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Boron doped microcrystalline hydrogenated silicon films prepared by photo-CVD for photovoltaic applications

Abhijit De, Sukriti Ghosh, Swati Ray and A.K.Barua
Energy Research Unit Indian Association for the Cultivation of Science, India

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Harin S. Ullal, Jack L. Stone, Kenneth Zweibel, Thomas Surek and Richard L. Mitchell
National Renewable Energy Laboratory, USA

Recent developments in CIS cell technology (invited)

Vijay K. Kapur
International Solar Electric Technology (ISET), USA

Analysis of CdTe-metal interface in thin film CdTe-CdS solar cells

O.M. Erickson, J.C. McClure* and V.P. Singh
Electrical Engg. Dept, USA, *Metallurgical and Material Engg. Dept, USA

Properties of Cu(In, Ga)Se_2 thin film surfaces and their relation to device performance

B. Dimmler, D. Schmid and H.W. Schock
Institut für Physikalische Elecktronik, Germany

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S. Purakayastha, B. Ghosh and M.K. Mukherjee
School of Energy Studies Jadavpur University, India

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C.P. Khattak and F. Schmid
Crystal Systems, Inc, USA

Development of silicon production processes at METKEM Silicon Ltd. (invited)

K.N. Ramanathan and H.S. Gopalakrishna Murthy
Metkem Silicon Limited, India

Silicon nitride AR coatings for low cost silicon solar cells

S. Narayanan, S. Roncin and J. Wohlgemuth
Solarex Corporation, USA

A new method of determination of the minority carrier diffusion length of a silicon solar cell using its spectral response

P.K. Basu, S.N. Singh, N.K. Arora and B. C. Chakravarty
National Physical Laboratory, India

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Gary J. Jones
Photovoltaic Systems Research Division Sandia National Laboratories, USA

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F.C. Treble
Consultant, UK

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Morton B. Prince
U.S. Department of Energy, USA

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Xun Zou and Pei-Nuo Yu*
Chinese Institute of Electronics, China, *Tianjin Institute of Power Sources, China

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S. Panyakeow
Semiconductor Device Research Laboratory, Thailand

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S.B. Saleh, Jalalur Rahman, Z.H. Mahmood, S.K. Ghafoor and S. Haider
Dept. of Applied Physics and Electronics, Bangladesh

Modeling of temperature dependence of power loss in solar cells

H.Saha*,S.Bandyopadhyay*,G.Bhattacharya*, U. Gangopadhyay*, K. Mukhopadhyay* and Swapan K. Datta**
*Department of Electronics & Telecommunication Engineering Jadavpur University, India, **Department of Physics, City College, India

Jahn-Teller effect in luminescence studies of solar energy photosensitizer semiconductor surfaces

B.D. Bhattacharyya
Physics Department, St.Xavier's College, India

Present outlook of solar grade silicon technology vis-a-vis PV industry

S. Deambi and A. Chaurey
Tata Energy Research Institute, India

Laser generation of multicrystalline silicon solar cell material

A.K. Shukla, H.S. Mavi, S.C. Abbi and K.P. Jain
Laser Technology Research Programme Indian Institute of Technology, India

Study of stability of multicrystalline silicon film

A.K. Shukla, H.S. Mavi, S.C. Abbi and K.P. Jain
Laser Technology Research Programme Indian Institute of Technology, India

Raman study of ion implanted-pulsed laser annealed silicon

P. Verma, S.C. Abbi and K.P. Jain
Laser Technology Research Programme Dept. of Physics Indian Institute of Technology, India

Atomic absorption spectrophotometric method for the determination of arsenic in semiconductor grade silicon

A.K. Sarkar, H.P. Gupta and D.C. Parashar
Chemistry Division, National Physical Laboratory, India

Growth of shaped polycrystalline silicon ingots in demountable reusable graphite molds

P.K. Singh, P. Prakash, R. Kishore, S.N. Singh and B.K. Das
Materials Division, National Physical Laboratory, India

Absolute spectral response for calibrating reference solar cell

Pei-Nuo Yu, Yu-Xue Wang* and Li-Bin Song*
Tianjin Institute of Power Sources, China, *National Solar Cells Measurement Centre, China

Process improvement in photovoltaic cell production line through defect analysis

V. Ramachandran, D. T. Barki and K.P. Raghunath
Electronics Division Bharat Heavy Electricals Limited, India

Bulk and surface contributions to enhanced solar-cell performance induced by aluminium alloying

