



## PVSEC-5 (1990) / Kyoto, Japan

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	<a href="#">Message</a> Hiroyuki Matsunami
	<a href="#">Foreword</a> Masayoshi Umeno
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A-O-2	<a href="#">Status of the United States National Photovoltaic Program</a> M.B. Prince D.O.E., U.S.A.
A-O-3	<a href="#">Photovoltaic R &amp; D in Europe</a> R.J. van Overstraeten, *W. Palz IMEC, Belgium, *CEC, DGXII
A-O-4	<a href="#">Photovoltaic R &amp; D Program in Japan (Sun-Shine Project)</a> T. Goto MITI, Japan

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A-IpA-3	<a href="#">Low Hydrogen-concentration a-Si:H Deposited by Direct Photo-CVD</a> T. Shirafuji, M. Yoshimoto, T. Fuyuki, H. Matsunami Kyoto Univ., Japan
A-IpA-4	<a href="#">Effect of High-Temperature Annealing on the Properties of Intrinsic a-Si : H Prepared at Low Temperature</a> W.A. Nevin, H. Yamagishi, Y. Tawada Kanegafuchi Chemical Industry Co., Ltd., Japan
A-IpA-5	<a href="#">Promotion of Deposition Rate in the Direct Photo-CVD of a-Si Films by Mercury-free Sensitizers</a> K. Du, F.L. Feng, *H. Matsunami Sichuan Univ., China *Kyoto Univ., Japan
A-IpA-6	<a href="#">The Effect of Hydrogen on the Plasma Deposition and Hydrogen Plasma Etching of a-SiGe: H Thin Films</a> M. Zeman, M.J. Geerts, J. Siegl, J.W. Metselaar Delft Univ. of Tech., The Netherlands

A-IP A-7	<p><a href="#"><u>Highly Conductive Microcrystal Si Films Prepared by Remote Plasma CVD</u></a></p> <p>J. Jang, S.C. Kim, M.H. Jung, J.M. Jun Kyung Hee Univ. Korea</p>
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A-IPB-3	<p><a href="#"><u>Preparation of a-Si:H Films by Alternately Repeating Deposition and Hydrogen Plasma Treatment</u></a></p> <p>K. Miyachi, M. Koyama, H. Tanaka, Y. Ashida N. Fukuda, A. Nitta Mitsui Toatsu Chemicals, Inc., Japan</p>
A-IPB-4	<p><a href="#"><u>Defect Equilibrium, Defect Pool, and Deposition-Induced Defects in Amorphous Silicon</u></a></p> <p>N. Rata, J. Bullock, M. Isomura, X. Xu, J.H. Yoon S. Wagner Princeton Univ., U.S.A.</p>
A-IPB-5	<p><a href="#"><u>Correlation between the Saturated Light-induced Defect Density and Growth Rate of Light-induced Defects of a-Si :H</u></a></p> <p>M. Isomura, H.R. Park, N. Hara, A. Maruyama P. Roca i Cabarrocas, J.R. Abelson, F. Finger, S. Wagner Princeton Univ., U.S.A.</p>

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B-IP A-4	<p><a href="#"><u>Over 30% Efficient Tandem Gallium Cell Assemblies for Use with Concentrated Sunlight</u></a></p> <p>L.M. Fraas, J.E. Avery, P.E. Gruenbaum Boeing High Technology Center, U.S.A.</p>
B-IP A-5	<p><a href="#"><u>Status of Concentrator Collector and High-Efficiency Concentrator Cell Development</u></a></p> <p>J.M. Gee Sandia National Labs., U.S.A.</p>
B-IP A-6	<p><a href="#"><u>Computer Simulation of AlGaAs/GaAs and AlGaAs/Si Tandem Solar Cells for Terrestrial and Spatial Applications</u></a></p> <p>C. Amano, M. Yamaguchi, *K. Hane NIT, *Keio Univ., Japan</p>
B-IP A-7	<p><a href="#"><u>A Theoretical Investigation of Effective Surface Recombination Velocity in AlGaAs/GaAs Heteroface Solar Cells</u></a></p> <p>J.M. Gee, T.J. Drummond Sandia National Labs., U.S.A.</p>

