

Table of Contents

Preface

Chapter 1: Silicon Based Solar Cells

Antireflection with Multilayer Structure Used on Silicon Solar Cell W.L. Wang and X.H. Rong	3
Influence of Defects on Solar Cell Characteristics O. Breitenstein, J. Bauer, P.P. Altermatt and K. Ramspeck	7
A Simple Texturization Approach for Mono-Crystalline Silicon Solar Cell with Low TMAH Concentration Solution W.Y. Ou, Y. Zhang, H.L. Li, L. Zhao, C.L. Zhou, H.W. Diao, M. Liu, W.M. Lu, J. Zhang and W.J. Wang	17
Aluminum-Induced Crystallization of p⁺ Silicon Pinholes for the Formation of Rear Passivation Contact in Solar Cell T. Fangsuwannarak, K. Amonsurintawong and S. Sopitpan	22
Effects of IPA on Texturing Process for Mono-Crystalline Silicon Solar Cell in TMAH Solution W.Y. Ou, Y. Zhang, H.L. Li, L. Zhao, C.L. Zhou, H.W. Diao, M. Liu, W.M. Lu, J. Zhang and W.J. Wang	32
Growth of Silicon Carbide Filaments in Multicrystalline Silicon for Solar Cells H.J. Möller, C. Funke, J. Bauer, S. Köstner, H. Straube and O. Breitenstein	39
Graded Buffer Layer Effect on Performance of the Amorphous Silicon Thin Film Solar Cells S.Y. Lien, M.J. Yang, Y.S. Lin, C.F. Chen, P.H. Lin, C.H. Hsu, P.C. Huang and Y.M. Shen	45
Antireflective Coatings with Nanostructured TiO₂ Thin Films for Silicon Solar Cells E. Manea, C.C. Pârvulescu, M. Purica, E. Budianu and F. Comanescu	50
Long Term Reliability and Power Degradation Analysis of Multicrystalline Silicon Solar Modules Using Electroluminescence Technique K.M. Lin, Y.H. Lee, W.Y. Huang, Y.W. Kuo, L.K. Wang and S.Y. Yang	56
Properties of Fe Doped Amorphous Carbon Thin Films for Photovoltaic Solar Cell Applications X.Y. Tan, X.Z. Zhang, C.H. Wan and X.L. Gao	60
Solar Grade Silicon Materials and Poly-Silicon Solar Cell Y.C. Gao, B.T. Zhao and W.X. Gao	64
Fabrication of a Spherical Silicon Solar Cell Module U.C. Cho	68
Research of Electric Properties of Monocrystalline Silicon Solar Battery Z.K. Li, J.Q. Wang, F.M. Zhang, X. Xia, H.H. Li, L. Meng, P. Zhang and L.B. Qi	70
Molecular Beam Epitaxy of Cu-Doped BaSi₂ Films on Si(111) Substrate and Evaluation & Qualification of Depth Profiles of Cu Atoms for the Formation of Efficient Solar Cells M.A. Khan, T. Saito, M. Takeishi and T. Suemasu	75
Increase of the Power of Solar Elements Based on Nanoparticles of Nickel Oxides Synthesized in Flame Z.A. Mansurov, M. Aueylkhankyzzy, B.T. Lesbaye, D.I. Chenchik, K.K. Dikhanbaev, N.G. Prikhodko, T.I. Taurbaev and A.V. Saveliev	80
Study of the Localized Heating of Si Solar Cells by Thermal Imaging and Scanning Electron Microscopy B. Wiengmoon	85
A Simple and Low Cost Approach for Texturing on CZ-Silicon Solar Cell X.F. Gou, X.D. Li, Y. Xu, S. Song, Y.F. Cui and H.Y. Fan	89
Amorphous and nc-Si:H Intrinsic Thin Films for Solar Cells Applications S. Halindintwali, D. Knoesen, B.A. Julies, T. Muller and C.J. Arendse	93
Research Progress of Slicing Method for Solar Silicon Wafer J.S. Wang, Z.F. Li and W.B. Wang	110

P-N Junction Formation in ITO/p-Si Structure by Powerful Laser Radiation for Solar Cells Applications	
A. Medvid', P. Onufrijevs, E. Dauksta, J. Barloti, A.G. Ulyashin, I. Dmytruk and I. Pundyk	115
Advanced Local Quality Assessment of Monocrystalline Silicon Solar Cell Efficiency	
P. Škarvada, L. Grmela and P. Tománek	119
Hydrogen Dilution Influence on the SiC Films Optical and Micro-Structural Properties as the Window Layer of P-i-n Solar Cell	
B.Y. Xu, H.D. Yang, B. Huang and J.D. Shi	123
Cleaning in Crystalline Si Solar Cell Manufacturing	
J. Schreckendiek, R. Hoyer, S. Patzig-Klein, F. Delahaye, G. Knoch and H. Nussbaumer	128
How to Overcome the Effects of Silicon Build-Up during Solar Cell Wet Chemical Processing	
I. Kashkoush, J. Rieker, G. Chen, D. Nemeth and A. Danel	134
Optimized Wet Processes and PECVD for High-Efficiency Solar Cells	
I. Kashkoush, G. Chen, D. Nemeth and J. Rieker	138
Wet-Chemical Conditioning of H-Terminated Silicon Solar Cell Substrates Investigated by Surface Photovoltage Measurements	
H. Angermann, U. Stürzebecher, J. Kegel, C. Gottschalk, K. Wolke, A. Laades, E. Conrad, C. Klimm and B. Stegemann	142
Combined Ozone/HF/HCl Based Cleaning and Adjusted Emitter Etch-Back for Silicon Solar Cells	
A. Moldovan, K. Birmann, J. Rentsch, M. Zimmer, T. Gitte and J. Fittkau	146
Wet Chemical Oxidation of Silicon Surfaces Prior to the Deposition of All-PECVD AlO_x/a-SiN_x Passivation Stacks for Silicon Solar Cells	
A. Laades, H. Angermann, H.P. Sperlich, U. Stürzebecher, C.A.D. Álvarez, M. Bähr and A. Lawerenz	151
Aspects of Surface Conditioning for High-Efficient Hetero-Junction Silicon Solar Cells	
L. Breitenstein, K.U. Ritzau, M. Hermle and W. Warta	155
Improved Surface Cleaning by <i>In Situ</i> Hydrogen Plasma for Amorphous/Crystalline Silicon Heterojunction Solar Cells	
S.N. Granata, T. Bearda, F. Dross, I. Gordon, J. Poortmans and R.P. Mertens	158
Ozone Based Chemical Oxide Growth for Crystalline Solar Cell Production	
K. Wolke, C. Gottschalk, J. Rentsch and H. Angermann	161
Simple Wet-Chemical Cleanings for High-Efficiency Silicon Solar Cell Applications	
L. Breitenstein, F. Sevenig, D. Pysch, C. Gottschalk, M. Hermle and W. Warta	165
Improvement the Open Circuit Voltage of Amorphous Silicon Solar Cells by Treating the P Layer with Hydrogen Plasma	
M.J. Shi, L. Xiong and L.L. Chen	169
Advanced Texturization of Mc-Si Solar Cells	
S. Braun, S. Mathijssen, M. Michel, M. Schmidt, M.M.C. Shen, W.C.W. Lin and A. Klipp	173
Good Quality N (a-Si)-P+(Na-Si)-P (μC-Si) Tunnel Junction for Tandem Solar Cells	
L.L. Chen, M.J. Shi and J.H. Yu	177
Optimization of Post-Texturization Cleans for Heterojunction Solar Cells	
T. Bearda, K. Yoshikawa, E. van Assche, B. O'Sullivan, I. Gordon, K. Yamamoto, K. Baert and J. Poortmans	181
HF Last Passivation for High Efficiency a-Si/c-Si Heterojunction Solar Cells	
A. Danel, F. Souche, T. Nolan, Y. Le Tiec and P.J. Ribeyron	185
Wet-Chemical Preparation of Textured Silicon Solar Cell Substrates: Surface Conditioning and Electronic Interface Properties	
H. Angermann, A. Laades, U. Stürzebecher, E. Conrad, C. Klimm, T.F. Schulze, K. Jacob, A. Lawerenz and L. Korte	189
Research on the Photoelectric Conversion Efficiency of Grating Anti-Reflective Layer Solar Cells	
H. Zhong, Y.Y. Gao, R.L. Zhou, B.J. Zhou, L.Q. Tang and L.X. Wu	193
Bulk Passivation of Defects in Multi-Crystalline Silicon Solar Cells by a-SiN_x:H Layers	
E. Cornagliotti, H.F.W. Dekkers, C. Prastani, J. John, E. Van Kerschaver, J. Poortmans and R.P. Mertens	198