P. Lölgen*, F.J. Bisschop*, W.C. Sinke**, R.A. Steeman**, L.A. Verhoef***, P.-P. Michiels*** and R.J.C. van Zolingen***
*FOM-Institute for Atomic and Molecular Physics, **Netherlands, Netherlands Energy Research Foundation ECN, Netherlands, ***R&S Renewable Energy Systems, Netherlands

Study of reverse conduction processes in C.E.L single crystalline silicon solar cells

R.V.R. Murty and V. Dutta
Photovoltaic Laboratory, Centre of Energy Studies Indian Institute of Technology, India

Growth of silicon nitride films on single crystalline and multicrystalline silicon solar cells using PECVD technique

Ram Kishore*, S.N. Singh*, B.K. Das* and V.K. Kaul**
*Division of Materials, National Physical Laboratory, India, **Central Electronics Ltd., India

Current status of FAST technology

F. Schmid, M.B. Smith and C.P. Khattak
Crystal Systems Inc., USA

Silicon nitride as an antireflection coating on silicon solar cells

S. Dayal, M. Mudholkar, G. C. Dubey, R.K. Purohit and A.K. Sreedhar
Solid State Physics Laboratory, India

Fabrication process of deep-junction silicon solar cells

Andrés Cuevas
Universidad Politécnica de Madrid Instituto de Energía Solar ETSI Telecomunicación, Spain

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Zhizhong Song, Fangqing Zhang, Yongping Guo and Guanghua Chen
Department of Physics Lanzhou University, China

Influence of annealing on the optical properties of indium tin oxide (ITO) thin films

M.A. Martinez, M. T. Gutierrez and J. Herrero
Instituto de Energías Renovables, CIEMAT Avda. Complutense, Spain

Parallel-connected tandem a-Si cell structure

Joze Furlan
Faculty of Electrical and Computer Engineering University of Ljubljana, Slovenia

The influence of various portions of DOS on a-Si solar cell performance

F. Smole
Faculty of Electrical and Computer Engineering University of Ljubljana, Slovenia

Interpretation of capacitance measurements on undoped a-Si:H

A. Rubino*, R. Buitrago**, U. Besi Vetrella*** and E. Terzini***
*Ansaldo S.p.A, Italy, **Departamento de Fisica Universidad Nacional, Argentina, *** ENEA-CRIF, C.P., Italy

Correlation of photosensitivity with defect concentration in a-$Si_{1-x}Ge_x$:H alloys

V.Kh. Kudoyarova, E.P. Milichevich and I. V. Shvedkov
A.F. loffe PTI Leningrad, USSR

Fast deposition of high quality amorphous silicon solar cells without powder formation

R. Tscharner*, D. Fischer*, H. Keppner*, A.V. Shah*, A.A. Howling**, J.-L. Dorier** and Ch. Hollenstein**
*Institut de Microtechnique Université de Neuchâtel, Switzerland, **CRPP/EPFL, Switzerland

Growth mechanism of p-type hydrogenated amorphous silicon carbide films prepared by plasma-CVD

P. Chaudhuri, Sukriti Ghosh and A.K. Barua
Energy Research Unit Indian Association for the Cultivation of Science, India

Properties and light induced degradation of a-Si:H films prepared at high deposition rates by plasma-CVD

S.C. Saha, Swati Ray and A.K. Barua
Energy Research Unit Indian Association for the Cultivation of Science, India

Computer modelling of the dependence of the J-V characteristics of a-Si:H solar cells on the front contact barrier height and gap state density

Parsathi Chatterjee
Energy Research Unit Indian Association for the Cultivation of Science, India

Ambipolar diffusion length in amorphous hydrogenated silicon

Enakshi Bhattacharya, G.Ravindra Kumar and Pratima Agarwal
Department of Physics Indian Institute of Technology, India

Study of light-soaking in hydrogenated amorphous silicon-germanium

G.H. Bauer, C.-D. Abel and G. Schumm
Institut fuer Physikalische Elektronik Universitaet Stuttgart. Germany

Effect of carbon grading and buffer layer at the P/I interface on the performance of P-I-N amorphous silicon solar cells

P.N. Dixit, O.S. Panwar, B.S. Satyanarayan, Tanay Seth, R. Bhattacharya and V. V. Shah
Thin Film & Amorphous Materials Group National Physical Laboratory, India

