



PVSEC-3 (1987) / Tokyo, Japan

	International PVSEC-3 Committees
	Acknowledgement
	Chairman's Message Kiyoshi Takahashi
	Foreword Taneo Nishino

[▲ Back to TOP](#)

■ Opening Session

A-O-1	Opening remarks K. Takahashi, General Chairman Tokyo Inst. of Technology, Japan
A-O-2	Welcome address T. Sugano President of Japan Society of Applied Physics
A-O-3	Opening speech R.H. Annan prospective D.O.E., U.S.A.

[▲ Back to TOP](#)

■ Plenary Lecture-I

PL-I-1	Photovoltaic R&D programs in the U.S M.B. Prince D.O.E., U.S.A.
PL-I-2	Photovoltaic R&D programs in the European Community W. Palz EC, Belgium
PL-I-3	Photovoltaic R&D programs of Japanese sunshine project S. Marukawa MITI, Japan

[▲ Back to TOP](#)

■ Amorphous Silicon Materials-I

A-IP-1	Photochemical vapor deposition for a-Si solar cells M. Konagai Tokyo Inst. of Technology, Japan
A-IP-2	Properties of a-Si:H by direct photo-decomposition of Si₂H₆ using vacuum ultra violet light T. Fuyuki, K.-Y. Du, S. Okamoto, S. Yasuda, T. Kimoto, M. Yoshimoto and H. Matsunami Kyoto Univ., Japan
A-IP-3	High-quality a-Si films prepared at high deposition rate by controlled plasma magnetron (CPM) method

	M. Ohnishi*, K. Uchihashi, H. Nishiwaki, H. Shibuya*, M. Tanaka, K. Ninomiya, M. Nishikuni, N. Nakamura, S. Tsuda, S. Nakano and Y. Kuwano Research Center, *Applied Research Center, Sanyo Electric Co., Ltd., Japan
A-Ip-5	Deposition process and film properties of a-Si alloy films by ECR plasma CVD Y. Ichikawa, K. Aizawa, H. Shimabukuro, Y. Nagao and H. Sakai Fuji Electric Corporate R&D, Ltd., Japan
A-Ip-6	Control of optical band gap of amorphous silicon by catalytic chemical vapor deposition method H. Matsumura Hiroshima Univ., Japan
A-Ip-7	Characterization of a-Si: H/a-Si_{1-x}C_x: H multi-layers H. Itoh, S. Matsubara, S. Muramatsu, N. Nakamura and T. Shimada Central Res. Lab., Hitachi, Ltd., Japan

[▲ Back to TOP](#)

■ Amorphous Silicon Materials-II

A-Ip-8	Preparation and properties of high-quality p-type a-SiC materials for a-Si solar cells H. Tarui, T. Matsuyama, S. Okamoto, Y. Hoshikawa, H. Dohjo, N. Nakamura, S. Tsuda, S. Nakano, M. Ohnishi* and Y. Kuwano Research Center, *Applied Research Center, Sanyo Electric Co., Ltd., Japan
A-Ip-9	Amorphous silicon carbide window layers doped by plasma assisted boron diffusion H.D. Mohring, G. Bilger, C.E. Nebel, S.M. Paasche, F. Kessler, M.B. Schubert, G. Schumm, H.C. Weller, G.H. Bauer and W.H. Bloss Univ. of Stuttgart, F.R.G.
A-Ip-10	Characterization of high-conductive p-type a-Si:H produced by highly hydrogen dilution K. Hanaki, T. Hattori and Y. Hamakawa* Nippon Soken Inc. *Osaka Univ., Japan
A-Ip-11	a-SiGe: H alloys with multi-structure of monolayer a-Si:H/monolayer a-Ge(Si) :H T. Ichimura, A. Asano, T. Hama, H. Ohsawa, H. Sakai and Y. Uchida Fuji Electric Corporate R&D, Ltd., Japan
A-Ip-12	IR study of a-SiGe:H films prepared by a microwave excited plasma CVD method T. Watanabe, K. Azuma, M. Tanaka, M. Nakatani, T. Sonobe* and T. Shimada** Prod. Eng. Res. Lab., *Hitachi Works, **Central Res. Lab., Hitachi, Ltd., Japan
A-Ip-13	Opto-electronic properties of amorphous Si_{1-x}Ge_x:H films prepared by de glow discharge A. Catalano, J.L. Newton, R.R. Arya and S. Wiedeman Solarex Thin Film Division, U.S.A.
A-Ip-14	Photoelectron emission study of boron-doped μC Si:H.65 H. Sasaki, K. Kawabata, T. Itagaki, K. Okaniwa, K. Sato, M. Aiga and M. Otsubo LSI R&D Lab., Mitsubishi Electric Corp., Japan

[▲ Back to TOP](#)

■ Single Crystal Silicon Solar Cells

B-Ip-1	High efficiency crystalline silicon solar cell R.M. Swanson Stanford Univ., U.S.A.
B-Ip-2	Characterization of 20%-efficient surface-passivated silicon solar cells T. Umematsu, Y. Kida* and T. Saitoh Central Res. Lab., *Hitachi Works, Hitachi, Ltd., Japan
B-Ip-3	High efficiency and high blue response silicon solar cells Q. Jia and E. Liu Xian Jiaotong Univ., Xian, China
B-Ip-4	Evaluation of n⁺-p and p-p⁺ junction fabricated by ion implantation and RTA, and its application to BSF silicon solar cells

	A. Usami, M. Nakamura, K. Aoyama* and T. Wada Nagoya Inst. of Technology *Aichi Electric Co., Japan
B-IP-5	Performance simulation of high-efficiency, medium resistivity silicon solar cells T. Saitoh, T. Uematsu, K. Matsukuma* and K. Morita** Central Res. Lab., *Hitachi Works, Hitachi, Ltd. **Kumamoto Inst. of Technology, Japan

[▲ Back to TOP](#)

