barcelona, Spain

9:15 Electron Reflector Behavior Of Cdte For Cdsete Absorber Devices
Amit H. Munshi[1], Adam H. Danielson[1], Thomas Fiducia[2], Ali Abbas[2], Anthony Nicholson[1], Kurt L. Barth[1], Kexue Li[3], Chris Grovenor[3], John M. Walls[2], Walajabad S. Sampath[1]
[1]Colorado State University, Fort Collins, CO, United States, [2]Loughborough University, Loughborough, United Kingdom, [3]Oxford University, Oxford, United Kingdom

Best Student Presentation Award Finalist

9:30 P-Type Transparent Conductor Cu-Zn-S: Structural Considerations And Photovoltaic Applications
Rachel E Woods-Robinson[1,2,3], Yanbing Han[3,5], Apurva Mehta[4], Kristin Persson[1,2], Andriy Zakutayev[3]
[1]University of California, Berkeley, Berkeley, CA, United States, [2]Lawrence Berkeley National Laboratory, Berkeley, CA, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States, [4]SLAC National Laboratory, Menlo Park, CA, United States, [5]Fudan University, Shanghai, China

9:45 Efficiency Improvement Of High Band Gap Cu_2Znsns_4 Solar Cell Achieved By Heterojunction Heat Treatment
Chang Yan, Jialiang Huang, Kaiwen Sun, Yuanfang Zhang, Martin Green, Xiaojing Hao
UNSW, Kensington, Australia

8:30 – 10:00 AM	Monarchy
Copper Contacts and Bifaciality	

Chair(s): Radovan Kopecek

8:30 Distortion Of Suns-V_{Oc} Measurements Due To Plated Copper Diffusion Through Silver Capping Layers On Silicon Solar Cells

Jack Colwell[1], Pei-Chieh Hsiao[1], Xiaowei Shen[1], Sean Lim[2], Oliver Kunz[1], Wei Zhang[1], Xi Wang[1], Alison Lennon[1]

[1]School of Photovoltaic and Renewable Energy Engineering, UNSW Sydney, Sydney, Australia, [2]Electron Microscope Unit, UNSW Sydney, Sydney, Australia

8:45 Direct Copper Plating To Iwo For Silicon Heterojunction Solar Cells

Pei-Chieh Hsiao, Wei Zhang, Zhongtian Li, Udo R er , Alison Lennon

UNSW, Sydney, Australia

9:00 Development Of Large-Area Bifacial Interdigitated-Back-Contact (Ibc) Solar Cell With Industrial Production Environment

Feng Li[1,2], Dawei Liu[1,2], Ziqian Wang[1,2], Wei Zhang[1,2], Jinye Zhai[1,2], Jinchao Shi[1,2], Nicolas Guillevin[3], Ilkay Cesar[3], Teun Burgers[3], Peter Venema[4]

[1]Yingli Green Energy Co., Ltd, Baoding, China, [2]State Key Laboratory of Photovoltaic Materials and Technology, Baoding, China, [3]Energy Research Center of the Netherlands, Petten, Netherlands, [4]Tempress Systems B.V, Vaassen, Netherlands

9:15 Towards 90% Bifaciality For P-Type Cz-Si Solar Cells By Adaption Of Industrial Perc Processes

Elmar Lohm･ler, Sabrina Lohm･ler (n馥 Werne, Mohammad Hassan Norouzi, Pierre Saint-Cast, Julian Weber, Sebastian Meier, Andreas Wolf

Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

9:30 24% Efficiency Hybrid Cell Technology Integrating A Low-Cost, Precision-Pattern Cu Metallization Used For Advanced Pcb

Wen Ma, Alec Jackson, Chenlei Wang, Farhad Moghadam , Ashok K Sinha

Sunpreme Inc., Sunnyvale, CA, United States

9:45 Bifacial Interdigitated-Back-Contact (Ibc) Crystalline Silicon Solar Cell: Fabrication And Evaluation By Internal Quantum Efficiency Mapping

Tomihisa Tachibana, Katsuto Tanahashi, Toshimitsu Mochizuki, Katsuhiko Shirasawa, Hidetaka Takato

National Institute of Advanced Industrial Science and Technology (AIST), Koriyama, Japan