Role of P-layer grown using different source gas combinations for the improvement of P-I-N hydrogenated amorphous silicon solar cells

P.N. Dixit, O.S. Panwar, R. Bhattacharya and V. V. Shah
Thin Film & Amorphous Materials Group National Physical Laboratory, India

Studies on the defect and tail states of a good quality a-$Si_{1-x}Ge_x$:H material prepared by RF glow discharge method

J.K. Rath, A.R. Middya and Swati Ray
Energy Research Unit Indian Association for the Cultivation of Science, India

A comparative study of conducting CdO films deposited by chemical spray and activated reactive evaporation techniques

C. Sravani, K. T.R. Reddy, P.S. Reddy and P. Jayarama Reddy
Department of Physics Sri Venkateswara University, India

Photovoltaic and electronic properties of LPCVD deposited amorphous and microcrystalline Si thin film-single crystal Si heterostructures

P.K. John*, B. Y. Tong*, S.K. Wong* and AC. Rastogi**
*Department of Physics and Centre for Chemical Physics University, Canada, **Materials Division, National Physical Laboratory, India

Photoinduced deposition and characterization of a-Si:H layers and its doping using monosilane

R.A Singh, S. Pal, G.C. Dubey, R.K. Purohit and AK. Sreedhar
Solid State Physics Laboratory, India

Non-resonant spin-dependent transport in amorphous silicon photocells

M. Bhatnagar and I. Solomon
Ecole Polytechnique Laboratoire de la Matière Condensée, France

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V.M. Andreev
A.F.loffe Physico-Technical Institute Leningrad, USSR

High efficiency tandem GaAs/GaSb concentrator solar cells (invited)

V.S. Sundaram, L.M. Fraas, P.E. Gruenbaum, J.E. Avery, E. Malocsay and MS. Kuryla
Boeing High Technology Center, USA

High efficiency GaAs solar cells (invited)

J.G. Werthen, M. Ladle Ristow, K.R. Wickham and MS. Kuryla
Varian Research Center, USA

GaAs/Si tandem solar cell by MOCVD (invited)

Masayoshi Umeno
Dept. of Electrical and Computer Engineering Nagoya Institute of Technology, Japan

Status and future directions in InP solar cell research

R.K. Jain and I. Weinberg
NASA Lewis Research Center, USA

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Recent advances in wide and narrow gap amorphous silicon alloys (invited)

A.K. Barua
Energy Research Unit Indian Association for the Cultivation of Science, India

Photo-CVD processing for amorphous silicon solar cells (invited)

Makoto Konagai*, Katsuya Tabuchi*, Wilson W*. Wenas*, Masahiro Yoshino**, Koeng Su Lim***, Akira Yamada* and Kiyoshi Takahashi*
*Dept. of Electrical and Electronic Engineering Tokyo Institute of Technology, Japan, **YKK Corporation Machinery Dept., Japan, ***Korea Advanced Institute of Science & Technology, Korea

Structural relaxation of a-SiGe:H films at low temperature by hydrogen dilution and lowering of deposition rate

A.R. Middya, S.C. De, Swati Ray and AK. Barua
Energy Research Unit Indian Association for the Cultivation of Science, India

The defect pool model: implications on photoconductivity and recombination in a-Si:H

G.H. Bauer, G. Schumm and C.-D. Abel
Institut für Physikalische Elektronik, Germany

Photochemical and radical assisted chemical formation of amorphous silicon films

F.J. Comes, S. Chiussi and A Roth
Institut für Physikalische und Theoretische Chemie Johann Wolfgang Goethe - Universität, Germany

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Amorphous silicon based triple junction solar cells and modules:status and challenges (invited)

R.R. Arya, A Catalano and D.E. Carlson
Solarex Corporation, Thin Film Division, USA

a-Si//poly-Si four terminal stacked solar cell having an efficiency more than 19%

W. Ma, T. Horiuchi, M. Yoshimi, K. Hattori, H. Okamoto and Y. Hamakawa
Faculty of Engineering Science, Japan

High efficiency a-Si and a-Si alloy solar cells

H. Nishiwaki, M. Ohnishi, H. Haku, H. Dohjoh, K. Sayama, Y. Hishikawa, Y. Nakashima, K. Wakisaka, S. Tsuda, S. Nakano, Y. Kishi and Y. Kuwano
Functional Materials Research Center Sanyo Electric Co. Ltd., Japan