■ Poly crystalline Silicon Solar Cells

B-IP-6	Solar cells using spinning Si polycrystals Y. Maeda and I. Hide Hoxan Res. Labs., Hoxan Corp., Japan
B-IP-7	Improvement in casting of polycrystalline silicon for solar cells J.H. Wohlegemuth and R.K. Brennenman Solarex Corp., U.S.A.
B-IP-8	Large area high efficiency multicrystal silicon solar cell K. Shirasawa, K. Okada, K. Fukui, M. Hirose and H. Watanabe Kyocera Corp., Japan
B-IP-9	High efficiency processing of polycrystalline solar cells S. Narayanan and M.A. Green Univ. of New South Wales, Australia
B-IP-10	E.P.R. ribbon solar cells R. M'Ghaieth, R. Gauthier, D. Chambonnet and P. Pinard Institut National des Sciences Appliquees de Lyon, France
B-IP-11	12% efficient thin silicon-film solar cells on low cost substrates A.M. Barnett, J.A. Rand*, R.B. Hall* and D.A. Fardig* Univ. of Delaware *Astrosystems, Inc., U.S.A.

[▲ Back to TOP](#)

■ National Project

C-IP-1	Photo-voltaic R&D programs in Indonesia M. Barmawi ITB, Indonesia
C-IP-2	Recent advances and future of photovoltaic research and development in People's Republic of China W.T. Li, R.Q. Cui, J.H. Yang and R.G. Cheng Chinese Solar Energy Society Beijing, China

[▲ Back to TOP](#)

■ National Programs and Activities

C-IP-3	The photovoltaic program in India E.V.R. Sastry Dept. of Non-Conventional Energy Sources, Government of India, India
C-IP-4	Photovoltaic generators for rural electrification: status and achievements in France A. Claverie French Agency for Energy Management, France
C-IP-5	Present status and future direction of solar cell manufacturing technology in Japan S. Marukawa, J. Shigeta*, T. Segawa*, J. Matsumoto* and S. Wakamatsu* Sunshine Project Promotion HQ., MITI *NEDO, Japan
C-IP-7	Crystalline cell research status and direction D.E. Arvizu Sandia National Labs., U.S.A.
C-IP-8	Mechanically stacked, multijunction solar cells: an update on Sandia programs

	J.M. Gee and D.L. King Sandia National Labs., U.S.A.
C-Ip-9	Impacts of photovoltaic applications to rural development in Thailand K. Chalermtiragool, C. Antarasena, B. Toprasertpong, M. Sawadsaringkarn and S. Panyakeow Chulalongkon Univ., Thailand
C-Ip-10	Indoor qualification of PV modules in Spain F. Chenlo, P. Roman and L. Delgado CIEMAT, Spain

[▲ Back to TOP](#)

■ Plenary Lecture-II

PL-II-1	Recent advance in solar cell technology Y. Hamakawa Osaka Univ., Japan
PL-II-2	Improvements in silicon non-concentrating solar cells M.A. Green Univ. of New South Wales, Australia

[▲ Back to TOP](#)

■ Amorphous Silicon Solar Cells-I

A-IIa-1	Progress of amorphous silicon based solar cells and modules J.L. Stone SERI, U.S.A.
A-IIa-2	A leaky Schottky barrier in the SnO₂/a-SiC(p⁺) junction monitored with the pulsed laser-induced transient photopotential technique K. Itoh, H. Matsumoto, T. Kobata, A. Fujishima, O. Nakamura* and K. Fukui Univ. of Tokyo *Corporate R&D Lab., Toa Nenryo Kogyo Co., Ltd., Japan
A-IIa-3	High efficiency amorphous heterojunction solar cell employing ECR-CVD produced p-type microcrystalline SiC film Y. Hattori, D. Kruangam, T. Toyama, H. Okamoto and Y. Hamakawa Osaka Univ., Japan
A-IIa-4	Control of amorphous silicon solar cell interfaces to obtain high conversion efficiencies W.Y. Kim, S. Yamanaka, M. Hallerdt, M. Konagai and K. Takahashi Tokyo Inst. of Technology, Japan
A-IIa-5	a-Si:H pin solar cell with two layers back electrode Z. Xu, B. Zhao, W. Chen, J. Zhong and J. Wang HuaZhong Univ. of Science and Technology, Wuhan, China
A-IIa-6	High performance solar cells fabricated by using disilane K. Miyachi, H. Tanaka, T. Igarashi, Y. Ohashi and N. Fukuda Mitsui Toatsu Chemicals Inc., Japan

[▲ Back to TOP](#)

■ Space System

B-IIa-1	Space photovoltaic technology in Europe H. Losch and K.P. Bogus* German Aerospace Res. Establishment (DFVLR), F.R.G.
B-IIa-2	High performance LPE GaAs solar cells with 200 μm thickness H. Matsumoto, K. Sato, S. Hokuyo, S. Yoshida, K. Yamagami, M. Ohkubo* and S. Matsuda** Kita Itami Works, *Kamakura Works, Mitsubishi Electric Corp. **NASDA, Japan
B-IIa-3	Thin-film GaAs-on-Si solar cells T. Oh'hara, H. Okamoto and K. Moriya NTT Applied Electronics Labs., Japan

B-IIa-4	Front and back grid design for spacecraft solar cells E. M. Gaddy Solarex Aerospace Division, U.S.A.
B-IIa-5	Relative damage coefficients of electrons for GaAs solar cells T. Tamura, S. Matsuda, M. Tsuji, H. Mitsui*, R. Tanaka* and H. Sunaga* NASDA JAERI, Japan
B-IIa-6	Experimental and theoretical comparison of 1MeV electron-induced radiation damage in InP and GaAs space solar cells C. Goradia, J.V. Geier and I. Weinberg* Cleveland State Univ. *NASA Lewis Res. Center, U.S.A.