Surface Passivation for Si Solar Cells: A Combination of Advanced Surface Cleaning and Thermal Atomic Layer Deposition of Al₂O₃ B. Vermang, A. Rothschild, K. Kenis, K. Wostyn, T. Bearda, A. Racz, X. Loozen, J. John, P.W. Mertens, J. Poortmans and R.P. Mertens	204
Iron Gettering in CZ Silicon during the Industrial Solar Cell Process A. Laades, K. Lauer, C. Maier, D. Alber, M. Bähr, J. Nutsch, J. Lossen and A. Lawerenz	209
Study of Internal versus External Gettering of Iron during Slow Cooling Processes for Silicon Solar Cell Fabrication J. Hofstetter, J.F. Lelièvre, C. del Cañizo and A. Luque	215
Fabrication of Novel Ag-Paste and Evaluation of its Electrical Properties in Bulk-Si Solar Cell J.H. Jeong, S.J. Kim, C.R. Son, S.C. Ur and S.Y. Kweon	222
EBIC Investigation of the Influence of Hydrogen Passivation on Thin-Film Polycrystalline Silicon Solar Cells Obtained by Aluminium Induced Crystallization and Epitaxy D. Van Gestel, I. Gordon and J. Poortmans	226
Characterization of Amorphous Silicon Thin Films Deposited on Upilex-s Polyimide Substrates for Application in Flexible Solar Cells Y.G. Li and D.X. Du	232
An Express Method for the Study of Planar Homogeneity of Diffusion Length in Multicrystalline Solar Silicon V.G. Litovchenko, A. SARIKOV and A.A. Evtukh	238
Properties of Aluminium Thin Films on Polyimide Plastics as Back Contacts in Thin Film Silicon Solar Cells M.Z. Pakhuruddin, K. Ibrahim and A. Abdul Aziz	243
Characterizations of Electron Beam Evaporated Silicon Thin Films on Plastic Substrates for Solar Cells Applications P.C. Ang, K. Ibrahim and M.Z. Pakhuruddin	249
Texturing of Multi-Crystalline Silicon Wafers Through Ionized Bubble for Solar Cell Fabrication L.Q. Wu, Y. Chao and J. Shao	254
Solar Cell Fabrication by Wet Etching Combined with Ultrasonic Vibration for Multicrystalline Silicon L.Q. Wu, Y. Chao and X.L. Luo	258
Preparation and Properties of Al-Doped ZnO Thin Films for Solar Cells Y.L. Wang, Y.H. Hu and J.Y. Ye	262
Surface Texturing for Crystalline Silicon Solar Cell Using RIE Equipped with Metal-Mesh D.Y. Kong, C.S. Cho, J.H. Jo, B.H. Kim and J.H. Lee	267
Centrifugal Separation of Primary Silicon during Solidification in Al-Si Alloy for Solar Silicon Feedstock J.Y. Cho, B.H. Kang and K.Y. Kim	271
Porous Silicon Based Solar Cells Y.M. Huang, Q.L. Ma, M. Meng and B.G. Zhai	275
Preparation and Characterization of Silicon Nanowire Arrays for Solar Cell W.B. Yang, J. Wun, M. Wei, C. Wang and C.Q. Xie	279
Fast Melting and Refining of Recycled Silicon Powders from the Wafer Back Grinding Process for Solar Cell Feedstock K.H. Seo, B.H. Kang and K.Y. Kim	283
The Fabrication of Large-Area Upgraded Metallurgical Grade Multi-Crystalline Silicon Solar Cells in a Production Line T. Chen, Y.W. Zhao, Z.Y. Don, J. Wang, T. Liu and H. Xie	289
The Purification of Solar Grade Silicon by Chloridizing Roasting T. Lin, D.L. Lu, Y.Y. Hu, B. Wang, Y. Liu, Y.H. Sun, H.Y. Chen and Q.S. Li	296
Study on Theoretical Basis and Process Optimization for Solar Grade Silicon Fabrication Y.C. Gao and B.T. Zhao	300
Fabrication the Texture Zinc Oxide Thin Films and its Application in Hydrogenated Amorphous Silicon Solar Cell Y.H. Hu, H.J. Xu, H. Gao and Y.C. Chen	304

Hydrogen Dilution Influence on the SiC Films Preparation and Structural Properties as the Window Layer of p-i-n Solar Cell	308
B.Y. Xu, H.D. Yang, B. Huang and J.D. Shi	
Preparation of Solar-Grade Polysilicon by Acid Leaching	313
Y. Chang, H.Y. Chen, Q.W. Luo and Q.H. Ye	
The Research of Flexible Solar Cells for Application in Solar Roof	317
J.S. Lei, Z.Q. Zhang and Y. Yao	
The Effect of the Doping Profile in Aluminum Back-Surface-Field on the Electronic Properties of c-Si Solar Cells	322
J.C. Zhou and Y.M. Chen	
Liquid-Phase Diffusion of Phosphorus Atoms in Laser-Doped Crystalline Silicon Solar Cells	326
T. Li, C.L. Zhou, Z.G. Liu, W.J. Wang, Y. Song, Z.H. Gao, Y. Duan and Y.Z. Li	
A Theoretical Study on the Performance of SnO₂/SiO₂/n-Si Solar Cells	330
F.A. Noor, F. Oktasendra, E. Sustini, A. Mikrajuddin and K. Khairurrijal	
Defect Generation and Propagation in Mc-Si Ingots: Influence on the Performance of Solar Cells	338
B. Sopori, V. Mehta, S. Devayajanam, M. Seacrist, G. Shi, J. Chen, A. Deshpande, J. Binns and J. Appel	
Silicon PV Wafers: Mechanical Strength and Correlations with Defects and Stress	348
G.A. Rozgonyi, K.M. Youssef, P. Kulshreshtha, M. Shi and E. Good	
Classification of Recombination-Active Defects in Multicrystalline Solar Cells Made from Upgraded Metallurgical Grade (UMG) Silicon	357
D. Lausch, R. Bakowskie, M. Lorenz, S. Schweizer, K. Petter and C. Hagendorf	
Efficiency-Limiting Recombination in Multicrystalline Silicon Solar Cells	363
M.C. Schubert, J. Schön, A. Abdollahinia, B. Michl, W. Kwapił, F. Schindler, F. Heinz, M. Padilla, J.A. Giesecke, M. Breitwieser, S. Riepe and W. Warta	
Implementation of Highly Resistive Emitter Solar Cells in a Production Environment using an Inline Doping System	371
W. Wille, R. Rothemund, G. Meinhardt and W. Jantsch	
Improving Silicon Concentrator Solar Cells Performance by Dielectric Liquids Immersion	376
X.Y. Han, Y.P. Wang and L. Zhu	
External and Internal Gettering of Interstitial Iron in Silicon for Solar Cells	380
D. Macdonald, A.Y. Liu and S.P. Phang	
Characterisation of Dislocation-Content in Multicrystalline-Silicon Wafers	388
A. Ghaderi and S. Senkader	
Electric Field Effect Surface Passivation for Silicon Solar Cells	394
R.S. Bonilla, C. Reichel, M. Hermle and P.R. Wilshaw	
Light Trapping in Monocrystalline Si Solar Cells Using Back-Side Diffraction Gratings	400
R. Rothemund, T. Umundum, G. Meinhardt, K. Hingerl, T. Fromherz and W. Jantsch	
Characterization of Plasmonic Silicon Solar Cells Using Indium Nanoparticles/TiO₂ Space Layer Structure	405
W.J. Ho, Y.Y. Lee and Y.T. Chen	
Nonlinear Response of Si-Based Solar Cells in Linearly Polarized Light under Low Illumination	410
Q. Wang, X.D. He and W.B. Xiao	
Characterization of Traps in Crystalline Silicon on Glass Film Using Deep-Level Transient Spectroscopy	414
T. Mcchedlidze, J.H. Zollondz and M. Kittler	
Influence of Laser Scribing System in the Electrical Properties for a-Si Thin Film Solar Cell Preparation	420
X.S. Chen, X. Chen, X.D. Chen and M.S. Yang	
Analysis on micro-/poly-Crystalline SiGe Alloy Solar Cells	425
Q.B. Zhang, W.S. Wei and F. Shan	
Direct Observation of Carrier Trapping Processes on Fe Impurities in mc-Si Solar Cells	434
Y. Yoshida, Y. Tsukamoto, M. Ichino and K. Tanaka	
Analysis of Inhomogeneous Dislocation Distribution in Multicrystalline Si	441
J. Chen, R.R. Prakash, J.Y. Li, K. Jiptner, Y. Miyamura, H. Harada, A. Ogura and T. Sekiguchi	
Recombination Activity of Twin Boundaries in Silicon Ribbons	447
E.B. Yakimov, O.V. Feklisova and S.K. Brantov	