The role of hydrogen in the light induced metastable defect formation in amorphous silicon films deposited at different temperatures

Ratnabali Banerjee, Sukriti Ghosh, A.K. Bandyopadhyay, A.K. Batabyal and A.K. Barua
Energy Research Unit Indian Association for the Cultivation of Science, India

Preparation of high conductivity and large band gap P-type a-Si:H films produced by high hydrogen dilution of silane at low RF power

Mohammad Faraji*, S. V. Rajarshi*, S. V. Ghaisas**, S. T. Kshirsagar*** and V. G. Bhide*
*School of Energy Studies, University of Poona, India, **Dept. of Electronic Science University of Poona Pashan, India, ***National Chemical Lab, India

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Residential photovoltaic system with an air conditioner

M. Hasunuma, A. Takeoka, Y. Fukuda, M. Suzuki, E. Sakoguchi, H. Tokizaki, K. Wakisaka, Y. Kishi and Y. Kuwano
Functional Materials Development Center Sanyo Electric Co. Ltd., Japan

Performance of amorphous silicon PV modules and arrays in Florida

Gobind H. Atmaram* and Bill Marion**
*Florida Solar Energy Center, USA, **National Renewable Energy Laboratory, USA

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Masafumi Yamaguchi
NTI Opto-electronics Laboratories, Japan

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D.J. Flood
National Aeronautics and Space Administration Lewis Research Center, USA

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Takashi Goto
Sunshine Project Promotion HQ Agency of Industrial Science and Technology (AIST), Japan

Photovoltaic R&D in the Federal Republic of Germany (invited)

A. Räuber* and K. Wollin**
*Fraunhofer-Institut für Solare Energiesysteme, Germany, **Bundesministerium für Forschung und Technologie, Germany

Photovoltaic programme of France (invited)

A. Claverie, B. Chabot and A. Anglade
Agence de l'Environnement et de la Maîtrise de l'Energie(Environment & Energy Management Agency)New Technologies Division, France

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Effect of dust on the performance of PV panels

P.C. Pande
Central Arid Zone Research Institute, India

Experimental evaluation and reduction of string -losses in photovoltaic modules

D. T. Barki, B. Umeshchandra and V. Ramachandran
Electronics Division Bharat Heavy Electricals Limited, India

Energy investments and production costs of amorphous silicon PV modules

K.S. Srinivas*, M. Vuknic**, R. Tscharner*** and A.V. Shah***
*On leave of absence from BHEL, Bangalore, India, **Rade-Koncar Solar Cells Div. Split, Yugoslavia, ***Institut de Microtechnlque. Université de Neuchâtel, Switzerland

Shadow effect in the field of large PV arrays

M. C. Bhatnagar* and J.C. Joshi**
*Physics Department Indian Institute of Technology, India, **Centre for Energy Studies Indian Institute for Technology, India

Effect of boosting mirror on solar cell modules

M. C. Bhatnagar* and J.C. Joshi**
*Physics Department Indian Institute of Technology, India, **Centre for Energy Studies Indian Institute of Technology, India

Performance analysis of crystalline and amorphous silicon photovoltaic modules in Virginia

S. Rahman and B.O. Kroposki
Energy Systems Research Laboratory Bradley Department of Electrical Engineering Virginia Polytechnic Institute and State University, USA

Abnormal output of PV modules used in village electrification system caused by lightning strike

Abubakar Lubis, Zanggischan Udin* and Kemala Cita*
*Directorate Coversion and Conservation Energy Energy Technology Laboratory, Indonesia, Agency for the Asessment and Application of Technology(BPP Teknologi), Indonesia

A PC based maximum power point tracking system

Nilanjan Bhowmik and V. G. Rau
Energy Systems Laboratory Dept. of Electrical Engineering Indian Institute of Technology, India

Performance evaluation of PV power packs

A. Chaurey, S. Deambi, P.M. Sadaphal and D. Tyagi
Tata Energy Research Institute, India

Comparison of commercially available PV batteries in India

A Chaurey and S. Deambi
Tata Energy Research Institute, India

A hybrid photovoltaic thermal solar water heater

H.P. Garg* and R.K. Agarwal**
*Head, Centre of Energy Studies Indian Institute of Technology, India, **Delhi Energy Development Agency, India