[▲ Back to TOP](#)

■ Silicon Solar Cell Technologies-I

C-IIa-1	Comparison of back or front point contact and bifacially contacted silicon solar cells A. Luque Instituto de Energia Solar E.T.S.I. Telecommunication, Spain
C-IIa-2	New solar cell design opportunities A.M. Barnett and J.S. Culik* Univ. of Delaware *Astrosystems, Inc., U.S.A.
C-IIa-3	Performance prediction of highly efficient polycrystalline silicon solar cells K. Matsukuma, S. Kokunai, H. Yagi, T. Saitoh*, R. Shimokawa** and K. Morita*** Hitachi Works, *Central Res. Lab., Hitachi, Ltd. **ETL ***Kumamoto Inst. of Technology, Japan
C-IIa-4	Review of analytical models for the study of highly doped regions of silicon solar cells A. Cuevas and M. Balbuena Universidad Politecnica de Madrid, Spain
C-IIa-5	Advances in multiblade slurry (MBS) sawing of solar silicon W. Ermer, D. Helmreich, K. Eggelhuber* and D. Seifert* Heliotronic GmbH*Wacker Chemie GmbH, F.R.G.
C-IIa-6	Experimental and theoretical analysis of recombination process at semiconductor surfaces and interfaces based on the unified disorder induced gap state model H. Hasegawa, H. Yano, T. Saitoh, Y. Yokoyama and H. Ohno Hokkaido Univ., Japan

[▲ Back to TOP](#)

■ Fundamentals

P-I-1	A new theoretical model of SIS solar cells H. You, M. Wang*, G. Liu* and Y. Jian* Nanjing Electronic Device Res. Inst. *Nanjing Inst. of Tech., Nanjing, China
P-I-2	Novel approach to highly efficient solar cells by use of electrolyte/metal-island/semiconductor junctions Y. Nakato, K. Ueda and H. Tsubomura Osaka Univ., Japan
P-I-3	Peculiar phenomena associated with variable injection in the base region of BSF solar cells M. Cid and J.M. Ruiz Universidad Politecnica de Madrid, Spain
P-I-4	The purification property of unidirectional solidification process of UPMG-Si J. Zhu, W. Wang* and G. Shu* Nanjing Res. Inst. of Electronics Technology *Nanjing Inst. of Technology, Nanjing, China
P-I-5	An accurate determination of the DX center density and free carrier density in Al_xGa_{1-x}As C.G. Choi, C.S. Yeh, S.S. Li and R.Y. Loo* Univ. of Florida *Hughes Res. Labs., U.S.A. Amorphous Silicon Materials

P-I-6	<p>A comparison of a-Si:Ge alloys made from photochemical ($\text{Si}_2\text{H}_6+\text{GeH}_4$) and glow discharge decomposition($\text{SiH}_4+\text{GeH}_4$)</p> <p>L.C. Kow, K.S. Teng, K.C. Hsu, C.S. Hong and H.L. Hwang* Energy and Mining Res./Service Organization *National Tsing Hua Univ., Hsin-chu, China</p>
P-I-7	<p>Photoconductive amorphous silicon nitride produced by direct photochemical deposition</p> <p>Y. Ihara, S. Miyazaki, M. Hirose, M. Fujita*, R. Yamaguchi** and K. Umenishi Hiroshima Univ., *Mitsui Petrochemical Industrials, Ltd. **Babcock-Hitachi, Japan</p>
P-I-8	<p>Properties of a-SiGe:H prepared by a mercury sensitized photo CVD</p> <p>T. Tomikawa, H. Itozaki and N. Fujita Sumitomo Electric Industries, Ltd., Japan</p>
P-I-9	<p>A comparative study of the photo-CVD of a-Si: H from internal and external lamp systems</p> <p>P.A. Robertson, Y.K. Bhatnagar and W.L. Milne Univ. of Cambridge, U.K.</p>
P-I-10	<p>Effect of geminate recombination on the photoconductivity in a-Si:H films</p> <p>J. Shirafuji, R. Hattori and K. Shirakawa Osaka Univ., Japan</p>
P-I-11	<p>Mobile charge carrier densities and photoconductivity of a-Si</p> <p>J. Furlan, S. Amon and F. Smole Univ. of Ljubljana, Yugoslavia</p>
P-I-12	<p>Raman study on post hydrogenated amorphous silicon films deposited by vacuum electron beam evaporation</p> <p>X. Wu and Z. Tian Yunnan Univ., Kunming, China</p>
P-I-13	<p>Derivation of phonon density of states and verification from Raman experiments in light induced lattice relaxations</p> <p>C.S. Hong, K.C. Hsu, Y.C. Chen and H.L. Hwang* Materials Res. Labs., ITRI *National Tsing Hua Univ., Hsin-chu, China</p>
P-I-14	<p>A new mechanism of light-induced changes in a-Si: H pin solar cells</p> <p>G.-C. Dai, G. Gao, Z.-X. Zheng and Z.-Y. Xu* Shandong Univ., Jinan *Huazhong Univ. of Science and Technology, Wuhan, China</p>
P-I-15	<p>ESR studies of doped a-SiC: H and a-SiN: H films used as window materials of solar cells</p> <p>G. Chen, F. Zhang and J. Cheng Lanzhou Univ., Lanzhou, China</p>
P-I-16	<p>A strange dependence of deposition rate on RF power in disilane glow discharge</p> <p>T. Igarashi and N. Fukuda Mitsui Toatsu Chemicals Inc., Japan</p>
P-I-17	<p>Effect of doping and post-hydrogenation of LPCVD silicon thin films</p> <p>X.W. Wu and B.Y. Tong Univ. of Western Ontario, Canada</p>
P-I-18	<p>Optimum deposition temperature for high-rate prepared a-Si:H films</p> <p>Z. Xi, Z. Zhang, Y. Du and M. Yan Peking Univ., Beijing, China</p>
P-I-19	<p>Properties and structure of hydrogenated carbon silicon germanium alloy</p> <p>F. Demichelis, G. Kaniadakis, A. Tagliaferro, E. Tresso and P. Rava* Politecnico di Torino Electrorava S.p.A., Italy</p>
P-I-20	<p>Properties of magnetron sputtered hydrogenated amorphous silicon films prepared at low temperature</p> <p>R. Banerjee, D. Das, A.K. Batabyal and A.K. Barua Indian Association for the Cultivation of Science, India</p>