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	C. Flores, B. Bollani, R. Campesato, F. Paletta D. Passoni, G. Timo, A. Tosoni CISE SpA., Italy
B-IpB-2	<a href="#">High Performance InGaAsP Solar Cells for Use of Space Application</a> R. Yonezawa, A. Yamaguchi, T. Kato, N. Tsuchiya N.S. Takahashi, S. Kurita Keio Univ., Japan
B-IpB-3	<a href="#">Low Dislocation Density GaAs on Si for Solar Cell Application</a> T. Soga, H. Nishikawa, T. Egawa, T. Jimbo, M. Umeno Nagoya Inst. of Tech., Japan
B-IpB-4	<a href="#">Growth of GaAs on p-n-Si and n-p-Si Substrates by MOCVD for GaAs/Si Monolithic Tandem Solar Cells</a> F. Cai, M. Imaizumi, D. Imanishi, H. Shimizu H. Matsuo, T. Soga, T. Jimbo, M. Umeno Nagoya Inst. of Tech., Japan

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C-IpA-2	<a href="#">Photovoltaics in France</a> A. Claverie, B. Chabot, A. Anglade Agence Francaise pour la Maitrise de L'Energie, France
C-IpA-3	<a href="#">An Outlook of the Italian Photovoltaic Energy Programme</a> V. Albergamo ENEA, Italy
C-IpA-4	<a href="#">Photovoltaic Applications in Egypt</a> S. Arafa The American Univ. in Cairo, Egypt
C-IpA-5	<a href="#">Critical Assessment of the Canadian PV Technology</a> J. Royer, Don Adkinson Renewable Energy Branch Energy Mines and Resouces, Canada
C-IpA-6	<a href="#">PV Projects in Mexico (Tentative)</a> R. Asomoza Mexico Inst. of Tech., Mexico

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C-IpB-2	<a href="#">Photovoltaic Project in Korea</a> J. Song, M. Han Korean Inst. of Energy & Resources, Korea
C-IpB-3	<a href="#">Recent Progress in Solar Photovoltaic System Development in China</a> P.N. Yu Tianjin Inst. of Power Sources, P.R. China
C-IpB-4	<a href="#">India's Programme on Development and Application of Solar Photovoltaic Technology</a> J. Gururaja Dept. of Non-conventional Energy Sources, India
C-IpB-5	<a href="#">PV Projects in Thailand</a>

	S. Panyakeow Chulalongkorn Univ., Thailand
C-IpB-6	<a href="#">Photovoltaic Development Strategy-National Activity</a> L.M. Panggabean BPP Teknologi, Indonesia

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- Symposium on "POLYCRYSTALLINE SILICON SOLAR CELLS, NOW !" The purpose of the symposium is to present and discuss the status, prospects, and needs of polycrystalline solar cells.

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C-IS-2	<a href="#">High Performance CDS Polycrystalline Silicon: Challenges and Opportunities</a> R. Brenneman Solarex, U.S.A.
C-IS-3	<a href="#">100cm<sup>2</sup> Silicon Square Ingot Made by Electromagnetic Casting</a> K. Kaneko, T. Misawa, K. Tabata Osaka Titanium, Japan
C-IS-4	<a href="#">Analysis of Electric Performance of Multicrystalline Silicon Solar Cells with Plasma CVD Silicon Nitride</a> H. Kikuchi, K. Okada, K. Masuri, K. Shirasawa H. Watanabe Kyocera, Japan
C-IS-5	<a href="#">The New Spin Cast Process for Low Cost Silicon Solar Cells</a> Y. Maeda, I. Hide, M. Suzuki, T. Suzuki, T. Moritani Hoxan, Japan
C-IS-6	<a href="#">Improvement of V<sub>oc</sub> in c-Si:H/poly-Si Junction Solar Cells</a> H. Morikawa, T. Itagaki, K. Kawabata, T. Ishihara K. Satoh, H. Namizaki Mitsubishi Elec., Japan

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PL-I-1	<a href="#">Recent Advances in Solar Photovoltaic Technologies in Japan</a> Y. Hamakawa Osaka Univ., Japan
PL-I-2	<a href="#">Recent Advances in Thin-Film Solar Cells</a> J.L. Stone SERI, U.S.A.