Analysis of Electron-Beam Crystallized Large Grained Si Films on Glass Substrate by EBIC, EBSD and PL	451
W. Seifert, D. Amkreutz, T. Arguirov, H.M. Krause and M. Schmidt	
Formation of a Low Reflective Surface on Silicon Solar Cells by Chemical Treatment Using Ag-Assisted Electroless Etching	457
G.F. Ma, H.L. Zhang and X.F. Yang	
Effect of Loading Rates on the Nominal Bonding Strength between Soft Substrate and Photovoltaic Silicon Wafer	461
G.N. Liu, H.D. Zhao, W. Yang, S.G. Ma and M.H. Zhao	
Studies on Nanostructure ITO Thin Films on Silicon Solar Cells	465
R. Balasundraprabhu, E.V. Monakhov, N. Muthukumarasamy and B.G. Svensson	
Research of a New Type of Solar Cell Materials	469
H.H. Li, Y.H. Wang and D.Y. Zhu	
Effects of One-Dimensional Photonic Crystal on Thin Film Silicon Solar Cells	473
Q. Wang, H.N. Mo, Z.Q. Lou, K.M. Yang, Y. Sun, Y.J. He and D.Y. Chen	
Evaluation and Optimization of Grid Patterns of Silicon Solar Cells by Diode and Series Resistance Model	478
S.K. Fan, J.X. Liao, X.B. Wei, S.H. Hu and J. Yu	
Mechanism of the Improvement in Microcrystalline Silicon Solar Cells by Hydrogen Plasma Treatment	484
J.Y. Li, X.B. Zeng, H. Li, X.B. Xie, P. Yang, H.B. Xiao, X.D. Zhang and Q.M. Wang	
Effects of Nitrogen Doping on Nanocrystalline Diamond/p-Type Si toward Solar Cell Applications	490
C.R. Lin, D.H. Wei and M.K. Bendao	
The Amorphous/Crystalline Silicon Interface Research of HIT Solar Cells by Simulation	495
H. Li, X.B. Zeng, X.B. Xie, P. Yang, J.Y. Li, X.D. Zhang and Q.M. Wang	
A New Structure of Tandem Solar Cell with Amorphous Silicon and Polysilicon	503
J.X. Zhang, J.X. Liu, Y.B. Wan and Y.H. Sun	
Mechanical Induced Defects and Fractures in the Silicon Solar Cell Structure	507
R. Macků, P. Koktavý, J. Šicner and V. Holcman	
Substrate with Si Nanoparticles Prepared by Low Pressure Chemical Vapor Deposition for Application in Si Solar Cells	511
X.G. Zhang, X.G. Miao, Z.Y. Zhao, R.P. Liu and M.Y. Li	
Low Reflectivity ErAlO Film on Si as Anti-Reflecting Coating in Solar Cells	515
Y.Y. Zhu, Z.B. Fang, H.Y. Li, J. Chen and H.J. Cao	
Ribbon Silicon Material for Solar Cells	519
J.G. Li, P. Wu, P. Yu and S.A. Li	
Study of the Influence of Structural Defects on Properties of Silicon Solar Cells	523
J. Šicner, P. Škarvada, R. Macků and P. Koktavý	
Influence of Surface Morphology of Textured Substrate against Poly-Si Thin Film Solar Cells Performance	527
R. Muhida, T. Toyama and H. Okamoto	
Experimental Analysis of Laser Scattering Patterns for the Surface Inspection of Crystalline Wafers in Solar Cell	532
G.B. Kim	
Light Trapping Potential of Hexagonal Array Silicon Nanohole Structure for Solar Cell Application	538
N.A. Yahaya, N. Yamada and T. Nakayama	
Adhesion and Barrier Properties Analysis of Silica-Like Thin Layer on Polyethylene Naphthalate Substrates for Thin Film Solar Cells	545
M.L. Addonizio and L. Fusco	
Laser Cold Ablation as a Cutting Edge Method of Forming Silicon Wafers Used in Solar Cells	551
P. Sek and S. Tofil	
High Temperature Annealing Amorphous Hydrogenated SiC Films for the Application as Window Layers in Si-Based Solar Cell	557
R.D. Hong, X.P. Chen, Q. Huang, Y.N. Xie, S.X. Wu, Z.F. Zhang and Z. Wu	
Design Analysis of <i>a</i>-Si/<i>c</i>-Si HIT Solar Cells	561
M. Nawaz	

The Research on Solar Cell of a Novel Ribbon Silicon Material	567
J.G. Li, P. Wu, P. Yu and S. Li	
Design and Simulation of a-Si:H/nc-Si:H Tandem Solar Cells	572
F. Shan and W.S. Wei	
Improvement on Electrical Properties of Screen-Printed Crystalline Silicon Solar Cells by Light-Induced Electroplating of Silver	578
T. Li, C.L. Zhou, Z.G. Liu, W.J. Wang, Y. Song, Z.H. Gao, Y. Duan and Y.Z. Li	
Active Materials Based on Implanted Si for Obtaining Intermediate Band Solar Cells	582
K. Sánchez, I. Aguilera, P. Palacios and P. Wahnón	
Preparation of Self-Assembled Au Nanoparticles Arrays for Silicon Solar Cell Applications	588
C.Y. Duan, Y. Feng, X.X. Zhao and H. Shen	
Improvement in the Transport of Charge Carriers in Tunnel Junctions of Silicon-Based Thin Film Tandem Solar Cells	594
M.J. Shi, X.F. Guo, S.Z. Wang and L.L. Chen	
Periodic Nanostructured Thin-Film Solar Cells	598
C.F. Hsieh, H.S. Wu, T.C. Wu and M.H. Liao	
EBIC Study on Metal Contamination at Intra Grain Defects in Multicrystalline Silicon for Solar Cells	602
T. Sameshima, N. Miyazaki, Y. Tsuchiya, T. Tachibana, Y. Ohshita, K. Arafune and A. Ogura	
Effects of Progressive SiN_x Films on the Performance of Polycrystalline Silicon Solar Cells	606
P. Wang, X.F. Gou, W.T. Fan and C.C. Sun	
Thin-Film Silicon Solar Cells Using Back Reflector with Embedded Metal Nanoparticles	611
R.R. Liang, R. Santbergen and M. Zeman	
Broadband Light Harvesting Enhancement in Thin Film Solar Cells with Surface and Back Reflector Grating Nanostructures	617
W. Zhang, X.Y. Li and L.Y. Jiang	
Combined EL and LBIC Study of the Electrical Activity of Defects in Solar Cells Based on Innovative Wafers Grown by Casting Methods	623
B. Moralejo, V. Hortelano, O. Martínez, J. Jiménez, M.A. González, I. Guerrero and V. Parra	
Behaviour of Light Induced Defect Generation and Carrier Lifetime Degradation in Solar Grade Silicon	627
B.D. Rezgui, V. Mong-The Yen, I. Péricaud, D. Barakel, M. Pasquinelli and O. Palais	
Effect of Temperature on Performance Parameters of Metallurgical Grade Polysilicon Solar Cells	631
L.F. Zhang, Y. Tan, Z.Q. Yang, Z.F. Gao and Y. Nie	
High-Speed Deep-Level Luminescence Imaging in Multicrystalline Si Solar Cells	635
F. Okayama, M. Tajima, H. Toyota and A. Ogura	
Distribution of Electromagnetic Field and Energy Flux in the Thin Film Solar Cell with Silver Nano-Disk Array	639
H. Zhou, X.P. Huang, L. Zhong, S.K. Ji, Y. Pang, S.J. Bi, Y.L. Liu, K. Chen and F.Z. Song	
Effect of Interface States on the Properties of a-Si:H/c-Si Heterojunction Solar Cells Based on Solar Materials	649
C.L. Zhong, L.E. Luo and Y.Q. Xia	
Combinatorial Synthesis Study of Passivation Layers for Solar Cell Applications	653
N. Ikeno, T. Tachibana, H. Lee, H. Yoshida, K. Arafune, S. Satoh, T. Chikyow and A. Ogura	
Influence of Nickel Film Thicknesses on Dark Current-Voltage Characteristics of Silicon Solar Cells	657
T. Li, C.L. Zhou, Z.G. Liu, W.J. Wang, Y. Song, Z.H. Gao, Y. Duan and Y.Z. Li	
The Investigation of Plating Technologies for Front Fingers of c-Si Solar Cells	661
S.Y. Sun, J.P. Long and B. Zhang	
Improvement of n/i Interface Layer Properties in Microcrystalline Silicon Solar Cell	665
X.B. Zeng, J.Y. Li, X.B. Xie, P. Yang, H. Li, H.B. Xiao, X.D. Zhang and Q.M. Wang	
Fabrication and Morphology of KOH Etching Single Crystalline Silicon Solar Cells	669
H.Y. Zhang, C.W. Zhao, J.W. Guo and J.F. Hou	
Optimizing Back Surface Field of Heterojunction Thin-Film Solar Cells by Numerical Simulation	673
G. Lu and L. Zhang	