8:30 – 10:00 AM	Kona 5
Silicon Cell Imaging Techniques	

Chair(s): Otwin Breitenstein

8:30 Surface Photovoltage Spectroscopy As A Characterization Technique For Surface Passivation Quality Assessment

Simone Bernardini, Mariana I. Bertoni

Arizona State University, Tempe, AZ, United States

8:45 Metal Induced Recombination Parameters Extraction Using High Resolution Pv Imaging For Silicon Wafer Solar Cells

Siyu Guo[1], Steve Johnston[3], Winston Schoenfeld[1,4], Kristopher Davis[2]

[1]Florida Solar Energy Center, University of Central Florida, Cocoa, FL, United States, [2]Material Science and Engineering Department, University of Central Florida, Orlando, FL, United States, [3]National Renewable Energy Laboratory, Golden, CO, United States, [4]College of Optics and Photonics, University of Central Florida, Orlando, FL, United States

9:00 Characterizing Heavily-Doped Regions In Silicon Solar Cells With Spectral Photoluminescence

Hieu T. Nguyen[1], Young J. Han[1], Steve Johnston[2], Appu Paduthol[3], Steven P. Harvey[2], Sieu P. Phang[1], Christian Samundsett[1], Chang Sun[1], Di Yan[1], Thorsten Trupke[3], Mowafak M. Al-Jassim[2], Evan Franklin[1], Daniel Macdonald[1]

[1]The Australian National University, Canberra, Australia, [2]National Renewable Energy Laboratory, Golden, CO, United States, [3]The University of New South Wales, Sydney, Australia

9:15 Carrier Injection From Amorphous Silicon Into Crystalline Silicon Determined With Photoluminescence

Appu Paduthol[1], Mattias K Juhl[1], Gizem Nogay[2], Andrea Ingenito[2], Philipp L   er[2], Thorsten Trupke[1]

[1]University of New South Wales, Sydney, Australia, [2]ノcole Polytechnique F鰔騂ale de Lausanne, Lausanne, Switzerland

9:30 Efficiency Gain Analysis Of Silicon Passivated Emitter And Rear Solar Cells Solely Based On Measurements

Sven Wasmer, Abraham van der Horst, Pierre Saint-Cast, Johannes M. Greulich

Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

Best Student Presentation Award Finalist

9:45 Photoluminescence Imaging At Uniform Excess Carrier Density Using Adaptive Non-Uniform Excitation

Yan Zhu[1], Friedemann D Heinz[2], Mattias Juhl[1], Martin C Schubert[2], Thorsten Trupke[1], Ziv Hameiri[1]

[1]University of New South Wales, Sydney, Australia, [2]Fraunhofer ISE, Freiburg, Germany

8:30 – 10:00 AM	Kona 1
Space Solar Cells	

Chair(s): Sheila Bailey

8:30 Development Of Imm- A And Z4J Radiation Hard Iii-V Solar Cells

Daniel Derkacs, Dan Aiken, Zachary Bittner, Samantha Cruz, Alexander Haas, John Hart, Clay McPheeters, Christopher Kerestes, Nathaniel Miller, Pravin Patel, Michael Riley, Paul Sharps, Alex Stavrides, Jeff Steinfeldt, Claudia Struempel, Steve Whipple

SolAero Technology Corp., Albuquerque, NM, United States

9:00 Inverted Metamorphic Triple-Junction Solar Cells On Polyimide Substrate For Space Applications

Pilar Espinet-Gonzalez[1], Ryan M. France[2], Michael D. Kelzenberg[1], John F. Geisz[2], Daniel J. Friedman[2], Harry A. Atwater[1]

[1]California Institute of Technology, Pasadena, CA, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

9:15 Low Temperature Low Intensity Effects In Iii-V Photovoltaic Devices For Deep Space Missions

Raymond Hoheisel[1], Andreas Bett[2], Jeffrey Warner[3], Robert Walters[3]

[1]The George Washington University, Washington, DC, United States, [2]Fraunhofer ISE, Freiburg, Germany, [3]Naval Research Laboratory, Washington, DC, United States

9:30 Niel Dose And Dlts Analyses On Triple And Single Junction Solar Cells Irradiated With Electrons And Protons