■ Terrestrial System

P-I-21	Optimum design of photovoltaic power generation systems in Japan T. Tani, K. Kurokawa, S. Sawata and K. Yamagami* ETL *Japan Industrial Technology Association, Japan
P-I-22	Performance evaluation of photovoltaic modules in Kuwait H. Al-Busairi and A. Al-Kandari Kuwait Inst. for Scientific Research, Kuwait
P-I-23	Research and development of the photovoltaic power generation system for a factory Y. Kita, M. Murozono, H. Takakura* and Y. Hamakawa* Matsushita Battery Industrial Co., Ltd. *Osaka Univ., Japan
P-I-24	Research & development of hybrid photovoltaic and dendro power generating system T. Amano and K. Saito Fuji Electric Co., Ltd., Japan
P-I-25	Performance of sun tracking system by means of shadow analysis method T. Homma, M. Katayama, K. Tanno and Y. Ohsawa Univ. of Tsukuba, Japan
P-I-26	Test results of 530 sun point focus Fresnel lens study W. Todorof Alternative Energy Systems, Inc., U.S.A.
P-I-27	Sea water desalination by electro dialysis process powered photovoltaic energy K. Nishinoiri ¹ , S. Wakamatsu ² , S. Itoh ² , S. Kubota ³ , N. Sohma ⁴ , E. Inada ⁵ , O. Kuroda ⁶ and Y. Eguchi ⁷ 1Hitachi, Ltd., 2NEDO, 3water Re-Use Promotion Center, 4Babcock-Hitachi K.K., 5Kure Works, Babcock-Hitachi K.K., 6Hitachi Res. Lab., 7Hitachi Works, Hitachi, Ltd., Japan
P-I-28	Development and operation experience of 30 kW_p photovoltaic seawater desalination system K. Kanematsu, T. Abe, T. Isayama and Y. Hamakawa* Hitachi Zosen Corp. *Osaka Univ., Japan
P-I-29	A method for detecting failed PV modules in a large PV field U. Coscia, G. Massano and A. Sarno ENEA-CRIF PORTICI, Italy
P-I-30	Solar cell power losses from forward biased non illuminated active area J. R. Silver and D.B. Warfield Solarex Aerospace Division, U.S.A.
P-I-31	The performance of loads powered by a common source of solar cells J. Appelbaum Tel-Aviv Univ., Israel
P-I-32	A new approach to photovoltaic panels design M.M. Alkaisi and N.A. Aldawody Univ. of Technology, Iraq
P-I-33	Optimization consideration of tilt angle and azimuth angle of solar photovoltaic arrays H. Takakura, Y. Kita*, M. Murozono* and Y. Hamakawa Osaka Univ. *Matsushita Battery Industrial Co., Ltd., Japan
P-I-34	A study of the dependence of spectral absorptance on incident angles in solar cells P. Yun Shanghai Inst. of Ceramics, Shanghai, China
P-I-35	Transient characteristics on redox flow photovoltaic system

	T. Homma, G. Zhao and Y. Ohsawa Univ. of Tsukuba, Japan
P-I-36	A recharging technique for sealed lead-acid battery in photovoltaic systems A. Kudou, K. Hironaka, S. Matsubayashi, S. Saitou, T. Hayakawa and A. Komaki Shin Kobe Electric Machinery Co., Ltd., Japan

[▲ Back to TOP](#)

■ Amorphous Silicon Solar Cells-II

A-IIp-1	Process technology for large area amorphous silicon solar cells H. Sakai and Y. Uchida Fuji Electric Corporate R&D, Ltd., Japan
A-IIp-2	Amorphous silicon solar cells fabricated using a hot-wall type symmetric plasma CVD reactor S. Muramatsu, N. Nakamura, S. Matsnbara, H. Itoh and T. Shimada Central Res. Labs., Hitachi, Ltd., Japan
A-IIp-3	New laser patterning method for integrated type a-Si solar cell submodules T. Matsuoka, S. Kiyama, H. Yagi, Y. Hirono, M. Ohsumi, S. Nakano and Y. Kuwano Research Center, Sanyo Electric Co., Ltd., Japan
A-IIp-4	A monolithic series-connected a-Si:H solar cell on an organic polymer film K. Nakatani, K. Suzuki and H. Okaniwa Advanced Film Products Lab., Teijin Ltd., Japan
A-IIp-5	IMW amorphous silicon thin-film PV manufacturing plant P. Nath, K. Hoffman, J. Call, C. Vogeli, M. Izu and S.R. Ovshinsky Sovonics Solar Systems, U.S.A.

[▲ Back to TOP](#)

■ LateNews-I

B-IIp-1	Polycrystalline CuInSe₂ thin-film solar cells R.A. Mickelsen, W.S. Chen, B.J. Stanbery and W.E. Devaney Boeing High Technology Center, U.S.A.
B-IIp-2	Production of high-efficiency InP solar cells for space use H. Okazaki, T. Takamoto, H. Takamura, T. Kamei, M. Ura, A. Yamamoto* and M. Ymaguchi* Nippon Mining Co. *NTT Electrical Communications Labs., Japan
B-IIp-3	A high-efficiency monolithic 2-junction AlGaAs-GaAs solar cell B-C. Chung, H.C. Hamaker, G.F. Virshup and J.G. Werthen Varian Research Center, Device Lab., U.S.A.
B-IIp-4	Carrier transport and relaxation process in nini multilayered structure H. Shirai and I. Shimizu The Graduate School at Nagatsuta, Tokyo Inst. of Technology, Japan
B-IIp-5	Electro-optical properties of a-Si:H/μC-Si:H and a-Si:C:H/c-Si:C:H undoped and doped films produced by a TCDDC* system R. Martins and L. Guimaraes UNINOVA/FCT-UNL, Portugal
B-IIp-6	A study of the electrical and optical properties of a-Si thin films M.N. Makadsi Univ. of Baghdad, Iraq
B-IIp-7	The optical properties of a-Si:H films and thin film Schottky barrier cells Y. Gekka, M. Akimoto and H. Kezuka* Tokai Univ. *Tokyo Engineering Univ., Japan
B-IIp-8	Surface passivation of direct-cast poly crystalline silicon solar cells