Light Scattering by Textured Al-Doped Zinc Oxide Film for Thin Film Silicon Solar Cells Coated on Glass Substrates	678
D.K. Miao, Q.N. Zhao, Y.H. Dong, W.H. Yuan, L. Wu, H.Y. Liang, B. Wang and X.Q. Lu	
Review and Development of Crystalline Silicon Solar Cell with Intelligent Materials	687
Y.L. Wang and J.Y. Ye	
Study on Properties of Thick-Film Front Silver Electrodes for Silicon Solar Cells	691
M. Fu, G.L. Jin, X. Ding, L. Fan and D. Chen	
Enhanced Omnidirectional Optical Absorption in a Nanopatterned Silicon Thin Film for Photovoltaic Applications	696
H. Lu, C.H. Xue and H. Chen	
Deposition and Properties of Hydrogenated Microcrystalline Silicon (μc-Si:H) Films for Solar Cells	700
Y.L. Li, Z.L. Zhang, H. Gang and P. Qiu	
Picosecond Laser Microstructuring for Black Silicon Solar Cells	704
X.N. Zhu, H.L. Zhu, D.W. Liu, Y.G. Huang, X.Y. Wang, H.J. Yu, S. Wang, X.C. Lin and P.D. Han	
An Ultraviolet-Enhanced Response Solar Cell and Tunneling Effect	709
B. He, H.W. Du, L. Zhao, F. Xu and Z.Q. Ma	
Process Study of Atomic Layer Deposition Al_2O_3 in Industry Application for Solar Cells	715
H.B. Qiu, H.Q. Li, B.W. Liu and Y. Xia	
Study on the Performance of Aluminum Thick Film Contacts for Silicon Solar Cells	721
M. Fu, H.Y. Li, G.L. Jin, L. Fan, D. Chen and Z. Feng	
Laser Textured Black Silicon Solar Cells with Improved Efficiencies	727
X. Sedao, R. Torres, T. Sarnet, P. Delaporte and M. Sentis	
Modeling of the Boron Emitter Formation Process from BCl_3 Diffusion for N-Type Silicon Solar Cells Processing	733
J. Armand, C. Oliver, F. Martinez, B. Semmache, M. Gauthier, A. Foucaran and Y. Cuminal	
A Simple Optimization of Triple-Junction Solar Cell nc-Si:H/a-Si:H/a-SiGe:H Using Computer Modeling and Robust Design	737
T. Abuzaire and N.R. Poespawati	
Detailed Analysis of Shallow and Heavily-Doped Emitters for Al-BSF Bifacial Solar Cells	741
S. Sepeai, S.H. Zaidi, M.Y. Sulaiman, K. Sopian, M.A. Ibrahim, M.K.M. Desa and M.D. Norizam	
Simulation of Graded Band-Gap PIN nc-Si Thin-Film Solar Cells	746
M.K. Xu	
Improved Ghost Plating of Light-Induced Plating on Crystalline Silicon Solar Cells by SiO_2/SiN Selective Etching	750
T. Li, C.L. Zhou, Z.G. Liu, W.J. Wang, Y. Song, Z.H. Gao, Y. Duan and Y.Z. Li	
Large-Area P-μc-Si:H Thin Films Prepared by VHF-PECVD and its Application in Micromorph Tandem Solar Module	754
H.Z. Ren, Y. Zhao, X.D. Zhang, H. Ge and Z.P. Wang	
Silicon Nanowires Based Solar Cell Using Native Oxide and Silicon Nitride Bi-Layer Passivation	759
X.X. Lin	
Numerical Simulation for Gas Supply Line Design in Manufacturing Process of Silicon Solar Cells Based on Steady State Fluid Dynamics	763
R.L. Chen, S.H. Wang, Y. Sun and Y.J. Dong	
Nanoimprint Photonic Crystal Film Enhanced Light-Trapping in a-Si Thin Film Solar Cells	769
W.P. Chu, F.S. Juang, J.S. Lin, T.C. Lin and C.W. Kuo	
The Fabrication and Photoelectric Properties of the Nanopillar Arrays for Solar Cell	775
J. Liu, Y.X. Liao, B. Wang and F.T. Yi	
Effect of Interface States on the Open-Circuit Volatage in a-Si:H/c-Si Heterojunction Solar Cells	780
L.E. Luo and C.L. Zhong	
Effect of the Impurity Concentration of a-Si:H on the Properties of a-Si:H/c-Si Heterojunction Solar Cells	783
L.E. Luo and C.L. Zhong	
Contribution of the Luminescence Phenomena of nc-Si to the Performances of the Industrial mc-Si Solar Cells	787
A. Zerga and K. Benyelles	

Research on Nanocrystalline Silicon Film Solar Cells	791
C.R. Xue	
Fabrication of Anti-Reflecting Silicon Surfaces for Solar Cells Using Ag Assisted Chemical Etching	
C.L. He, X.F. Yang, G.F. Ma, J.M. Wang, Z.F. Du, D.L. Zhao and Q.K. Cai	795
APCVD Deposition of Si Film on SiO₂ Patterned Si (111) Substrates for Solar Cells	
C.Y. Duan, B. Ai, J.J. Lai, C. Liu, Y.J. Deng and H. Shen	799
Two-Dimensional Modelling and Simulation of Crystalline Silicon n⁺pp⁺ Solar Cell	
S. Tobbeche and M.N. Kateb	805
Investigation on Antireflection Coatings for Silicon Solar Cells	
C.R. Xue, Y.Q. Gu and M.L. Deng	814
Analysis on the Efficient Limiting Factors of N-Type Rear Junction Solar Cells by PC1D Simulation	
H.L. Li, L. Zhao, C.L. Zhou, H.W. Diao and W.J. Wang	818
Optical and Electrical Simulations of Solar Cell Based on Silicon and Silicon Carbide	
S. Biondo, W. Vervisch and L. Ottaviani	823
Macroporous Silicon Fabricated by HF Electrochemical Etching for Antireflective Application in Solar Cells	
W.Y. Ou, L. Zhao, Z.C. Li, H.W. Diao and W.J. Wang	827
Optimization of Texturization on Monocrystalline Silicon Solar Cell	
X.F. Gou, P. Wang, L.K. Jiang, S. Song and Y. Xu	832
Simulation on Temperature Characteristics of Solar Cell	
Y.C. Jiang, F.Q. Yang and G.L. Hu	836
Titanium-Doped Indium-Tin-Oxide Anti-Reflection Coating for Poly-Si Solar Cells	
J.Y. Lin, S.Y. Lien, H.Z. Liao, C.C. Wang, A. Nautiyal and Y.H. Lin	840
Design and Analysis of One-Dimensional Nanostructure on Amorous Silicon Solar Cell for Surface Reflectance Reduction	
Y. Li, X.D. Zheng and L.F. Shen	845
An Improved Engineering Model of Silicon Solar Cell	
Z.L. Liao, Y.J. Xu and D. Xu	850
Experimental Study of Light Intensity on I-V Characteristic of Single Crystalline Silicon Solar Cell	
T. Meng, C.M. Zhang, C. Liu and S.S. Meng	854
Electrical Simulation and Characterization of Shunts in Solar Cells	
R. Gupta, P. Somasundaran and D.K. Nandi	858
The Measurements of Spectral Reflectance Spatial Distribution on Mc-Si Solar Cell Surface	
X.D. Zheng, Y.Z. Ye and L.F. Shen	863
Three Reductions Used in Preparation of the Silver Nano-Particle for Crystalline Silicon Solar Cell and its Characterization	
Q. Peng and Y.L. Zhu	867
Preparation of Large Size Pyramidal Texture on N-Type Monocrystalline Silicon Using TMAH Solution for Heterojunction Solar Cells	
J.W. Chen, L. Zhao, S. Zhou, H.W. Diao, Y.H. Tang, B.J. Yan and W.J. Wang	871
Microcrystalline Silicon Thin Films and Triple-Junction Solar Cells	
H.Z. Ren, Y. Zhao, X.D. Zhang, H. Ge and Z.P. Wang	876
Investigation on AR Techniques of Silicon Solar Cells	
C.R. Xue, Y.Q. Gu and M.L. Deng	880
The Effect of Al-BSF on S_{eff} and R_b in Industrialized Mono-Silicon Solar Cells	
S.S. Dai, G.J. Zhang, X.D. Luo, J.X. Wang, W.J. Chen and Y. Ma	884
Numerical Simulation of Nc-Silicon PIN Solar Cells with AMPS-1D	
M.K. Xu	889
A Study on Optical and Electrical Properties of Solar Cells of a-Si_{1-x}Ge_x:H	
M.B. Li and L.B. Shi	893
Preparation of Ag Nanoparticles Arrays for Silicon Solar Cells	
C.Y. Duan, X.X. Zhao, C.J. Hu, D.L. Lu and H. Shen	897
Design for Amorphous Silicon Solar Cells	
C.R. Xue and X.Y. Sun	904

High Efficiency Thin Film Silicon Solar Cells	
C.R. Xue and X.Y. Sun	908
Simulation of Silicon Solar Cell Using PC1D	
C. Jiang, T.Z. Li, X. Zhang and L. Hou	912