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A-IIa-3	<a href="#">The Mobility-Lifetime Products of Carriers in a-Si:H Solar Cells</a> B.Yan, L. Shi, J. Liu, X. Geng, Z Sun, W. Xu Nankai Univ., P. R. China
A-IIa-4	<a href="#">Local Dependence of Electron Lifetime in Amorphous Si Devices with pin-structure</a> K. Dietrich, F. Karg, W. Krühler Siemens AG, F.R.G.

A-IIa-5	<a href="#"><u>Implications of a 1.9eV Mobility Gap and Concomitant Density of States Shifts on the Performance of a-Si:H p-i-n Solar Cells</u></a>
	J.K. Arch, P.J. McElheny, S.J. Fonash The Pennsylvania State Univ., U.S.A.
A-IIa-6	<a href="#"><u>Optical Absorption of Transparent Conducting Oxides and Power Dissipation in a a-Si:H p-i-n Solar Cell Measured by Photothermal Deflection Spectroscopy</u></a>
	F. Leblanc, J. Schmitt, J.M. Siebert, *J. Perrin *C. Godet Solems S.A.-Photronics, *Lab. de Physique des Interfaces et des couches Mincees., France
A-IIa-7	<a href="#"><u>Study of a-SiC:H/a-Si:H Heterojunction and Carrier Injection under Photogenerated Carriers</u></a>
	K. Hayashi, M. Yamaguchi, Y. Tawada Kanagafuchi Chemical Industry Co., Ltd., Japan
A-IIa-8	<a href="#"><u>Effect of the Texture of Transparent Electrodes on the player and Voc of Amorphous Silicon Solar Cells</u></a>
	Y. Hishikawa, S. Tsuge, S. Tsuda, S. Nakano, Y. Kishi Y. Kuwano, N. Nakamura SANYO Electric Co., Ltd., Japan

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B-IIa-2	<a href="#"><u>Preparation of CuInS<sub>2</sub> Photovoltaic Thin Films by Sulfurization of Metals</u></a>
	T. Nakazawa, K. Tohyama, K. Ito Shinshu Univ., Japan
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	A.J. Nelson, L.L. Kazmerski, A. Rockett, E. Colavita, M. Engelhardt, H. Hochsut SERI, U.S.A.
B-IIa-4	<a href="#"><u>Preparation of CuInSe<sub>2</sub> Films by Encapsulated Selenization and Its Characterization by Raman Scattering Spectroscopy</u></a>
	M. Tanda, S. Yamana, *N. Nakada, A. Ya'inada M. Konagai, K. Takahashi Tokyo Inst. of Tech. *YKK Corp., Japan
B-IIa-5	<a href="#"><u>Structural Properties of CuInSe<sub>2</sub> Thin Films for Solar Cell Applications</u></a>
	T. Hama, T. Ihara, H. Sato, H. Fujisawa, M. Ohsawa Y. Ichikawa, H. Sakai FuH Electric Corp. R & D, Ltd., Japan
B-IIa-6	<a href="#"><u>n-ZnO/p-MoSe<sub>2</sub> Heterojunction Solar Cells</u></a>
	A. Jäger-Waldau, M. Lux-Steiner, P. Dolatzoglou E. Bucher Univ. Konstanz, F.R.G.