Performance of solar panel considering the effect of shadow

A. Gupta and S. Kumar
Physics Group, BITS, India

Development of efficient and reliable charge controller (12V/5A)

P.R. Mishra*, A.K. Pandey* and J.C. Joshi**
*Instruments and Systems Division, Central Electronics Limited, Sahibabad (U.P.), India, **Centre of Energy Studies, Indian Institute of Technology, India

A PV power driven small water pump controlled by a maximum power point tracker

S. Haider, R.K. Mazumdar, Zahid Hasan Mahmood and S.K. Aditaya
Dept. of Applied Physics and Electronics University of Dhaka, Bangladesh

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Saturation behavior of solar cell efficiency due to light soaking under different wavelengths for a-Si:H cells made by high deposition rate VHF-GO

H. Keppner, P. Fath, D. Fischer, N. Pellaton, A Mettler, R. Tscharner and A Shah
Institut de Microtechnique, Switzerland

Effect of various process parameters on the properties of hydrogenated amorphous silicon germanium films grown in a multizone plasma CVD reactor

O.S.Panwar, P.N. Dixit and R. Bhattacharyya
Thin Film & Amorphous Materials Group National Physical Laboratory, India

Remarkable changes in film properties by low level of Ge incorporation into a-Si:H network

S.C. De and Debajyoti Das
Energy Research Unit Indian Association for the Cultivation of Science. India

Improvement of mobility-lifetime product of holes in a-SiGe:H alloys prepared with hydrogen dilution

P. Chaudhuri, AR. Middya and Swati Ray
Energy Research Unit Indian Association for the Cultivation of Science, India

Diagnostic of silane plasma using hot Langmuir electrical probe Zhonghe Xi, Xiaolin Zhang, Guanghuai Zhang, Jiwen Yan, Ziguang Shi,

Zhonghe Xi, Xiaolin Zhang, Guanghuai Zhang, Jiwen Yan, Ziguang Shi*,Jianfang Hu** and Hongyi Lin***
*Peking University, Radio-Electronics Dept., China, **Central Institute of Nationalities Physics Dept., China, ***Beijing Institute of Technology Electronics Dept., China

Extrapolation to standard test conditions of I-V characteristics of a-Si solar cells: applicability and comparison to c-Si devices

F. Fabero, M. C. Alonso, N. Vela and F. Chenlo
CIEMAT-Instituto de Energias Renovables Avda., Spain

Amorphous hydrogenated silicon carbide p doped by ion implantation and by gas phase

F. Demichelis*, C.F. Pirri*, E. Tresso*, R. Galloni**, P. Rava*** and R. Dusane****
*Dipartimento di Fisica, Politecnico C, Italy, **Laboratori LAMEL CNR, Italy, ***Elettrorava S.p.A., Italy, ****Department of Physics, Univ. of Pune, India

Design of plasma deposition systems for producing a-Si:H devices

R. Martins, I. Ferreira, N. Carvalho and L. Guimaraes
Dept. of Materials Science Faculty of Science and Technology of New University of Lisbon, Portugal

Interface characterization of a-Si:H devices by spectral photovoltage technique (SPT)

E. Fortunato, M. Vieira, R. Martins and L. Guimarães
Dept. of Materials Science Faculty of Science and Technology of New University of Lisbon, Portugal

Role of hydrogen plasma on the structural and electro-optical properties of transparent conductive oxides

C. Carvalho, E. Fortunato, M. Vieira, R. Martins, B. Fernandes and L. Guimarães
Dept. of Materials Science Faculty of Science and Technology of New University of Lisbon, Portugal

Comparative study of DOS in amorphous silicon by SCLC and by C(T) measurements

E. Fortunato*, L. Rodrigues*, C. Carvalho*, R. Martins*, L. Guimarães* and A. Amaral**
*Dept. of Materials Science Faculty of Science and Technology of New University of Lisbon, Portugal, **Instituto Superior Técnico da Universidade Técnica de Lisboa, Portugal

Admittance spectroscopy techniques to analyse the evolution of the deep gap states in amorphous silicon films produced by PECVD

A. Amaral*, L. Rodrigues**, R. Martins**, L. Guimarães**, D. Mencaraglia***, J.P. Kleider***, Z.Djebbour*** and C.Longeaud***
*Dept. Física, Instituto Superior Técnico Av. Rovisco Pais, Portugal, **Dept. de Ciências dos Materiais, Faculdade de Ciências e Tecnologia, Portugal, ***Laboratoire de Génie Electrique de Paris Universités Paris VI et Paris XI, École Supérieure d'Electricité, France