Chapter 2: Dye-Sensitized Cells

A Novel Counter Electrode Based on Hierarchical Porous Carbon for Dye-Sensitized Solar Cells	
G.Q. Wang, W. Xing and S.P. Zhuo	919
Dye Sensitized Solar Cell: A Summary	
K. Rokesh, A. Pandikumar and K. Jothivenkatachalam	924
Dye-Sensitized Solar Cells Built on Plastic Substrates by Low-Temperature Preparation of Semiconductor Films	
T. Miyasaka	948
Study on Determination of I-V Curve of Dye-Sensitized Solar Cell	
H.M. Tian, T. Yu and Z.G. Zou	967
Dye-Sensitized Solar Cells Based on Nitrogen-Doped Titania Electrodes	
W. Guo, Q.Q. Miao, G. Xin, L.Q. Wu and T.L. Ma	974
Porphyrins as Potential Sensitizers for Dye-Sensitized Solar Cells	
H. Imahori	981
Composite Polymer Electrolyte for Dye-Sensitized Solar Cells: Role of Multi-Walled Carbon Nanotubes	
A. Chindaduang, P. Duangkaew, S. Pratontep and G. Tumcharern	993
Improvement of Photovoltage in Dye-Sensitized Solar Cells with Azobenzene and Azulene Sensitizing Dyes by Applying Br₃⁻/Br⁻ Redox Mediator	
K. Kakiage, E. Fujimura, Y. Nakada, T. Ogino, T. Kyômen and M. Hanaya	997
Dye Sensitized Solar Cell Using Natural Dyes as Chromophores - Review	
I. Jinchu, C.O. Sreekala and K.S. Sreelatha	1002
Investigation of PEO-Imidazole Ionic Liquid Oligomer and Polymer Electrolytes for Dye-Sensitized Solar Cells	
Y. Lin, M. Wang and X.R. Xiao	1015
Enhancing the Performance of Dye-Sensitized Solar Cells by Incorporating Mesoporous Carbon in Polymer Gel Electrolyte	
G.Q. Wang, L. Wang and S.P. Zhuo	1036
A Critical Review on Mesoporous Photoanodes for Dye-Sensitized Solar Cells	
D. Jyoti, D. Mohan, A. Singh and D.S. Ahlawat	1040
Gelation of Ionic Liquid-Based Electrolyte with Ordered Mesoporous Silica Particles for Quasi-Solid-State Dye-Sensitized Solar Cells	
G.Q. Wang, L. Wang, W. Xing and S.P. Zhuo	1057
Adsorption and Sensitizing Properties of Azobenzenes Having Different Numbers of Silyl-Anchor Groups in Dye-Sensitized Solar Cells	
K. Kakiage, M. Yamamura, T. Kyômen, M. Unno and M. Hanaya	1062
Research Progress of the Counter Electrode in Dye-Sensitized Solar Cells	
Y.T. Tang, X. Pan, S.Y. Dai, C.N. Zhang and H.J. Tian	1068
Hybrid Structure of TiO₂ Nanofiber and Nanoparticle for Dye-Sensitized Solar Cells	
J.S. Kim, S.C. Shim, T.H. Hwang and W.Y. Choi	1084
Fabrication of Dye-Sensitized Solar Cells with Electrolyzed TiO₂ Nanotube Array Films	
T. Nakamura, K. Hayashi, A. Masahiro and T. Ogihara	1088
Improved Gel Electrolyte by Layered α-Zirconium Phosphate for Quasi-Solid-State Dye-Sensitized Solar Cells	
L. Han, N. Wang, H.C. He, D.T. Kong and H.J. Chen	1093
ZnO Nanoforest Based New Generation Dye Sensitized Solar Cells	
P.N. Dave and P.R. Malpani	1098
Fabrication of Nanostructured NiO Thick Films by Facile Printing Method and their Dye-Sensitized Solar Cell Performance	
K. Sakurai and S. Fujihara	1117

Influence of Polymer Concentration on Polysaccharide Electrolyte for Quasi-Solid-State Dye-Sensitized Solar Cell	1121
Y. Yang, X.Y. Guo and X.Z. Zhao	
Performance of TiO₂ Nanoparticles Synthesized at pH 2 as Photoelectrode in Dye Solar Cell	1127
A. Ramli and I.A. Ahmad	
Advantageous Effect of Macroporous TiO₂ Particles on Dye-Sensitized Solar Cells	1132
N. Hitachi and S. Fujihara	
Light Trapping in Dye Sensitized Solar Cells with Length-Modulated TiO₂ Nanotubes	1136
C. Shen, L. Shen, J. Yang, J.W. Shi, F. Xu and Z.Q. Ma	
Plasmon Resonance Enhanced Zinc Oxide Photoelectrodes for Improvement in Performance of Dye Sensitized Solar Cells	1141
T. Bora, H.H. Kyaw and J. Dutta	
Application of Micro-Metal Textile for Flexible Dye-Sensitized Solar Cell	1152
K. Kakiage, E. Fujimura, M. Abe, H. Shinoda, T. Kyōmen and M. Hanaya	
Design and Synthesis of Ruthenium (II) Complexes and their Applications in Dye Sensitized Solar Cells (DSSCs)	1160
P. Prompan, K. Wongkhan and R. Jitchati	
Effect of Nanograss and Annealing Temperature on TiO₂ Nanotubes Based Dye Sensitized Solar Cells	1164
J. Naduvath, S. Shaw, P. Bhargava and S. Mallick	
Computational Study on Triphenylamine-Based Dyes Containing Benzimidazole Units for Dye-Sensitized Solar Cells	1175
Z.Q. Wan, L.L. Zhou, C.Y. Jia, X.J. Yao and Y. Shi	
Preparation and Photovoltaic Properties of Flexible Dye-Sensitized Solar Cells	1180
Y. Zeng, L.J. Zhao, Y. Zhen, F.X. Shi and Y. Tong	
Effect of Material Parameters on the Optical Properties of Dye-Sensitized Solar Cell Photoanode	1184
A. Singh, D. Mohan, D.S. Ahlawat and D. Jyoti	
Influence of Sintering Behavior of ZnO Nanoparticles on J-V Characteristics of ZnO-Based Dye-Sensitized Solar Cells	1189
S. Ueno and S. Fujihara	
Fabrication and Testing of Dye-Sensitized Solar Cell	1193
D.T. Rajalakshmi and R. Velavan	
Electron Transportation and Recombination in TiO₂ Film for Flexible Dye-Sensitized Solar Cell	1204
H. Lin, X.C. Zhao, Y.Z. Liu, X. Li and J.B. Li	
Nanostructural Control of Pt Layer on Counter Electrode for Application to Dye-Sensitized Solar Cells	1215
K. Murakami, S. Fujiwara, D. Kobayashi, H. Ishihara and M. Shimomura	
Synthesis of Titania Nanotubes with Different Diameters for Dye-Sensitized Solar Cells	1219
J. Tang, T. Nakamura, T. Ogihara and J. Xiong	
Lawsone Sensitized ZnO Photoelectrodes for Dye Sensitized Solar Cells	1223
S.S. Khadtare, S.R. Jadkar, S. Salunke-Gawali and H.M. Pathan	
Effect of Sintering Profiles on Titania Interparticle Connectivity, Electron Transport and Interfacial Resistance in Dye-Sensitized Solar Cells	1229
A.K. Jena, S.P. Mohanty and P. Bhargava	
New Family of Ruthenium-Dye-Sensitized Solar Cells (DSSCs) with a High Solar-Energy-Conversion Efficiency	1244
Y. Thathong, K. Traipop, T. Sudyoadsuk and R. Jitchati	
Fabrication of Dye-Sensitized Solar Cells with Hydrothermally-Synthesized TiO₂ Nanopowder Films	1248
T. Nakamura, K. Hayashi and T. Ogihara	
The Microstructure of Titanium Oxide Films for Dye-Sensitized Solar Cells	1252
T. Kakuda and T. Futakuchi	
Preparation and Characterization of Dye-Sensitized Solar Cells Containing TiO₂ Nanotube Clusters/Nanoparticle Hybrid Films	1256
K. Hayashi, T. Nakamura and T. Ogihara	
Preparation of Titanium Dioxide Paste for Dye Sensitized Solar Cells (DSSCs)	1260
H. Abdullah, M.Z. Razali and M.A. Yarmo	