	H. Somberg and Z.Z. Qin* Global Photovoltaic Specialists, Inc., U.S.A. *Darning Solar Cell Co. Ltd., Shenzhen, China
B-IIp-9	Silicon solar cell technology state of the art and a proposed double sided cell M.M. Seddik Ain Shams University, Egypt

[▲ Back to TOP](#)

■ Silicon Solar Cell Technologies-II

C-IIp-1	Influence of the substrate on the quantum efficiency of thin film epitaxial silicon solar cells S.N. Singh, P.K. Singh and R. Kishore National Physical Lab., India
C-IIp-2	An improvement method for growing directional solidificational semicrystal Si ingot H.-S. Tang and X.-T. Yu Fudan Univ., Shanghai, China
C-IIp-3	Characterization of cast polycrystalline silicon using temperature-dependent electron beam induced current method K. Yasutake, A. Takeuchi, Y. Tanaka, K. Yoshii and H. Kawabe Osaka Univ., Japan
C-IIp-4	EBIC/XTEM investigation of as grown and hydrogen passivated, gas assisted solidified polycrystalline silicon C.H. Chu, C.Y. Sun* and H.L. Hwang National Tsing Hua Univ., Hsinchu *National Taiwan Inst. of Technology, Taipei, China
C-IIp-5	A calculating method on non-equilibrium minority carrier diffusion length in polycrystalline silicon B. Ji, X. Zhao, G. Jin and D. Cui Inner Mongolia Univ., Huhehot, China
C-IIp-6	Solar cell concentrator PV systems at 530 suns W. Todorof Alternative Energy Systems, Inc., U.S.A.

[▲ Back to TOP](#)

■ Plenary Lecture III

PL-III-1	Recent progress in space photovoltaic systems H.W. Brandhorst, Jr., D.J. Flood and I. Weinberg NASA, U.S.A.
PL-III-2	Recent progress of PV-systems of intermediate power range A. Goetzberger and J. Schmid Fraunhofer Inst., F.R.G.

[▲ Back to TOP](#)

■ Amorphous Silicon Solar Cells-III

A-IIIa-1	Status of thin film tandem PV module development K. Mitchell, C. Eberspacher, R. Wieting, J. Ermer, D. Willett, K. Knapp, D. Morel and R. Gay ARCO Solar Inc., U.S.A.
A-IIIa-2	A four-terminal thin-film tandem solar module using a-Si:H and c-Si W. Krühler, J. Grabmaier, P. Mil l a and J. Dannenberg Siemens Res. Labs., F.R.G.
A-IIIa-3	Light and current soaking behavior of a-Si: H n²⁺-p⁺ solar cells J. Jang, Y.S. Lee, J.B. Kim, Y.K. Lee, J.K. Yoon* and C. Lee* Kyung Hee Univ. *Korea Advanced Inst. of Science & Technology, Korea
A-IIIa-4	Effect of a-Si:C:H graded p/i interface on the performance and stability of a-Si:H p-i-n solar cells R.R. Arya, M.S. Bennett, A. Catalano and K. Rajan Solarex Thin Film Division, U.S.A.

A-IIIa-5 [Study of light-induced change in a-SiH solar cells and films by intense light pulse irradiation](#)
M. Yamaguchi, H. Yamagishi, M. Kondo, Y. Hosokawa, K. Tsuge, T. Nakayama and Y. Tawada
Central Res. Labs., Kanegafuchi Chemical Ind. Co., Ltd., Japan

A-IIIa-6 [Electrical performance and light-induced change in double-stacked tandem cell](#)
T. Yoshida, S. Fujikake, H. Shimabukuro, T. Ihara, Y. Ichikawa and H. Sakai
Fuji Electric Corporate R&D, Ltd., Japan

[▲ Back to TOP](#)

■ Advanced Material Solar Cells-I

B-IIIa-1 [Radiation-induced defects in InP solar cells](#)
M. Yamaguchi
NTT Electrical Communications Labs., Japan

B-IIIa-2 [22.5% \(one-sun, AMO\) GaAs solar cell with AlGaAs/GaAs superlattice buffer layer](#)
N. Ogasawara, S. Ochi, N. Hayafuji, M. Kato, K. Mitsui, K. Yamanaka and T. Murotani
LSI R&D Lab., Mitsubishi Electric Corp., Japan

B-IIIa-3 [MOCVD growth of GaAs on Si for solar cell application](#)
T. Soga, T. Jimbo, T. Imori and M. Umeno
Nagoya Inst. of Technology, Japan

B-IIIa-4 [Heteroepitaxy of InP on Si substrates by OMVPE and its application to InP thin-film solar cells](#)
N. Uchida, M. Sugo, A. Yamamoto and M. Yamaguchi
NTT Electrical Communications Labs., Japan

B-IIIa-5 [Evaluation of photovoltaic characteristics of III-V alloys for low-band-gap cells](#)
Y. Takeda, H. Yamashita, Y. Nishimura and A. Sasaki
Kyoto Univ., Japan

B-IIIa-6 [Thermally stable GaAs tunnel interconnect for a high conversion efficiency AlGaAs/GaAs tandem solar cell](#)
H. Sugiura, C. Amano, A. Yamamoto and M. Yamaguchi
NTT Electrical Communications Labs., Japan

[▲ Back to TOP](#)

■ Terrestrial System Applications

C-IIIa-2 [Development of a marine photovoltaic system for aquaculture](#)
M. Watanabe, T. Maruyama, H. Sawai and T. Tsuji
Energy Conversion Labs., Sharp Corp., Japan