Recombination and collection in a-Si:H p-i-n solar cells

A.V. Shah, J. Hubin and E. Sauvain
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Characterization of thermally deposited WO_3 films for PEC applications

S.L. Agrawal*, R.K. Dwivedi** and R.P. Singh**
*Physics Department A.P.S. University, Rewa (M.P.), India, **Physics Department, B.H.U. Varanasi (U.P.), India

Effect of doping and lifetime on efficiency of TPV cells

T.K. Chaudhuri and S. Chatterjee
Engineering R&D Wing Mecon (India) Ltd., India

High efficiency Ru-modified GaAs PEC solar cell

D.N. Bose and S. T. Ali
Semiconductor Division Materials Science Centre Indian Institute of Technology, India

Structural dependence of the photoconduction and photovoltaic behavior of merocyanine dyes-1

H.O. Yadav*, P.K.N. Raghavan*, T.S. Varadarajan*, M. Mohanty**, B.N. Patnaik** and L.N: Patnaik**
*Centre for Advanced Studies in Applied Chemistry University Dept. of Chemical Technology, India, **Chemistry Department Ravenshaw College, India

Spray pyrolysis process study of SnO_2/(111)N-Si solar cell

H. H. Afifi*, S.H. El-Hefnawi** and A.Y. Eliwa**
*Solid State Physics Dept. National Research Center (NRC), Egypt, **Photovoltaic Cells Dept. Electronics Research Center (NRC), Egypt

LPE growth of $In_{1-x}Ga_xAs$ and application to PEG solar cells

A. Kumar, S. T. Ali and D.N. Bose
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Wet photovoltaic solar cells with electrodeposited zinc mercury selenide

C. Natarajan and Maheshwar Sharon
Department of Chemistry Indian Institute of Technology, India

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■ Session 13-2A: POLYCRYSTALLINE SILICON SOLAR CELLS

Thin polycrystalline silicon solar cells on low cost substrates (invited)

Alien M. Barnett*, Robert B. Hall**, James A. Rand** and William R. Bottenberg**
*Electrical Engineering Department, University of Delaware Newark, USA, **Astro Power, Inc., Solar Park Newark, USA

Improvements in large area multicrystalline silicon solar cells (invited)

H. Watanabe
Kyocera Corporation, Japan

Polycrystalline silicon thin-film solar cells prepared by a new solid phase crystallization (SPC) method

T. Matsuyama, M. Sasaki, M. Tanaka, K. Wakisaka, S. Tsuda, S. Nakano, Y. Kishi and Y. Kuwano
Functional Materials Research Center, Sanyo Electric Co. Ltd., Japan

Efficient optical design of polycrystalline silicon solar cells

P. Campbell
School of Electrical Engineering University of N.S.W. Australia

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Advances in space photovoltaics (invited)

K. Kasturirangan, B.L. Agrawal, N. Srinivasamurthy and S.K. Sharma
ISRO Satellite Centre Airport Road, India

Qualification testing of flexible amorphous silicon modules

P. Nath, K. Hoffman, J. Call and C. Vogeli
United Solar Systems Corporation, USA

Modified open loop control for tracking photovoltaic system

A.K. Saxena and V. Dutta
Photovoltaic Laboratory, Centre of Energy Studies Indian Institute of Technology, India

Project and installation of a PV power plant for multi applications based on PV concerted actions and results

L. Guimarães, Peter Helm, A. Ribas, H. Ehmann, A. Hanel and R. Martins
Dept. of Materials Science Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa, Portugal

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Measurement of solar cell performance parameters (invited)

K.A. Emery
National Renewable Energy Research Laboratory, USA

Modeling of a front illuminated n^+-p-p^+ silicon solar cell for high concentrated sunlight (invited)

S.K. Sharma, P.K. Singh, S.N. Singh and B.K. Das
Division of Materials, National Physical Laboratory, India

Computer modeling of solar cell structures (invited)

F.A. Rubinelli, S.J. Fonash and J.K. Arch
Center for Electronic Materials and Processing The Pennsylvania State University, USA

A decoupled technique for numerical analysis of solar cells

J. C. Jimeno, C. lcaran and S. Uriarte
Dpto. Automática, Electrónica y Telecomunicación ETSIIIT de Bilbao, Universidad del País Vaco Alda. de Urquijo s/n, Spain