Development of a Dye-Sensitized Solar Cell with a Carbon Counter Electrode Formed by Screen-Printing	1264
T. Kakuda, T. Terasawa and T. Futakuchi	
Enhanced Photovoltaic Performance of the Dye Sensitized Solar Cell Using Natural Dyes with Surface Modification of the Photoanode	1268
I. Jinchu, A.B. Sharma, C.O. Sreekala, K.S. Sreelatha and K. Achuthan	
Effect of Electron Beam Irradiation on the Properties of Polyethylene Oxide-TiO₂ Composite Electrolyte for Dye Sensitized Solar Cells	1278
M. Shaheer Akhtar, U.Y. Kim, D.J. Choi and O.B. Yang	
Quasi-Solid-State Dye-Sensitized Solar Cells Using ZnO Photoelectrodes Fabricated by a Liquid Process	1282
M. Hosokawa and S. Fujihara	
Performance and Stability of Dye-Sensitized Solar Cells with Quasi-Solid State Electrolytes Base on N-Methyl-Quinoline Iodide	1286
S. Wantawee, S. Saenthaweesuk, S. Pukird, T. Saipin and U. Tipparach	
Structural Behavior of Ni-Doped TiO₂ Nanoparticles and its Photovoltaic Performance on Dye-Sensitized Solar Cell (DSSC)	1290
S.N.F. Zainudin, M. Masturah and H. Abdullah	
Fabrication of Nanostructured Zinc Oxide Films on Plastic Substrates by Pyrolysis Method and their Application to Dye-Sensitized Solar Cells	1297
H. Utsunomiya, S. Ueno and S. Fujihara	
A Review of Dye Incorporated Conducting Polymers Application as Sensors and in Solar Cells	1301
M. Matoetoe	
Zinc-Doping in TiO₂ Films to Enhance Photovoltaic Performance of Dye-Sensitized Solar Cells	1324
Q.P. Liu, Y. Zhou, Y.D. Duan and Y. Lin	
Nanostructured Solar Cells	1329
E. Vigil	
The Effect of Calcinations Temperature on the Performance of TiO₂ Aggregates-Based Dye Solar Cells (DSCs)	1355
N.A.Z. Siti, M.M. Norani and M.A. Bustam	
The Factors that Affect the Function of Dye-Sensitized Solar Cell	1361
H.W. Liu, X.W. Feng, F. Hu, H. Zhu and P. Xing	
Solid-State Dye Sensitized Solar Cells: Effect of Hole Transport Material Properties to the Photovoltaic Performance	1366
M. Nur Amalina and M. Rusop	
Gel Polymer Electrolyte from Poly(Acrylamide) Coated on Natural Rubber Latex by Topology-Controlled Emulsion Polymerization for Dye Sensitized Solar Cells Application	1373
P. Silakul and R. Magaraphan	
Gel Polymer Electrolyte from Ozonolysis of Poly(3-(trimethoxysilyl)Propyl Methacrylate) Graft on Natural Rubber Latex for Natural Dye Sensitized Solar Cell Application	1377
P. Silakul and R. Magaraphan	
Electrical Properties of Dye-Sensitized Solar Cells Prepared by Blending SnO₂ Micro Particles and TiO₂ Nano Particles	1381
T. Nakamura, Y. Nakatani, T. Ogihara, H. Horikawa and M. Asahara	
Dye Sensitized Solar Cells Based on ZnO Nanorod/TiO₂ Nanoparticle Composite Films	1385
H. Tong, M. Inada, Y. Tanaka, N. Enomoto and J. Hojo	
The Influence of TiO₂ Photoanode Morphology for Scattering Enhanced Properties of Dye-Sensitized Solar Cell	1392
M.H. Abdullah, I. Lyly Nyl, M.Z. Musa and M. Rusop Mahmood	
Characterization of Copper (I) Iodide (CuI) Thin Film using TMED for Dye-Sensitized Solar Cells	1402
A.R. Zainun, M.H. Mamat, U.M. Noor and M. Rusop	
Carbon Black-LaCoO₃ Composite Material as Counter Electrode for Quasi-Solid-State Dye-Sensitized Solar Cell	1407
V. Somsongkul, A. Wongchaisuwat, A. Worayingyong and M. Arunchaiya	
Improved Photoelectrode of Dye-Sensitized Solar Cell Using a ZnO/Zn₂TiO₄	1411
W. Koonnasoot, A. Gardchareon, S. Choopun and D. Wongratanaphisan	

Evaluation Methods of Energy-Storable Dye-Sensitized Solar Cells Y. Saito, K. Iwata, S. Uchida, T. Kubo and H. Segawa	1415
Effect of Nickel Oxide Thin Films on Photoconversion Efficiency in Zinc Oxide Dye-Sensitized Solar Cells S. Futemvong, A. Pengpad, N. Hongsith, D. Wongratantanaphisan, A. Gardchareon and S. Choopun	1419
Effect of Metal Doped-TiO₂ on the Performance of Dye Solar Cells (DSCs) S.N.A. Zaine, M.M. Norani, A.E. Samsudin and A.Z. Sahmer	1423
Probing Electron Lifetime and Recombination Dynamics in Large Area Dye-Sensitized Solar Cells by Electrochemical Impedance Spectroscopy A. Fakharuddin, I. Ahmed, Q. Wali, Z. Khalidin, M.M. Yusoff and R. Jose	1428
Effect of Reflective Platinum Film on the Performance of Flexible Dye Solar Cell (DSC) A.Z. Sahmer and M.M. Norani	1434
Modified Polyol-Mediated Synthesis of Doped TiO₂ Nanoparticles as the Photoanode in Dye Solar Cells (DSCs) S. Bashardoust, M.M. Norani, B.H. Ong and S.N.A. Zaine	1439
Effect of Annealing on Material Properties of Both Electrodes in Dye Sensitized Solar Cell Structure P. Prachopchok, C. Thanachayanont, K. Sriprapha, A. Heawchin, S. Kaewket, P. Vijitjanya, C. Sac-Kung and T. Osotchan	1444
Efficiency Enhancement in Dye-Sensitized Solar Cell Using TiO₂ /Ilmenite-Derived Nanofiber Composite as Working Electrode A. Simpraditpan, T. Wirumongkol, S. Pavasupree and W. Pecharapa	1448
Application of Vertically Oriented TiO₂ Nanotube Arrays on Dye Sensitized Solar Cells T.H. Meen, W.Y. Shih, W. Water, J.K. Tsai, Y.S. Liu, C.T. Ho and C.J. Huang	1453
The Effects of the TiO₂ Films Thickness on the Performance of Quasi-Solid Dye-Sensitized Solar Cells Y.H. Dai, J.L. Wang, J.L. Li and Q.F. Shi	1457
A Study of Photocatalyst of the TiO₂ Thin Film with Acid Dispersed CNT for Dye-Sensitized Solar Cell Y.W. Kim, E.N. Cho, S.C. Choi and D.W. Lee	1461
Performance Improvement of Dye Sensitized Solar Cell by Using Recycle Material for Counter Electrode N. Gomes, M. Shafawi, M. Irwanto, M.I. Yusoff, M. Fitra and N. Mariun	1468
Dry Drawn Multiwall Carbon Nanotube Sheet as a Counter Electrode for Dye-Sensitized Solar Cells: Multilayer Optimization Z. Kuanyshbekova, C. Huynh, S. Hawkins, D. Smagulov, S. Malayev and A. Zakhidov	1472
Synthesis of TiO₂ Nanopowders and their Applications in Dye-Sensitized Solar Cell J. Sun, Y.X. Wang, M. Xu, T.L. Ma and X.Y. Fan	1477
Improved Stability of Unsealed Quasi-Solid-State Dye-Sensitized Solar Cell Using Poly(3,4-Ethylenedioxythiophene) Film as Layer Electrolyte S. Vivekaphirat, C. Saekung, S.H. Thang, A. Wongchaisuwat and M. Arunchaiya	1481
Fabrication and Characterization of Dye-Sensitized Solar Cell with Different Microstructure ZnO Y.X. Wang, T.L. Ma, X.Y. Fan and X.Y. Li	1486
Design of Dye-Sensitized Solar Cell by Inserting Single-Walled Carbon Nanotubes R. Yadipour, K. Abbasian, B.A. Afshar and A. Rostami	1490
Influence of Additive on the Performance of Energy Conversion Solar Cell N.M. Abdullah, A.Z.M. Rus and M.F.L. Abdullah	1496
Improvement of the Photovoltaic Performance of Dye-Sensitized Solar Cells by Using Mesoporous Carbon in Polyvinylidene Fluoride/1-Methyl-3-Hexylimidazolium Iodide Gel Electrolyte G.Q. Wang, L. Wang and S.P. Zhuo	1501
The Fabrication of Highly Ordered TiO₂ Nanotube Arrays and their Application in Dye-Sensitized Solar Cells H.M. Xu, Y. Liu, H. Wang, W.X. Zhao, H. Huang, C.L. Liang, Q.H. Ye, M. Li, Y.J. Deng and H. Shen	1505
The Absorption of TiO₂ Nanotube-Dye Sensitization Solar Cells by Thermo-Compression Systems in Dye Molecules W.D. Jheng and C.C. Chen	1511