Roberta Campesato[1], Mariacristina Casale[1], Erminio Greco[1], Piergiorgio Rancoita[2], Massimo Gervasi[2], Davide Rozza[2], Mauro Tacconi[3], Enos Gombia[4], Aldo Kingma[4], Carsten Baur[5]

[1]CESI S.p.A, Milan, Italy, [2]INFN MIB, Milan, Italy, [3]University MIB, Milan, Italy, [4]IMEM CNR, Parma, Italy, [5]ESA, Noordwijk, Netherlands

9:45 Bend Testing Of Imm And Triple Junction Solar Cells

David Wilt[1], Ryan Beauchemin[2], Clay McPheeters[3], Paul Sharps[3], Neil Snyder[2], Cody Griffee[4]

[1]Air Force Research Lab, Albuquerque, NM, United States, [2]ATA Corp, Albuquerque, NM, United States, [3]SolAero Tech, Albuquerque, NM, United States, [4]LoadPath, Albuquerque, NM, United States

8:30 – 10:00 AM	Queens 4

Inverter Technology, Energy Storage and Smart Energy Management Systems

Chair(s): Chris Deline

8:30 100% Renewable Energy For Residential Hawaii Using Islanded Nano-Grid Operation Mode With No Export And Grid-Connection For Back-Up: Best Economical Electricity Savings

John O Borland[1], Takahiro Tanaka[2], Corpuz Poncho[3]

[1]JOB Technologies, Aiea, HI, United States, [2]Tabuchi Electric , San Jose, CA, United States

8:45 Impacts Of Wide Band Gap Power Electronics On Photovoltaic System Design Through The Arpa-E Circuits Program Technologies

Daniel W Cunningham, Eric Carlson, Isik Kizilyalli, Joseph S Manser

ARPA-E, Washington, DC, United States

9:00 Dc-Connected Solar Plus Storage Modeling And Analysis For Behind-The-Meter Systems In The System Advisor Model

Nicholas A. DiOrio, Janine M. Freeman, Nate Blair

National Renewable Energy Laboratory, Golden, CO, United States

9:15 Evaluating The Cost Benefits Of U.S. Utility-Scale Photovoltaics Plus Energy Storage Systems

Ran Fu, Timothy Remo, Robert Margolis

National Renewable Energy Laboratory , Golden, CO, United States

9:30 Grid-Connected Gan Solar Microinverter

Sudip K Mazumder[1], Abhijit Kulkarni[2], Ankit Gupta[1], Debanan Chatterjee[1], Nikhil Kumar[1]

[1]University of Illinois at Chicago, Chicago, IL, United States, [2]Honeywell, Bengaluru, India

9:45 Smart Grid Optimization By Deep Reinforcement Learning Over Discrete And Continuous Action Space

Tomah Sogabe[1,2,3], Dinesh Bahadur Malla[2], Shota Takayama[2], Seiichi Shin[1], Katsuyoshi Sakamoto[2], Koichi Yamaguchi[2], Thakur Praveen Singh[3], Masaru Sogabe[3], Yoshitaka Okada[4], Tomohiro Hirata[4]

[1]Info-Powered Energy System Research Center,The University of Electro-Communications, Tokyo, Japan, [2]Department of Engineering Science,The University of Electro-Communications, Tokyo, Japan, [3]Technology Solution Group, Grid Inc., Tokyo, Japan, [4]Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, Japan

8:30 - 10:00 AM	King 2,3

PID and Interconnections

Chair(s): Nick Bosco

8:30 Large-Area Material And Junction Damage In C-Si Solar Cells By Potential-Induced Degradation

Chuanxiao Xiao, Chun-Sheng Jiang, Steve P. Harvey, Jun Liu, Helio Moutinho, Peter Hacke, Steve Johnston, Mowafak Al-Jassim

National Renewable Energy Laboratory, Golden, CO, United States

8:45 Prediction Of Potential-Induced Degradation Rate Of Thin-Film Modules In The Field On The Basis Of Coulombs Transferred

Peter Hacke[1], Steve Johnston[1], Wei Luo[1], Sergiu Spataru[2], Ryan Smith[3], Ingrid Repins[1]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]Aalborg University, Aalborg, Denmark, [3]Pordis, LLC, Austin, TX, United States

9:00 Evaluation Of The Pid-S Susceptibility Of Modules Encapsulated In Materials Of Varying Resistivity