Diffusion length in photovoltaic cells from photocurrent-capacitance measurements

C.H. Champness and C.H. Chan
Department of Electrical Engineering Mcgill University, Canada

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MOCVD of compound semiconductors for photovoltaics (invited)

A. Rohatgi and R. Sudharsanan
School of Electrical Engineering Georgia Institute of Technology, USA

GaAs-on-Si solar cell structures grown by MBE and LPE

A. Bett, K. Borgwarth, Ch. Schetter, O. V. Sulima and W. Wettling
Fraunhofer-Institut für Solare Energiesysteme, Germany

The design and fabrication of polycrystalline thin-film $CuInSe_2$ and Cu{In, Ga)Se_2-based photovoltaic materials and devices

J.R. Tuttle, D.S. Albin, R. Noufi and S.K. Deb
National Renewable Energy Laboratory (NREL), USA

Characterization of polycrystalline thin film n-$Zn_{0.35}Cd_{0.65}S$/p-$CuGa_{0.5}In_{0.5}Se_2$ heteroj unctions

Y. Aparna, P. Sreedhara Reddy, S. Uthanna, B. Srinivasulu Naidu and P. Jayarama Reddy
Department of Physics Sri Venkateswara University, India

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■ **Session 14-0A: PLENARY SESSION-IV**

High efficiency silicon solar cells (invited)

MA. Green, S.R. Wenham, J. Zhao, A. Wang, F. Yun and P. Campbell
Centre for Photovoltaic Devices and Systems, Australia

II-VI semiconductors for photovoltaics-A critical review (invited)

Y. Marfaing
Laboratoire de Physique des Solides de Bellevue, France

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■ **Session 14-1A: PV DEVICES, SYSTEMS AND PROGRAMS**

Properties of hydrogenated amorphous silicon produced at high temperature

R.S. Crandall*, A.H. Mahan*, B. Nelson*, M. Vanecek** and I. Balberg***
*National Renewable Energy Laboratory, USA, **Institute of Physics, Czechoslovakia, ***The Racah Institute of Physics The Hebrew University, Israel

Solar lanterns: problems and prospects

B. Bhargava and E.V.R. Sastry
Department of Non-conventional Energy Sources,, India

Spectral effects on PV-device efficiency at different sites

S. Nann, A. Bakenfelder and F. Pfisterer
Centre for Solar Energy and Hydrogen Research (ZSW), Germany

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■ **Poster Session 14-PC: PV MODULES AND SYSTEMS-II**

Optical and thermal performance of N-S orientation E-W tracking composite parabolic concentrator for photovoltaic and thermal application

J.C. Joshi and MP. Singh
Photovoltaic Laboratory, India

Design and development of solar PV systems for crop protection

P.C. Pande
Central Arid Zone Research Institute, India

Solar PV lantern for rural usage

K. Mukhopadhyay, G. Bhattacharya, A. Mondol and H. Saha
Department of Electronics & Telecommuncation Engineering Jadavpur University, India

Evaluation of outdoor performance of polycrystalline silicon photovoltaic panels

V. Ramamurthy, (Mrs)P. Tiku, V. Radha Mohan and M.U.B. Rao
Materials Science Laboratory, India

A novel approach for performance asessment of PV D.C. drives

Yash Pal Singh and V. G. Rau
Energy Systems Laboratory, India

Status of photovoltaic programme in Himachal Pradesh

S.S. Chandel
Solar Energy Research Group, India

PV water pumping and PV battery charging stations in the green project of Thailand

Wandee Khunchornyakong
Solartron Co. Ltd, Thailand

Designing versatility of photovoltaic water pump

P.K. Koner*, J.C. Joshi* and K.L. Chopra**
*Photovoltaic Laboratory, Centre of Energy Studies Indian Institute of Technology, India, **Indian Institute of Technology, India

Identification of strategic approaches for PV development in India

S. Deambi
Tata Energy Research Institute, India

Application of photovoltaics for Indian Railways

O.S. Sastry and N.P. Singh
Department of Nonconventional Energy Sources Ministry of Power & Nonconventional Energy Sources, India

Solar photovoltaic pumpimg systems in India-field experience with 10 installations