Fabrication of Nanocrystalline TiO₂ Films by Aerosol Deposition Method for Dye-Sensitized Solar Cells	
D.L. Cheng, C.Y. Lin, C.S. Liu, K.S. Kao and C.M. Wang	1518
Atomic Layer Deposition of Inverse Opals for Solar Cell Applications	
S.K. Karuturi, L.J. Liu, L.T. Su, W.B. Niu and A.L.Y. Tok	1522
Enhanced Efficiency of Au-Deposited BiFeO₃ Nanoparticles Based Dye-Sensitized Solar Cells	
N.K. Verma, I. Kaur, K. Kaur and G.S. Lotey	1527
Affection of Post-Nitrogen-Doping of ZnO Columnar Films Photo-Anode on Performance of Dye-Sensitized Solar Cells	
H.Q. Zhou, X.P. Zou, G.Q. Yang, G.Q. Teng, Z.B. Huang and B.L. Zhang	1531
Beta-Carotene Dye of <i>Daucus carota</i> as Sensitizer on Dye-Sensitized Solar Cell	
R. Suryana, Khoiruddin and A. Supriyanto	1536
Nanostructural Materials for Dye-Sensitized Solar Cells	
C. Cheng, C.C. Ho, C.T. Wu and F.H. Ko	1541
Effect of Surface Morphology on the Performance of Natural Dye Sensitized TiO₂ Thin Film Solar Cell	
T.S. Senthil, N. Muthukumarasamy, S. Agilan, R. Balasundaraprabhu and C.K. Senthil Kumaran	1547
Performance of Dye-Sensitized Solar Cells Using ZnO-Natural Dyes from Sappan Wood, Noni Leaves, Safflower and Black Rice	
R. Magaraphan and J. Joothamongkhon	1552
Application of Graphene Oxide and TiO₂ in the Fabrication of Dye Sensitized Solar Cells Module by Electrode Modification	
S.K. Prakash, H. Singh, H. Panjtar, S. Manhas and B.S.S. Daniel	1557
Fabrication of Flexible Dye-Sensitized Solar Cells with Double Sensitized Layers	
T.H. Meen, S.M. Chao, J.H. Fan, J.K. Tsai, J.H. Hong, L.W. Ji, T.C. Wu and C.J. Huang	1562
Synthesis of Highly-Ordered TiO₂ through CO₂ Supercritical Extraction for Dye-Sensitized Solar Cell Application	
B. Priyono, A.H. Yuwono, B. Munir, A. Rahman, A. Maulana and H. Abimanyu	1568
Investigation of the Dye-Sensitized Solar Cell Prepared by the Mixed Oxide from the ZnAl-Layered Double Hydroxide	
L.J. Zhang, M.Z. Leng, Y.W. Qin and J.Q. Liu	1573
Synthesis of TiO₂ - CNT Nanocomposites and its Application to Dye-Sensitized Solar Cells	
L.Q. Wang	1577
Fabrication of Flexible Dye-Sensitized Solar Cells by Pressurization-Transfer Technique	
S.M. Chao, T.H. Meen, Y.T. Jhuo, J.K. Tsai, J.X. Wang, W.R. Chen, T.C. Wu and C.J. Huang	1581
Photoelectrode with Multilayer of Gradual Scattering Structure Used in Dye-Sensitized Solar Cells	
X. Peng, B. Zhang, S.X. Meng, X.M. Yu, Z. Zeng, L. Liu and Y.Q. Feng	1586
Dye-Sensitized Solar Cells (DSSC) from Black Rice and its Performance Improvement by Depositing Interconnected Copper (Copper Bridge) into the Space between TiO₂ Nanoparticles	
S. Saehana, E. Yuliza, P. Arifin, K. Khairurrijal and M. Abdullah	1592
Rapid Synthesis of Ag Nanoparticles Using Henna Extract for the Fabrication of Photoabsorption Enhanced Dye Sensitized Solar Cell (PE-DSSC)	
S.C.G. Kiruba Daniel, N. Mahalakshmi, J. Sandhiya, N. Kasi and S. Muthusamy	1603
Effects of Polyethylene Glycol on Agarose-Based Magnetic Polymer Electrolyte for Dye-Sensitized Solar Cell	
X.Y. Guo, P.F. Yi, W.J. Wang, S. Xiao and Y. Yang	1615
Photovoltaic Performance Improvement of Dye-Sensitized Solar Cells (DSSCs) Based on Y-Doped TiO₂Thin Films	
Q.P. Liu	1620
Synthesis of TiO₂ Film for Dye-Sensitized Solar Cells	
H. Singh, S.K. Prakash, H. Panjtar and B.S.S. Daniel	1624
The Effect of Diatomite on the Photoelectric Properties of TiO₂ Dye Sensitized Solar Cells	
J.B. Feng, L.J. Hua, F.J. Shan, Z.G. Yan and G.C. Qi	1629
Charge Transmission and Recombination in the Dye-Sensitized Solar Cells Based on Mn-Doped TiO₂ Thin Films	
Q.P. Liu, Y. Zhou, H.J. Huang, Q.J. Guo, X.H. Zhao and L. Yuan	1634

Enhancement Performance of Dye-Sensitized Solar Cells from Black Rice as Dye and Black Ink as Counter Electrode with Inserting Copper on the Space between TiO₂ Particle's by Using Electroplating Method	1638
E. Yuliza, S. Saehana, D.Y. Rahman, M. Rosi, K. Khairurrijal and A. Mikrajuddin	
Affection of Post-Nitrogen-Doping of TiO₂ Nanoparticle Film Photo-Anode on Performance of Dye-Sensitized Solar Cells	1646
H.Q. Zhou, X.P. Zou, G.Q. Yang, G.Q. Teng, Z.B. Huang and B.L. Zhang	
Synthesis of Nest-Like NiO and its Application on P-Type Dye-Sensitized Solar Cell	1650
X.X. He, P.F. Cheng, G.Y. Lu and F.M. Liu	
Preparation of Graphene Films and their Applications in Dye-Sensitized Solar Cells	1654
T. Shen, Y. Shen, X.T. Ma, W.T. Gao, M. Cao, F. Gu and L.J. Wang	
Influence of Heat Treatment on the Properties of CuInS₂ Sensitized Solar Cells	1659
Q.C. Wan, C.Y. Luan, X.Q. Xu, F.J. Mei, P. An and G. Xu	
Effect of ZnO Seed Layer and TiO₂ Coating Treatments on Aligned TiO₂/ZnO Nanostructures for Dye-Sensitized Solar Cells	1664
L.C. Chen, J.H. Chen, S.F. Tsai and G.W. Wang	
Synthesis of Mixed TiO₂-Rare Earth Up-Conversion Material and Application in the Dye-Sensitized Solar Cells	1670
F. Xue, J. Zhang, Y.H. Wu, X.F. Wang, N. Liu, M.J. Yuan, C.X. Yang and Y. Huo	
Preparation of ZnO Films with Different Morphologies and their Applications in Dye Sensitized Solar Cells	1674
Y.X. Wang, S. Jian and B.X. Zhao	
Effect of NiO Nanoparticles on Magnetic Polymer Electrolyte for Dye-Sensitized Solar Cells	1678
Y. Yang, J.R. Cui, P.F. Yi, S. Xiao and X.Y. Guo	
Effects of NiO/TiO₂ Mixed Nanoparticles on Quasi-Solid Dye-Sensitized Solar Cells	1683
Y. Yang, J.R. Cui, P.F. Yi and X.Y. Guo	
Performance of TiO₂ Aggregates-Based Dye Solar Cells	1688
N.M. Mohamed and S.N.A. Zaine	
Preparation of High Performance Pt Counter Electrodes on Conductive Plastic Substrate for Flexible Dye-Sensitized Solar Cells	1696
Y.Q. Wang, Q.H. Zhang, H.Z. Wang and Y.G. Li	
Fabrication, Characteristics and Application in Dye-Sensitized Solar Cell of Vertically Alligned ZnO Nanorod Arrays Guided with Polyethyleneimine via Hydrothermal Method	1700
M. Saleem, L. Fang, F. Wu, L.W. Jun, C.L. Xu and S.J. Xue	
Tandem Dye-Sensitized Solar Cells Consisting of Floating Electrode Supported by Non-Conductive Glass Mesh	1706
K. Uzaki, S.S. Pandey, Y. Ogomi and S. Hayase	
Application of Long-Range-Corrected Density Functional in Zinc Porphyrin for Dye-Sensitized Solar Cells	1713
Y.D. Zhao and Y. Liao	
Two Ruthenium Complexes with Phenanthroline Ligand for Dye-Sensitized Solar Cells	1718
Y. Thathong, K. Wongkhan and R. Jitchati	
Evaluation of Annealing Effects on TiO₂ Nanorod Arrays for Dye-Sensitized Solar Cells by Equivalent Circuit Analysis	1723
M.R. Sui and X.Q. Gu	
Graded Multilayered TiO₂ Photoelectrode for Improving the Performance of Dye Solar Cells	1730
A.E. Samsudin and M.M. Norani	
Influence of Particle Size of TiO₂ Powder on the Energy Conversion Efficiency of a Dye-Sensitized Solar Cell	1737
N. Bilgin, J. Park and A. Öztürk	
Optimization of ZnO-Coated TiO₂ Working Electrode and Application in a Dye-Sensitized Solar Cell	1742
C.S. Chou, T. Watanabe, Y.H. Huang and P. Wu	
Performance of Natural Carotenoids from <i>Musa aromatica</i> and <i>Citrus medica</i> var Lemon as Photosensitizers for Dye-Sensitized Solar Cells with TiO₂ Nanoparticle	1746
C.P. Eka, B. Yuliarto and S. Suyatman	