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	J.G. Grabmaier, R. Falckenberg Siemens AG, F.R.G.
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	D.A. Hukin Crystalox Ltd., U.K.
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	K. Yasutake, A. Takeuchi, K. Yoshii, H. Kawabe *J. Masuda, K. Kaneko Osaka Univ. *Osaka Titanium Co., Ltd., Japan

C-IIa-5	<a href="#"><u>High-Performance, Cold Crucible Cast Si Solar Cells Using Hydrogen Ion Implantation</u></a> S. Kokunai, *R. Shimokawa, Y. Saegusa, K. Matsukuma H. Yagi Hitachi Ltd. *ETL, Japan
C-IIa-6	<a href="#"><u>Passivation Effect Improvement of Si Solar Cells by Reducing Contact Area</u></a> S. Tanaka, S. Okamoto, K. Nakajima, N. Shibuya K. Okamoto, T. Namomori, T. Nunoi, T. Tsuji Sharp Corp., Japan
C-IIa-7	<a href="#"><u>Large Area High Efficiency Multicrystalline silicon Solar Cell</u></a> M. Takayama, H. Yamashita, K. Fukui, K. Masuri K. Shirasawa, H. Watanabe Kyocera Corp., Japan
C-IIa-8	<a href="#"><u>Design Option for a Crystalline Silicon Solar Cell</u></a> Y. Hayashi, R. shimokawa, K. Hane*, T. Saitoh** ETL, *Keio Univ. **Tokyo Univ. of Agri. & Tech., Japan

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P-IA-3	<a href="#"><u>Analysis of Internal Properties and External Characteristics of a-Si:C:H Abrupt and Graded Bandgap p-i Interface in p-i-n Solar Cells</u></a> F. Smole, J. Furlan, S. Amon Univ. of Ljubljana, Yugoslavia
P-IA-4	<a href="#"><u>Influence of External Factors on the Quality of CP-1 and GBP-1 Heterojunction in pin-a-Si:H Solar Cell</u></a> F. Zhang, G. Chen, Y. Li, Z. Song Lanzhou Univ., P.R. China
P-IA-5	<a href="#"><u>Investigation of Internal Effects on Spectral Response of a-Si Solar Cells</u></a> J. Furlan, F. Smole, S. Amon Univ. of Ljubljana, Yugoslavia
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P-IA-8	<a href="#"><u>A Prediction Method of Degradation of a-Si:H Solar Cells</u></a> K. Nakamura, S. Nakazawa, K. Takahisa, K. Nakahara ETL, Japan
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P-IA-10	<a href="#"><u>Improvement of Interface Properties of TCO/p-layer in pin-type Amorphous Silicon Solar Cells</u></a> Y. Ashida, N. Ishiguro, H. Tanaka, M. Koyama, K. Miyachi, N. Fukuda, A. Nitta Mitsui Toatsu Chemicals, Inc., Japan
P-IA-11	<a href="#"><u>Effect of the p-i Interface Layer on the Performance of a-Si Solar Cells</u></a> S. Yoshida, K. Seki, K. Nabeshima, S. Katayama, S. Kitahara, A. Ohmura YKK Corp., Japan

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P-IA-16	<a href="#"><u>Study of High Efficiency a-Si:H Based Triple-Junction Solar Cells</u></a> Z. Xu, X. Zou, X. Zhou, B. Zhao, C. Wang Univ. of Sci. & Tech., P.R. China