Svend Erik Mikkelsen
COWlconsult. Consulting Engineers and Planners AS, Denmark

Important aspects of configuring stand-alone solar photovoltaic water pumping installations to achieve high reliability and system efficiency

V. Balasubramanian
Radio Astronomy Centre. Tata Institute of Fundamental Research, India

Performance of modules and evaluation of some photovoltaic systems

S.K. Srivastava, O.P. Singh and G.N. Pandey
Department of Applied Sciences (Energy Lab.) Institute of Engineering & Technology. India

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■ Poster Session 14-PD: COMPOUND SEMICONDUCTOR MATERIALS AND SOLAR CELLS

Preparatory aspects of electrophoretically deposited CdS-CdTe devices

P.C. Pande
Central Arid Zone Research Institute, India

Chemical bath deposition of CdS thin films, electrochemical in-situ kinetic studies

J.M. Doña and J. Herrero
Instituto de Energías Renovables - CIEMAT, Spain

Performance of n-ZnO/p-$CuGaSe_2$ thin film solar cells

H. Gopalaswamy and P. Jayarama Reddy
Dept. of Physics S.V. University, India

A P-1-N heterojunction model for the thin film [CdS/Cu_2S] solar cell

S.A. AI Kuhaimi
Physics Department Gulf College of Education, Saudi Arabia

Grain boundary scattering in ZnO and $CuInSe_2$

K.K. Chattopadhyay, D. Bhattacharyya, S. Chaudhuri and A.K. Pal
Department of Materials Science Indian Association for the Cultivation of Science, India

Chemical bath deposition of CdS on $CuInSe_2$, etching effects and growth kinetics

J. Kessler*, K.O. Velthaus*, M. Ruckh*, R. Laichinger*, H. W. Schock*, D. Lincot**, R. Ortega** and J. Vedel**
*Institut für Physikalische Elektronik Universität Stuttgart, Germany, **Laboratoire d'Electrochimie Analytique et Appliquee (ENSCP), France

Electroplated CdS thin films

S.N. Qiu and I. Shih
Department of Electrical Engineering McGill University, Canada

Adhesion-free ingots of Bridgman-grown $CuInSe_2$

L.S. Yip, Z.A. Shukri, I. Shih and C.H. Champness
Department of Electrical Engineering McGill University, Canada

Majority and minority carrierμτproducts in a-Si:H- Results from a recombination model with correlated defects

E. Morgado
Centro de Física Molecular das Universidades de Lisboa Instituto Superior Técnico, Technical University of Lisbon, Portugal

The GaAs solar array of the arsene spacecraft

B. Bolani*, C. Flores*, F. Paletta*, D. Passoni*, A. Tosoni*, L. Brambilla**, A. Caon**, R. Contini**, G.D' Accolti**, E. Rossi** and F. Viola***
*Cise SpA v., ltaly, **Fiar Spa v. Montefeltro, Italy, ***ASI vi. Regina Margherita, Italy

$CuInSe_2$ films and devices obtained by a two-stage process

Bülent M. Basal
International Solar Electric Technology (ISET), USA

Improvement of PV-performance by partly structured surfaces

S. Krauter and R. Hanitsch
Technical University of Berlin, Germany

1 MW photovoltaic power plant, TOLEDO PV 1-state of the project

E. Medina, J. Villa and B. Yordi
Unión Eléctrica Fenosa (UEF), Spain

Novel deposition technique and device design for stable a-Si solar cells

Vikram L. Dalal
Iowa State University Dept. of Electrical Engineering, USA

Efficient sizing techinques for solar cells

G.Jayaprakash Babu* and A. Obul Reddy**
*Research Scholar, Dept. of Physics, S.V. University, India, **Scientist/Engineer "SD" E.T.D.C. STQC Dte, DoE, India

Ohmic contact formation to GaAs and Si by laser irradiation for solar cells

A. V. Chankin*, G.N. Mikhailova*, A.S. Seferov*, A. Dhaul**, I. Chandra**, Ramesh Chandra** and V.K. Jain**
*Institute of General Physics, USSR, **Solid State Physics Laboratory, India

The study of microstructures in hydrogenated amorphous silicon prepared by novel fabrication methods

K.C. Hsu, C.S. Hong and H.L. Hwang
Dept. of Electrical Engineering, National Tsing-Hua Univ., China

Intensity induced errors for IV-curve measurement of different types of large area a-Si modules

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Siemens Solar GmbH, Germany

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