Brian M. Habersberger[1], Peter Hacke[2], Lisa S. Madenjian[1]

[1]Dow Chemical Company, Lake Jackson, TX, United States, [2]National Renewable Energy Laboratory, Golden, CO, United States

9:15 Cyclic Mechanical Loading Of Solar Panels &Ndash; A Field Experiment

Hubert Seigneur[1], Eric Schneller[1], Jason Lincoln[1], Andrew Gabor[2]

[1]UCF Florida Solar Energy Center, Cocoa, FL, United States, [2]BrightSpot Automation LLC, Westford, MA, United States

9:30 Quantifying And Modeling The Impact Of Interconnection Failures On The Electrical Performance Of Crystalline Silicon Photovoltaic Modules

Eleonora Annigoni[1], Alessandro Virtuani[1], Jacques Levrat[2], Antonin Faes[2], Matthieu Despeisse[2], Christophe Ballif[1,2]

[1]/cole Polytechnique F醷閞ale de Lausanne (EPFL), Institute of Microengineering (IMT), Photovoltaics and Thin Film Electronics Laboratory (PVLAB), Neuchatel, Switzerland, [2]CSEM, PV-center, Neuchatel, Switzerland

9:45 The Impact Of A Faster Thermal Cycling Profile On Pv Interconnect Cycles To Failure

John Lippiatt, Staffan Westerberg, Doug Rose

SunPower Corporation, San Jose, CA, United States

8:30 – 10:00 AM	King 1
PV Deployment	

Chair(s): Dr. Ingrid Wei°

8:30 A Snapshot Of Global Pv Markets – The Latest Survey Results On Pv Markets And Policies From The Iea Pvps Programme In 2017

Ga•an Masson[1], Izumi Kaizuka[2], Johan Lindahl[3], Arnulf Jaeger-Waldau[4], Gregory Neubourg[5], Peter Ahlm[6], Jos□ Donoso[7], Francesca Tilli[8]

[1]IEA PVPS Task 1, Brussels, Belgium, [2]RTS Corporation, Tokyo, Japan, [3]Svensk Solenergi, Stockholm, Sweden, [4]EC Joint Research Center, Brussels, Belgium, [5]APERe, Brussels, Belgium, [6]PA Energy, Copenhagen, Denmark, [7]UNEF, Madrid, Spain, [8]GSE, Rome, Italy

9:00 Overcoming Barriers To 100% Renewable Energy For Hawaii On The Utility Centralized Macro-Grid Level Starts At The Bottom Of The Energy Food Chain With Residential Islanded Nano-Grid And Everyday Lifestyle Behavioral Changes

John O Borland[1], Takahiro Tanaka[2]

[1]JOB Technologies, Aiea, HI, United States, [2]Tabuchi Electric , San Josee, CA, United States

9:15 Photovoltaics In Europe After The Paris Agreement

Arnulf J鬱er-Waldau, Thomas Huld, Sandor Szabo

European Commission, DG JRC, Ispar, Italy

9:30 150Gw By 2030 : Pv Market Outlook For Japan

Koichi SUGIBUCHI, Izumi KAIZUKA, Haruki YAMAYA, Takashi OHIGASHI, Osamu IKKI

RTS Corporation, Tokyo, Japan

9:45 Human Capital For The Global Pv Revolution: *Experiences With Online Bsc And Msc Education In Solar Energy Engineering*

Arno H.M. Smets

Delft University of Technology, Delft, Netherlands

10:00 – 10:30 AM	Grand Promenade
Coffee Break	

10:30 – 12:00 PM	King 1
Novel Material Systems	

Chair(s): Laurent Lombez

10:30 Deep Level Transient Spectroscopy Characterization Of $Basi_2$ Light Absorbers

Yudai Yamashita, Kaoru Toko, Takashi Suemasu
University of Tsukuba, Tsukuba, Japan

10:45 Liquid Phase Epitaxy Doping For High-Performance Emitters In Silicon Solar Cells

Tulika Rastogi, Ernesto Maga , Guillaume von Gastrow, David P. Fenning
University of California, San Diego, La Jolla, CA, United States

11:00 Screen Printed Contacts To Iii-V Epilayers For Low Cost Photovoltaics

Joshua D. Wood, Christopher L. Stender, Christopher T. Youtsey, David Rowell, Andree Wibowo, Mark Osowski, Noren Pan
MicroLink Devices, Inc., Niles, IL, United States