C-IIIa-3 [Electromechanical matching of water pumping systems to photovoltaic \(PV\) arrays](#)
S. Singer and A. Braunstein
Tel-Aviv. Univ., Israel

C-IIIa-4 [A 1 kW redox flow battery for photovoltaic power systems](#)
K. Kurokawa, K. Nozaki, T. Tani, Y. Akai* and H. Sekiguchi*
ETL *Ebara Corp., Japan

C-IIIa-5 [Appropriate PV power systems for rural communities of developing countries: a case study](#)
S. Arafa
The American Univ. in Cairo, Egypt

C-IIIa-6 [200kW demonstration and test facility for dispersed small scale PV systems](#)
Y. Takeda, K. Takigawa, H. Kobayashi, K. Nakahara*, T. Morishita*, A. Kitamura* and H. Matsuda*
CRIEPI *KEPCO, Japan

[▲ Back to TOP](#)

■ Crystalline Silicon Solar Cells

P-II-1 [Effects of aluminum segregation on polycrystalline silicon solar cells](#)
H. You, M. Wang*, G. Liu*, Y. Jian* and L. Shao*
Nanjing Electronic Device Res. Inst. *Nanjing Inst. of Tech., Nanjing, China

P-II-2	An effective method to improve the characteristics of silicon solar cells S. Zhang, Q. Jia and E. Liu Xian Jiaotong Univ., Xian, China
P-II-3	The effects of dilute-source emitter diffusion on semi crystalline silicon solar cells S.P. Shea and T.D. Koval Solarex Corp., U.S.A.
P-II-4	Progress in alumino thermic production of solar-grade silicon J. Dietl and C. Holm Heliotronic GmbH, F.R.G.

[▲ Back to TOP](#)

■ Advanced Material Solar Cells

P-II-5	Photochemical vapor deposition of GaAs for photovoltaics D.P. Norton and P.K. Ajmera Louisiana State Univ., U.S.A.
P-II-6	Performance of large area $Al_xGa_{1-x}As$ solar cells R.Y. Loo and G.S. Kamath Hughes Res. Labs., U.S.A.
P-II-7	AlGaAs/Si monolithic three-terminal solar cells T. Nishioka, Y. Itoh, N. Uchida, A. Yamamoto and M. Yamaguchi NTT Electrical Communications Labs., Japan
P-II-8	Performances of GaAs/Si stacked solar cells in AM0/AM1 low concentration conditions L. Bertorri, C. Flores, F. Paletta and M. Martella* CISE SPA *FIAR SPA, Italy
P-II-9	Effect of oxygen in sealed CdS/CdTe solar modules on their photovoltaic properties A. Nakano, T. Hibino, H. Takada, Y. Yamaguchi and M. Yoshida Matsushita Battery Industrial Co., Ltd., Japan
P-II-10	Growth of CuInSe films for solar cells by using a multisource sputtering apparatus T. Nakada, K. Suzuki and A. Kunioka Aoyama Gakuin Univ., Japan
P-II-11	InP (MIS) Schottky barriers prepared by surface nitridation with photo-assisted process for solar cell application K. Kamimura, Y. Takese, Y. Onuma and A. Kunioka* Shinshu Univ. *Aoyama Gakuin Univ., Japan

[▲ Back to TOP](#)

■ Amorphous Silicon Solar Cells

P-II-12	High efficiency triple stacked amorphous solar cell M. Ishii, H. Itozaki and N. Fujita Sumitomo Electric Industries, Ltd., Japan
P-II-13	A solar cell unified with a building material T. Matsuoka, H. Yagi, M. Waki, K. Honma, H. Hashimoto, S. Nakano and Y. Kuwano Res. Center, Sanyo Electric Co., Ltd., Japan
P-II-14	Development of see-through a-Si solar cell and its applications Y. Kishi, H. Inoue, H. Tanaka, M. Morizane, H. Shibuya, M. Ohnishi and T. Yazaki Applied Research Center, Sanyo Electric Co., Ltd., Japan
P-II-15	A new type of a-Si based photovoltaic device for X-ray detection G.-P. Wei Shanghai Univ. of Science and Technology, Shanghai, China

P-II-16	<p>Optimization of efficiencies of single-junction a-Si:H solar cells prepared in a single deposition chamber</p> <p>K.S. Teng, L.C. Kow, I.Y. Wan, S.J. Sheu, S.Y. Fu, C.M. Su, K.C. Hsu, C.S. Hong and H.L. Hwang* Energy and Mining Res./Service Organization *National Tsing Hua Univ., Hsin-chu, China</p>
P-II-17	<p>Amorphous silicon solar cells with a screen-printed back contact</p> <p>K. Baert, G. Willeke, M. Honore, J. Roggen and J. Nijs Interuniversity Micro-Electronics Center, Belgium</p>
P-II-18	<p>A graded superlattice structure window layer for a-Si solar cell</p> <p>Z. Sun, Z. Men, Z. Wang, F. Ma and W. Xu Nankai Univ., Tianjin, China</p>
P-II-19	<p>Gap-state density in a-Si solar cell</p> <p>M. Warashina and A. Ushirokawa Inst. of Space and Astronautical Science, Japan</p>
P-II-20	<p>Intrinsic defects and the limits to performance of Si-Ge alloy solar cells</p> <p>Z.E. Smith, S. Aljishi, V. Chu, J. Conde and S. Wagner Princeton Univ., U.S.A.</p>
P-II-21	<p>The recovery effects with near infrared rays irradiation on photovoltaic performances of a-Si solar cells</p> <p>T. Machida, A. Yokoto, Y. Yamamoto, Y. Nakata and T. Inoguchi Energy Conversion Labs., Sharp Corp., Japan</p>
P-II-22	<p>Long term stability of a-SiC:H/a-Si:H heterojunction solar cells</p> <p>H. Yamagishi, M. Yamaguchi, H. Nishio, K. Tsuge, T. Nakayama and Y. Tawada Central Res. Labs., Kanegafuchi Chemical Ind. Co., Ltd., Japan</p>
P-II-23	<p>Analysis of a-Si:H solar cells by I-V curve fitting</p> <p>J. Smeets, M.V. Roy and P. Nagels S.C.K./C.E.N., Belgium</p>
P-II-24	<p>Analysis on the open circuit voltage of a-Si:H solar cells</p> <p>Z. Xu, W. Chen, B. Zhao, C. Wang and J. Wang Huazhong Univ. of Science and Technology, Wuhan, China</p>
P-II-25	<p>A new photoelectric response phenomenon in a-Si: H solar cells</p> <p>B.-C. Cao, Q.-H. Miao and Z.-Y. Xu* Shandong Univ., Jinan *Huazhong Univ. of Science and Technology, Wuhan, China</p>
P-II-26	<p>A new tin oxide film with large grains and its application to a-Si solar cells</p> <p>Y. Kato, M. Hyodo, M. Misonou and H. Kawahara Central Res. Lab., Nippon Sheet Glass Co., Ltd., Japan</p>
P-II-27	<p>SnO₂ films prepared by PECVD</p> <p>Y. Chen, Z. Zheng, S. Li, H. Ma and C. Xu Shandong Univ., Jinan, China</p>
P-II-28	<p>Performance of a-Si:H solar cells with H₂ plasma pretreated SnO₂:F films</p> <p>R. Shiratsuchi, M. Hirata, M. Misonou and H. Kawahara Central Res. Lab., Nippon Sheet Glass Co., Ltd., Japan</p>