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P-IB-2	<a href="#"><u>Bridgman-Grown Nonstoichiometric CuInSe<sub>2</sub></u></a> L.S. Yip, W.S. Weng, I. Shih, C.H. Champness McGill Univ., Canada
P-IB-3	<a href="#"><u>Longitudinal Thermal Gradient Effects on CuInSe<sub>2</sub> Growth Mechanisms</u></a> B. Rezig, M. Kenzari, M. Brunei Laboratoire de Technologies Photovoltaïques Tunisia
P-IB-4	<a href="#"><u>Growth and Properties of CuInSe<sub>2</sub> Films by Thermal Annealing of Sputter-Deposited Amorphous-Like Layers</u></a> T. Nakada, K. Yuda, A. Kunioka Aoyama Gakuin Univ., Japan
P-IB-5	<a href="#"><u>Preparation and Properties of Tandem Heterojunctions n-C/p-CuInSe<sub>2</sub>/p<sup>+</sup>-Si</u></a> Z.Z. Bing, C.R. Qiang, L.Y. Min, D. Ning, S.Z. Biao Xi'an Jiaotong Univ., P.R. China
P-IB-6	<a href="#"><u>The Effects of CH<sub>3</sub>OH as a Solvent on the Electrical and Optical Properties of Pyrosol Deposited SnO<sub>2</sub>:F Thin Films</u></a> K. Yoon, J. Song Korea Inst. of Energy and Resources., Korea
P-IB-7	<a href="#"><u>Three-layer Organic Solar Cell with an Interlayer of Mixed Pigments</u></a> M. Hiramoto, H. Fujiwara, M. Yokoyama Osaka Univ., Japan
P-IB-8	<a href="#"><u>Photovoltaic Properties of Al/Poly(3-methylthiophene) Schottky Diodes</u></a> T. Nagatomo, K. Endo, M. Yoshikawa, Y. Higashi O. Omoto Shibaura Inst. of Tech., Japan
P-IB-9	<a href="#"><u>A Novel Two Layer Organic Photovoltaic Cell Using TDAPD-High Rectification Ratio and High Fill Factor</u></a> K. Uehara, T. Serikawa, A. Maekawa Univ. of Osaka Prefecture, Japan
P-IB-10	<a href="#"><u>Effeciency Improvement in Screen-Printed CdS/CdTe Solar Cells by Heat Treatment in a H<sub>2</sub>-N<sub>2</sub> Atmosphere</u></a>

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P-IB-11	<a href="#">Vacuum Evaporated CdS/CdTe Solar Cell</a> H. Uda, S. Ikegami, H. Sonomura Kinki Univ., Japan
P-IB-12	<a href="#">InAlAs/InGaAs Photovoltaic Cells for 1 μm Wavelength Range</a> T. Ikeoku, A. Fujihara, A. Wakahara, Y. Takeda A. Sasaki Kyoto Univ., Japan
P-IB-13	<a href="#">Novel Structure of GaAst<sub>x</sub>P<sub>y</sub>/Si Two Terminal Tandem Solar Cell for Extremely High Efficiency</a> Y. Komatsu, T. Fuyuki, H. Matsunami Kyoto Univ., Japan
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P-IB-17	<a href="#">Reverse Bias Tests on Silicon Solar Cell and Module</a> T. Hisamatsu; M. Uesugi, T. Noguchi, Y. Tonomura T. Saga, T. Matsutani, A. Suzuki Sharp Corp., Japan
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P-IB-21	<a href="#">Conductive Organic Thin Films and Membranes : Their Scientific Foundations and Industrial Applications</a> S.K. Bahador Kyoto Univ., Japan

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P-IC-2	<a href="#">Temperature Coefficient of Output Performance for Single-Crystalline Solar Cells</a> A. Yamamoto, T. Tanaka, T. Ikejiri, *M. Yamaguchi Fukui Univ., *NTT, Japan
P-IC-3	<a href="#">Photovoltaic Measurements and Calibration</a> K. Bücher, K. Heidler Fraunhofer-Institut Fur Solare Energiesysteme F.R.G.

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	O. Kamataki, S. Iida, T. Saitoh Tokyo Univ. of Agri. & Tech., Japan
P-IC-6	<a href="#">The Influence of Surface Recombination on the Limiting Efficiency of Silicon Solar Cells</a>
	E. Demesmaeker, J. Symons, J. Nijs, R. Mertens Interuniversity Micro Electronics Ctr., Belgium
P-IC-7	<a href="#">Exact Analytical Simulation for Large-Area, Simplified Backside-Contact Silicon Solar Cells</a>
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B-IVp-2	<a href="#">An Experience on Operation and Maintenance of PV Village Electrification System</a> A. Lubis, Z. Udin, R. Mulyadi BPP Teknologi, Indonesia
B-IVp-3	<a href="#">Monitoring and Evaluation of Performance of Solar Photovoltaic Installations in Ghana</a> J. Essandoh-Yeddu, C.Y. Wereko-Brobby, *F. K. Akorli National Energy Board, *Univ. of Sci. & Tech. Ghana
B-IVp-4	<a href="#">The Experience of the CINVESTAV-IPN in the R &amp; D of Photovoltaic Systems for the Mexican Rural Area</a> A. Urbano, Y. Matsumoto, J.L. del Valle, R. Asomoza Mexico Inst. of Tech., Mexico
B-IVp-5	<a href="#">Demonstration Tests at Rokko Advanced Energy Experiment Center</a> A. Kitamura, H. Matsuda, *K. Takigawa, *H. Kobayashi The Kansai Electric Power Co., *CRIEPI Japan
B-IVp-6	<a href="#">Operation and Characteristic Analysis of 1 MW Centralized PV Power System</a> K. Kawasaki, Y. Tanaka Shikoku Res. Inst.Inc., Japan
B-IVp-7	<a href="#">Design-Aid Expert System for Photovoltaic Power Generation System</a> E. Endo, K. Kurokawa, *M. Hayashi ETL, * A.I. Soft Inc., Japan