11:15 Direct Growth Of Thin Ge-On-Si Layer At Low Temperature As A Template For Lattice Matched Gaas Based Solar Cells

Ghada H. Dushaq[1], Amna Siddiqui [2], Ammar Nayfeh[2], Mahmoud Rasras[1]
[1]New York University, Abu Dhabi, United Arab Emirates, [2]Khalifa University of Science and Technology, Masdar Institute, Abu Dhabi, United Arab Emirates

11:30 Dc And Small Signal Ac Performance Analysis Of Ingan/Gan Multi-Quantum-Well Solar Cells Operated At Elevated Temperatures

Ehsan Vadiee[1], Alec Fischer[1], Evan Clinton[2], Heather McFavilen[3], Chantal Arena[3], Stephen Goodnick[1], Christiana Honsberg[1], Alan Doolittle[2]
[1]Arizona State University, Tempe, AZ, United States, [2]Georgia Institute of Technology, Atlanta, GA, United States, [3]Photonitride Devices, Tempe, AZ, United States

11:45 Order Parameter And Band Gap Of $Znsnn_2$

Robert A Makin[1], Krystal York[1], Steven M Durbin[1], Nancy Senabulya[2], James Mathis[2], Roy Clarke[2], Nathaniel Feldberg[3], Patrice Miska[3], Christina Jones[4], Logan Williams[4], Emmanouil Kioupakis[4], Roger Reeves[5], Tim Veal[6]
[1]Western Michigan University, Kalamazoo, MI, United States, [2]Department of Applied Physics, University of Michigan, Ann Arbor, MI, United States, [3]Universit□ de Lorraine, Institut Jean Lamour, Nancy, France, [4]Department of Materials Science and Engineering, University of Michigan, Ann Arbor, MI, United States, [5]School of Physical and Chemical Sciences, University of Canterbury, Christchurch, New Zealand, [6]University of Liverpool, Liverpool, United Kingdom

10:30 – 12:00 PM	Queen 5,6
Material Properties	

Chair(s): William N. Shafarman

10:30 Towards Grain Boundary Free Thin Films: Ultrafast Growth Of Cdte Single Crystals And Other Novel Grain Structures

Eric Colegrove[1], David S. Albin[1], Mahisha Amarasinghe[2], James M. Burst[1], Joel N. Duenow[1], Helio R. Moutinho[1], Wyatt K. Metzger[1]

[1]National Renewable Energy Laboratory (NREL), Golden, CO, United States, [2]University of Illinois at Chicago (UIC), Chicago, IL, United States

10:45 Doping Effects On Kesterites Other Than Alkalis

Sergio Giraldo[1], Markus Neuschitzer[1], Victor Izquierdo-Roca[1], Alejandro P駸ez-Rodr劭uez[1,2], Edgardo Saucedo[1]

[1]Catalonia Institute for Energy Research (IREC), Sant Adri□ de Bes (Barcelona), Spain, [2]IN2UB, Departament d脫nginyeria Electr ica i Biom鐵ica, Universitat de Barcelona, Barcelona, Spain

11:00 Microscopic Materials Properties Of A High-Efficiency Cu(In,Ga)Se_2 Solar Cell – A Case Study

Maximilian Krause[1], Aleksandra Nikolaeva[1], Wolfram Witte[2], Philip Jackson[2], Dimitrios Hariskos[2], Daniel Abou-Ras[1]

[1]Helmholtz-Zentrum Berlin, Berlin, Germany, [2]Zentrum f• Sonnenenergie- und Wasserstoff-Forschung Baden-W•ttemberg (ZSW), Stuttgart, Germany

11:15 Abnormal Grain Growth As Key Mechanism For Defect Annihilation During Cu(In,Ga)Se_2 Co-Evaporation

Roland Mainz[1], Helena Stange[2], Christian Kaufmann[1]

[1]Helmholtz-Zentrum Berlin f• Materialien und Energie GmbH, Berlin, Germany, [2]Technische Universit舩 Berlin, Institut f• Werkstoffwissenschaften, Berlin, Germany