[▲ Back to TOP](#)

■ Space Solar Cells

P-II-29	<p>Effects of electron and proton irradiations on n/p and p/n GaAs cells grown by MOCVD</p> <p>I. Weinberg, C.K. Swartz and R.E. Hart, Jr. NASA Lewis Research Center, U.S.A.</p>
P-II-30	<p>Computer simulations of proton and electron irradiated Al_{0.33}Ga_{0.67}As and GaAs P-N junction solar cells</p>

	C.S. Yeh, S.S. Li and R.Y. Loo* Univ. of Florida *Hughes Res. Labs., U.S.A.
P-II-31	Proton irradiation induced-defects and degradations in InP solar cells K. Ando, K. Shikano, A. Yamamoto and M. Yamaguchi NTT Telecommunications Labs., Japan
P-II-32	Characteristics of cover glass for space solar cell against particle and UV radiations S. Matsuda, K. Komagata*, Y. Moriguchi*, T. Kimura* and R. Tamamura* NASDA *Asahi Glass Co., Ltd., Japan
P-II-33	A coversliding method for vertical junction solar cells D.B. Warfield Solarex Aerospace Division, U.S.A.
P-II-34	Lightweight rigid solar array paddle H. Hashimoto, K. Matsumura*, Y. Kawai* and H. Nishiyama* NASDA *Toshiba Corp., Japan
P-II-35	Evaluation of materials and structure of silicon space solar cells H. Ueyama, Y. Tonomura, T. Saga, T. Matsutani and A. Suzuki Sharp Corp., Japan

[▲ Back to TOP](#)

■ Amorphous Silicon Materials-III

A-IIIp-1	Amorphous superlattice and its application to solar cells M. Hirose Hiroshima Univ., Japan
A-IIIp-2	Below-gap modulated photocurrent spectroscopy for determination of gap states distribution in a-Si alloy systems Y. Tsutsumi,-K. Abe, Y. Nitta, H. Okamoto and Y. Hamakawa Osaka Univ., Japan
A-IIIp-3	Electronic transport properties of differently fabricated a-SiGe: H-films for tandem solar cells F. Karg, K. Dietrich, W. Krühler and R. Plattner Siemens Res. Labs., F.R.G.
A-IIIp-4	An investigation of recombination mechanism in a-Si:H solar cells by PDMR method X. Lin, G. Zhang, J. Liu, M.-X. Yan, S. Wu, H. Xu, E. Wu and J. Mao Peking Univ., Beijing, China
A-IIIp-5	Optical degradation of a-Si:H films with different morphology and preparation of degradation-resistive films H. Ohagi, M. Yamazaki, J. Nakata, J. Shirafuji*, K. Fujibayashi and Y. Inuishi Kinki Univ. *Osaka Univ., Japan

[▲ Back to TOP](#)

■ Advanced Material Solar Cells-II

B-IIIp-1	II-VI compound semiconductor solar cells S. Ikegami Matsushita Battery Industrial Co., Japan
B-IIIp-2	Zn₃P₂ thin film solar cell grown by plasma assisted vapor phase deposition Y. Kato, T. Watanabe, S. Kurita and T. Suda* Keio Univ. *Inst. of Vocational and Technical Education, Japan
B-IIIp-3	Preparation and solar cell performance of n-ZnO/p-WSe₂ heterojunctions M.C. Lux-Steiner, M. Vogt, P. Dolatzoglou, A. Jager-Waldau and E. Bucher University of Konstanz, F.R.G.
B-IIIp-4	Optimum properties of semiconductors for Cu(Ga, In)Se₂ heterojunction solar cells

	B. Dimmler, H. Dittrich, R. Menner, H.W. Schock and W.H. Bloss Univ. of Stuttgart, F.R.G.
B-IIIp-5	Properties of the screen-printed and sintered CdTe film formed on a CdS sintered film H. Matsumoto and S. Ikegami Matsushita Battery Industrial Co., Ltd., Japan

[▲ Back to TOP](#)