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#### ■ Late News

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C-IVpA-2	<a href="#">GaAs/Si Monolithic 2-Terminal Tandem Structure Solar Cell Grown by MOCVD</a> D. Imanishi, H. Shimizu, T. Soga, T. Jimbo, M. Umeho Nagoya Inst. of Tech., Japan
C-IVpA-3	<a href="#">Radiation-Hard High Efficiency InP Space Solar Cells and Panels</a> K.J. Linden, C.J. Keavney, L.M. Geoffroy, M.M. Sanfacon, S.M. Vemon, M.J. Nowlan, V.E. Haven, E.D. Gagnon Spire Co., U.S.A.
C-IVpA-4	<a href="#">Zn<sub>3</sub>P<sub>2</sub> Photovoltaic Film Growth by MOCVD for Zn<sub>3</sub>P<sub>2</sub>/Si Solar Cell</a> K. Kakishita, S. Ikeda, T. Suda Univ. of Ind. Tech., Japan
C-IVpA-5	<a href="#">Microcrystalline and Amorphous Silicon and Silicon Carbon Alloy Films Deposited by Microwave Plasmas</a>

	Y.H. Shing, F.S. Pool Jet Propulsion Lab., California Inst. of Tech., U.S.A.
C-IVpA-6	<a href="#"><u>Textured SnO<sub>2</sub>:F TCO Substrates for Stacked a-Si Solar Cells</u></a> K. Sato, Y. Gotoh, Y. Hayashi, K. Adachi, H. Nishimura Asahi Glass Co., Ltd., Japan
C-IVpA-7	<a href="#"><u>Textured ZnO Films with the In-plane C-axis Grown by MOCVD</u></a> A. Yamada, W.W. Wenas, M. Konagai, K. Takahashi Tokyo Inst. of Tech., Japan

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**■ Late News -Solar Cars & Solar Plane-**

	<a href="#"><u>Technical Trend of Solar Car in 1990 World Solar Challenge</u></a> H. Numasaki, H. Kabaya Solar Systems Institute, Japan
C-IVpB-2	<a href="#"><u>Hoxan Solar Car Phoebus III</u></a> Y. Maeda Hoxan Res. Labs., Japan
C-IVpB-3	<a href="#"><u>Solar Powered Vehicle "Blue Eagle"</u></a> H. Tezuka, Y. Umezawa, *K. Kanayama Kyocera Co., *Kitami Inst. of Tech., Japan
C-IVpB-4	<a href="#"><u>SEL-MAZDA Solar Car Powered by Amorphous Silicon Solar Cells to Enter 1990 "World Solar Challenge" in Australia</u></a> H. Shinohara, K. Nishi, *Y. Tsuji, M. Abe, S. Yamazaki Sernicon. Energy Lab., *Mazda R & D Cent., Japan
C-IVpB-5	<a href="#"><u>A Transcontinental Flight Across the United States by a Solar-Powered Airplane</u></a> Y. Kishi, H. Inoue, K. Murata, H. Tanaka, S. Kouzuma, M. Morizane, Y. Fukuda, H. Nishiwaki, K. Nakano, A. Takeoka, M. Ohnishi, Y. Kuwano SANYO Electric Co., LTD., Japan

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**■ Plenary Lecture-III**

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