11:30 Efficient Cdte Photovoltaics By Co-Passivating Grain Boundaries

Fatih G. Sen[1], Arun Kumar Mannodi-Kanakkithodi[1], Tadas Paulauskas[2], Ce Sun[3], Jinglong Guo[2], Luhua Wang[3], Jake Wands[4], Angus Rockett[4], Moon J. Kim[3], Robert F. Klie[2], Maria K.Y. Chan[1]

[1]Argonne National Laboratory, Lemont, IL, United States, [2]University of Illinois at Chicago, Chicago, IL, United States, [3]University of Texas at Dallas, Richardson, TX, United States, [4]Colorado School of Mines, Golden, CO, United States

11:45 Atomistic Insights Of Multiple Stacking Faults In Cdte Thin-Film Photovoltaics: A Dft Study

Michael J. Watts[1], Stephen R. Yeandel[1], Roger Smith[1], J. Michael Walls[2], Pooja M. Panchmatia[1]

[1]School of Science, Loughborough University, Loughborough, United Kingdom, [2]Centre for Renewable Energy Systems Technology, Loughborough University, Loughborough, United Kingdom

10:30 – 12:00 PM	Kona 4

Passivated Contacts and Carrier Selective Contacts: Materials and Processes

Chair(s): Yimao Wan

10:30 Engineering Of Thin Film Silicon Materials For High Efficiency Crystalline Silicon Solar Cells.

Matthieu Despeisse, Loris Barraud, Bertrand Paviet-Salomon, Antoine Descoeudres, Christophe Allebe, Christophe Ballif

CSEM SA, NEUCHATEL, Switzerland

10:45 Wide Band-Gap Silicon Based Layers For Heterojunction Solar Cells

Cao Yu, Miao Yang, Xiangang Chen, Hongfan Wu, Shihu Lan, Yongdeng Long, Yuanmin Li, Xixiang Xu

Beijing Juntai Innovation Technology Co., Ltd., Chengdu, China

11:00 Local Structure Of High Performance TiO_X Passivating Layer Revealed By Electron Energy Loss Spectroscopy

Takeya Mochizuki[1], Kazuhiro Gotoh[1], Akio Ohta[1,2], Yasuyoshi Kurokawa[1], Seiichi Miyazaki[1], Takahisa Yamamoto[1], Noritaka Usami[1]

[1]Graduate School of Engineering, Nagoya University, Nagoya, Japan, [2]Institute for Advanced Research, Nagoya University, Nagoya, Japan

11:15 Miracle: Material Independent Rear Passivating Contact Solar Cells Using Optimized Texture And Novel P^+Poly-Si Hydrogenation

Kees Tool[1], Maciej Stodolny[1], John Anker[1], Gaby Janssen[1], Martijn Lenes[2], Ingrid Romijn[1]

[1]ECN, Petten, Netherlands, [2]Tempress Systems Inc, Vaassen, Netherlands

11:30 Contact Resistivity Of N-Type Amorphous Silicon Electron Contacts In Silicon Heterojunction Solar Cells

William J. Weigand, Ashling (Mehdi) Leilaeioun, Tien Ngo, Stefen Mercado, Zachary C. Holman

Arizona State University, Tempe, AZ, United States

11:45 Application Of Carrier-Selective Passivating Contacts With Different Thermal Budgets In C-Si Front-Back Contacted (Fbc) And Ibc Solar Cells

Gianluca Limodio, Guangtao Yang, Paul Procel, Arthur Weeber, Olindo Isabella, Miro Zeman

Delft University of Technology, Delft, Netherlands

10:30 – 12:00 PM	Queens 4
Thin Films Characterization	

Chair(s): Mowafak Al-Jassim

10:30 Nanoscale Electronic Structure Characterization In Cigs With Electron Energy-Loss Spectroscopy

Julia I. Deitz[1], Pran K. Paul[2], Shankar Karki[3], Sylain Marsillac[3], Aaron R. Arehart[2], Tyler J. Grassman[1,2], David W. McComb[1]

[1]The Ohio State University, Department of Materials Science and Engineering, Columbus, OH, United States, [2]The Ohio State University, Department of Electrical and Computer Engineering, Columbus, OH, United States, [3]Old Dominion University, Department of Electrical and Computer Engineering, Norfolk, VA, United States

10:45 Optical Spectroscopic Probes Of Degradation And Metastability In Polycrystalline (Ag,Cu)(In,Ga)Se_2 Absorbers