■ Late News-II

C-IIIp-1	A novel p-i-n a-Si solar cell structure with very low active-area loss and interconnection power loss J. Xi, S. Muhl, B. von Roedern and A. Madan Glasstech Solar, Inc., U.S.A.
C-IIIp-2	High efficiency amorphous silicon solar cells integrated by an excimer laser patterning method for a solar powered car race "World Solar Challenge" M. Susukida, K. Suzuki, M. Abe, M. Kinka, N. Ishida, Y. Arai, A. Satake, K. Nishi, H. Shinohara, S. Imato and S. Yamazaki Semiconductor Energy Laboratory Co. Ltd., Japan
C-IIIp-3	The relationship between p-layer thickness and TFS solar cell performance R.D. Wieting, D.R. Willett, S.C. Lewis, R.R. Gay and E. Berman ARCO Solar, Inc., U.S.A.
C-IIIp-4	The development of large-area a-Si:H solar cells in Harbin-Chronar K.M. Gue, J. Shen and D. Yin Harbin-Chronar Solar Energy Electricity Corp., China
C-IIIp-5	PV power system for isolated islands K. Koyamatsu, A. Kamo, Y. Jifuku* and T. Tanaka The Kyushu Electric Power Co., Inc. Hitachi, Ltd. *Hitachi Works, Hitachi, Ltd., Japan
C-IIIp-6	Japan, Indonesia joint technical development project for rural electrification with photovoltaic power generation I. Hatta, A. Lubis* and S. Kurashima** NEDO, Japan *Agency for Assessment and Application of Technology, Indonesia **Kyocera Corp., Chiba Sakura Plant, Japan
C-IIIp-7	High efficiency polycrystalline silicon solar cells by 60 kg cast ingots K. Kaneko, T. Misawa, M. Asai*, K. Nishida*, A. Suzuki*, R. Shimokawa**, K. Yasutake*** and H. Kawabe*** R&D Center, Osaka Titanium Co., Ltd. *Sharp Corp., **ETL, ***Osaka Univ., Japan
C-IIIp-8	The study and fabrication of polysilicon solar cells for low concentrated sunlight C. Zhang, J. Li, Z. Zhang and M. Niu Solar Energy Research Inst. of Inner Mongolia Univ., Hohehaote, China

[▲ Back to TOP](#)

■ Amorphous Silicon Solar Cells-IV

A-IVa-1	A semi-transparent solar cell using a-SiC active layer H. Nakabayashi, A. Takeuchi, S. Yamaguchi and Y. Hamakawa* Nippon Denso Co., Ltd. *Osaka Univ., Japan
A-IVa-2	High efficiency a-Si_{1-x}C_x:H single and stacked junction solar cells A. Catalano, C. Fortmann, J. Newton, R.R. Arya and G. Wood Solarex Thin Film Division, U.S.A.
A-IVa-3	An experimental and theoretical study of amorphous SiGe:H based solar cells S. Yamanaka, S. Kawamura*, M. Konagai and K. Takahashi Tokyo Inst. of Technology *YKK Corp., Japan
A-IVa-4	Improvement of a-SiGe:H pin cells with graded band gap layers T. Ishihara, S. Terazono, H. Morikawa, M. Deguchi, M. Usui, M. Aiga and M. Otsubo LSI R&D Lab., Mitsubishi Electric Corp., Japan
A-IVa-5	Carrier collection in bandgap engineered a-Si:H, F/a-Si, Ge:H:F multilayered structures

	J.P. Conde, V. Chu, D.S. Shen, S. Aljishi, S. Tanaka and S. Wagner Princeton Univ., U.S.A.
A-IVa-6	Carrier collection in a-Si:H based superlayer (superlattice) solar cells C.R. Wronski, M. Hicks and S. Lee The Pennsylvania State Univ., U.S.A.
A-IVa-7	High efficiency a-Si:Ge:H single and stacked junction solar cells R.R. Arya, A. Catalano, J.L. Newton and J. Morris Solarex Thin Film Division, U.S.A.

[▲ Back to TOP](#)

■ Terrestrial System Technologies

B-IVa-1	Japanese PV systems perspective: R&D status, economics and future prospects Y. Takeda CRIEPI, Japan
B-IVa-2	Crystalline silicon flat-plate photovoltaics technology and electric utility valuation: a challenge W.T. Callaghan Jet Propulsion Lab., U.S.A.
B-IVa-3	International intercomparison results of spectral calibration of silicon solar cells J.-G. Chen, X.-J. Guan, P.-N. Yu* and Y.-X. Wang Tianjin Inst. of Power Sources *National Solar Cells Measurement Center, China
B-IVa-4	Storage battery operation techniques for large scale photovoltaic system H. Kobayashi, K. Takigawa and Y. Takeda CRIEPI, Japan

[▲ Back to TOP](#)

■ Advanced Material Solar Cells-III

C-IVa-2	Large-scale MOCVD growth of GaAs solar cells with average efficiency more than 20% (one-Sun, AMO) S. Ochi, N. Hayafuji, N. Ogasawara, M. Kato, K. Mitsui, K. Yamanaka and T. Murotani LSI R&D Lab., Mitsubishi Electric Corp., Japan
C-IVa-3	Indium Oxide/Indium Phosphide heterojunction solar cells T. Nakazawa and K. Ito Shinshu Univ., Japan
C-IVa-4	Heteroepitaxial growth of GaAs on Si for solar cells Y. Itoh, T. Nishioka, A. Yamamoto and M. Yamaguchi NTT Electrical Communications Labs., Japan
C-IVa-5	Development of a three solar cell mechanically stack with an AMO efficiency greater than 30% A.M. Barnett, G.H. Negley*, S.L. Rhoads*, J.B. McNeely* and N.E. Terranova Univ. of Delaware *Astrosystems, Inc., U.S.A.
C-IVa-6	High efficiency AlGaAs/GaAs tandem solar cells grown by molecular beam epitaxy C. Amano, H. Sugiura, A. Yamamoto and M. Yamaguchi NTT Electrical Communications Labs., Japan

[▲ Back to TOP](#)

■ Closing Session

A-C-1	Future of photovoltaic power generating systems S. Wakamatsu NEDO, Japan
A-C-2	Photovoltaics for electric utility applications E. DeMeo EPRI, U.S.A.
A-C-3	Closing remarks