Andrew J. Ferguson[1], Pat Dippo[1], Darius Kuciauskas[1], Rouin Farshchi[2], Jeff Bailey[2], Geordie Zapalac[2], Dmitry Poplavskyy[2]

[1]National Renewable Energy Laboratory, Golden, CO, United States, [2]MiaSol□ Hi-Tech Corp., Santa Clara, CA, United States

11:00 Junction Locations With Different Window-Layer Materials In Cu(In,Ga)Se_2 Solar Cell

C.-S. Jiang, L.M. Mansfield, S. Glynn, C. Xiao, M.M. Al-Jassim

National Renewable Energy Laboratory, golden, CO, United States

11:15 Understanding The Impact Of Nanoscale Compositional Variation On Cu(In,Ga)Se_2 Solar Cells Grown On Stainless Steel

Tara M. Nietzold[1], Michael Stuckelberger[1], Bradley M. West[1], Rouin Farshchi[2], Jeff Bailey[2], Dmitry Poplavskyy[2], Barry Lai[3], Mariana I. Bertoni[1]

[1]Arizona State University, Tempe, AZ, United States, [2]MiaSole Hi-Tech Corp., Santa Clara, CA, United States, [3]Argonne National Laboratory, Lemont, IL, United States

11:30 *In Situ* Quantification Of The Arsenic Content In Gaasp Graded Buffer Layers For Iii-V-On-Si Tandem Absorbers During Movpe Growth

Oliver Supplie[1], Alexander Heinisch[1], Masakazu Sugiyama[2], Thomas Hannappel[1]

[1]Ilmenau University of Technology, Ilmenau, Germany, [2]The University of Tokyo, Tokyo, Japan

11:45 Optical Hall Effect Of Pv Device Materials

Prakash Uprety, Changlei Wang, Prakash Koirala, Kiran Ghimire, Maxwell Junda, Yanfa Yan, Robert Collins, Nikolas Podraza, Dhurba Sapkota

University of Toledo, Toledo, OH, United States

10:30 – 12:00 PM	Kona 5
Reliability Topics	

Chair(s): Max K topp

10:30 The Effect Of Encapsulant Properties And Temperature Cycling On The Fracture Strength Of Encapsulated Solar Cells

Michael W. Rowell[1], Shandor G. Daroczi[1], Duncan J. Harwood[1], Andrew M. Gabor[2]

[1]D2Solar, San Jose, CA, United States, [2]BrightSpot Automation, Wesfford, MA, United States

10:45 Partial Shade Endurance Testing For Monolithic Photovoltaic Modules

Timothy J Silverman, Ingrid Repins

National Renewable Energy Laboratory, Golden, CO, United States

11:00 Degradation Studies Including Light-Induced Degradation Of C-Si Solar Cells With Nickel-Copper Plated Contacts

Joseph Karas[1], Lynne Michaelson[2], Krystal Munoz[2], Jim Rand[3], Stuart Bowden[1]

[1]Arizona State University, Tempe, AZ, United States, [2]Technic Inc., Cranston, RI, United States, [3]Core Energy Works, Newark, DE, United States

11:15 Combined-Accelerated Stress Testing System For Photovoltaic Modules

Sergiu V. Spataru[1], Peter Hacke[2], Michael Owen-Bellini[2]

[1]Aalborg University, Aalborg, Denmark, [2]National Renewable Energy Laboratory, Golden, CO, United States

11:30 Cross-Correlation Analysis Of The Indoor Accelerated And Real World Exposed Photovoltaic Systems Across Multiple Climate Zones

Jiqi Liu[1], Alan J. Curran[1], Justin S. Fada[1], Xuan Ma[1], Wei-Heng Huang[1], C. Birk Jones[2], Erdmut Schnabel[3], Michael K l[3], Jennifer L. Braid[1], Roger H. French[1]

[1]Department of Materials Science and Engineering, Case Western Reserve University, Cleveland, OH, United States, [2]Sandia National Laboratories, Albuquerque, NM, United States, [3]Fraunhofer Institute for Solar Energy Systems (ISE), Freiburg, Germany

12:00 – 1:00 PM	Monarchy Plenary
Closing Ceremony	

Chair(s): Alex Freundlich