Synthesis and Characterization of Nanocrystalline TiO₂ by Non-Aqueous Sol-Gel in Acidic Condition for Dye-Sensitized Solar Cells	1750
L. Muliani and B. Sunendar	
Fabrication of TiO₂ Nanotubes by Anodic Oxidation for the Dye Sensitized Solar Cell Application	1755
W. Cong, E.X. Han and J. Li	
Fabrication of Porous TiO₂ Electrodes from P25 Powder by Chemical Technique for Dye-Sensitized Solar Cells	1760
Y. Yan, J.Z. Wang and Q.H. Chang	
Modification of Working Electrode of Dye-Sensitized Solar Cell Using TiO₂ Nanoparticles/TiO₂ Nanofibers/CNT Composite	1764
W. Mekprasart, W. Jarermboon and W. Techitdheera	
Preparation Mico/Nano Composite Particles and their Applications for Dye-Sensitized Solar Cells	1769
T.L. Chiang, C.S. Chou, D.H. Wu and C.M. Hsiung	
TiCl₄ Treatment to the Substrate of Dye-Sensitized Solar Cell for the Applications on BIPV	1773
H.M. Tian, R.X. Yang and F.L. Tian	
Fabrication of Multiwalled Carbon Nanotube-Titania Nanocomposite for Dye-Sensitized Solar Cell	1778
W.J. Lin, C.T. Hsu, Y.C. Lai, W.C. Wu, T.Y. Hsieh and Y.C. Tsai	
TiO₂ Particles with Controlled Size Prepared by a Simple Micro-Emulsion Method and their Application in the Dye-Sensitized Solar Cell	1782
X.M. Yu, S.X. Meng, Y.Q. Feng, L. Liu and X. Peng	
Preparation at Low-Temperature and Characterization of TiO₂ Film Used for Solar Cells	1787
X.Q. Wang, Y.L. Li, J.M. Wang, J. Guo and M.Y. Li	
Synthesis and Application of Novel β D-π-A Porphyrin Dyes in Dye-Sensitized Solar Cells	1791
F.Q. Zhou, Y.Q. Feng, X. Peng and B. Zhang	
Synthesis and Characterization of Carboxymethyl κ-Carrageenan for Dye-Sensitized Solar Cells Application	1795
N.N. Mobarak, N. Ramli and A. Ahmad	
Large Pore Nanocrystalline TiO₂ Films for Quasi-Solid State Dye-Sensitized Solar Cells	1800
J. Gao, H.R. Li, H. Rong and Y.H. Dai	
Novel Post-Treatment Process by La³⁺ Modification to TiO₂ Photoanode with Enhanced Performance for DSSCs	1805
Q.Q. Gao, S.W. Yang and L. Lei	
Investigation of Hexagonal Boron Nitride for Application as Counter Electrode in Dye-Sensitized Solar Cells	1809
S.J. Xu, Y.F. Luo, W. Zhong, Z.H. Xiao and X.Y. Liu	
Solid-State Dye-Sensitized Solar Cells Using Mesoporous TiO₂ Films Fabricated with Amphiphilic Rubbery Random Copolymer	1813
D.J. Kim, S.H. Ahn, D.K. Roh and J.H. Kim	
Synthesis of Rare Earth Up-Conversion Material and Application in the Dye-Sensitized Solar Cells	1818
J. Zhang, Y.H. Qu, F.X. Zhang, X.D. Peng, S.Y. Qian and L.K. Li	
The Effect of Paste Preparation and Annealing Temperature of ZnO Photoelectrode to Dye-Sensitized Solar Cells (DSSC) Performance	1822
A. Syukron, R.A. Wahyuono, D. Sawitri and D.D. Risanti	
Preliminary Study on the Photovoltaic and Impedance Characteristics of Dye Sensitized Solar Cell (DSSC) using Polymer Gel Electrolyte	1826
W.S. Arsyad, H. Pujiarti, P. Wulandari, Herman and R. Hidayat	
Sol-Gel Derived ZnO Nanorod Templated TiO₂ Nanotube Synthesis for Natural Dye Sensitized Solar Cell	1831
I. Kartini, Evana, Sutarno and Chotimah	
Preparation of Photoanode of Dye-Sensitized Solar Cell by Electrospinning	1835
Y.Y. Chu and Y.C. Chao	
Fabrication of Dye Sensitized Solar Cell Based on TiO₂ Nanoparticles and Chlorophyll from Pandan Leaf as Active Layer	1839
N.H. Yusoff, M.F. Rosle and S. Buniran	

The Hydrothermal Synthesis of Nanoporous Titanium Dioxide and its Application in Dye-Sensitized Solar Cell	1844
L.M. Jiang	
A Polymer Gel Electrolyte Based on P(MMA-NVP) for Quasi-Solid-State Dye-Sensitized Solar Cell	1848
Y.H. Dai, X.L. Sun, Q.F. Shi and M.S. Yang	
Nanostructured Mesoporous Thick Films of Titania for Dye-Sensitized Solar Cells	1852
J. Wang and Y. Zhang	
One-Dimensional ZnO Nanostructures by Wet-Chemistry Technique for Dye Sensitized Solar Cell Application	1859
A.H. Yuwono, N. Sofyan, S. Harjanto, D. Daneswara, A. Ferdiansyah, H. Dharma and O. Hammerstein	
Dye-Sensitized Solar Cells TiO₂ Thin Film Preparation and Conditions in Laboratory	1866
C. Wu, Q.X. Wu and W.Y. Chen	
Dye-Sensitized Solar Cells Based on Three-Dimensional Web-Like Structure Anodes	1871
Z.H. Tian, J.X. Yao and M.N. Guli	
Characterization of N719 Dye Desorption on TiO₂ Nanotube Arrays Used for Dye-Sensitized Solar Cells	1878
F.Y. Qi, Q.Y. Huang, F. Jiao, Y.Z. Zheng, Y.C. Gan and J. Xie	
The Effects of Sputtering Pressure on the Properties of Carbon Counter Electrodes for Dye-Sensitized Solar Cells	1884
S.H. Liu, G.S. Liu, X.Y. Shen and Z.Q. Hu	
Study of Dye-Sensitized Solar Cells with Nanostructure Inn Compact Layer and Au Nano Particles	1889
C.C. Chen, L.C. Chen and S.J. Kuo	
Investigation on Applying Compound Solvent in Liquid Electrolyte for Dye-Sensitized Solar Cells	1895
Z.Q. Hu, D.F. Huang, X.Q. Liu, H. Gao and H.S. Hao	
A Cheap Synthetic Route to Commercial Ruthenium N3 Dye for Sensitizing Solar Cell Applications	1901
R. Jitchati, Y. Thathong and K. Wongkhan	
High Performance Dye-Sensitized Solar Cells Based on Vacuum-Assisted Thermal Deposition Pt Counter Electrodes	1907
Y.X. Wang, H.D. Jiang and J. Sun	
Synthesis and Characterization of SnO₂ Nano-Cystalline for Dye Sensitized Solar Cells	1912
J.G. Song, L. Hua, Q. Shen, F. Wang and L.M. Zhang	
The Synthesis and Properties of the Inverse Opals Structure Used in Dye-Sensitized Solar Cells	1916
Y.L. Zhang, X.Q. Wang, M.Y. Li and J. Wang	
Properties and Optimization of Photoanode in Dye-Sensitized Solar Cells	1920
H.X. Cao, Z. Zhou, X.D. Li, B.Y. Wang, Y.L. Zhang, X.Q. Wang and M.Y. Li	
The Preparation of TiO₂ Nanotube by ZnO Nanorod Template Method and Application in Dye-Sensitized Solar Cells	1924
Y.X. Wang, Y.H. Ye and J. Sun	
Influence of Scattering Layer on the Performance of Solid-State Dye Sensitized Solar Cell	1929
M. Xu and H.W. Han	
An Efficient Metal Conductor Paste/Nanoporous Carbon Composite Counter Electrode for Dye-Sensitized Solar Cells	1934
S.J. Xu, Y.F. Luo, W. Zhong and G.J. Qiao	
Fabrication of the Effective Counter Electrode for Dye-Sensitized Solar Cells	1938
R. Liu, W.D. Yang, J.F. Wu and L.S. Qiang	
Performance Improvement of Dye-Sensitized Solar Cell by Optimizing TiO₂-Photoanode Structure	1942
F. Yang, L.F. Liu, X. Wang and J.F. Kang	
Fabricate Dye-Sensitized Solar Cell with Electrospinning	1947
Y.Y. Chu and Y.C. Chao	
The Preparation of ZnO Nanopowders and Dye Sensitized Solar Cells By Sol-Gel Method	1951
Y.X. Wang, S. Jian and B.X. Zhao	

Fabrication of ZnO Nanospheres and Application to Dye-Sensitized Solar Cells	1955
Y.X. Wang, B.X. Zhao and J. Sun	
Application of Three-Dimensional ZnO Inverse Photonic Crystal in Dye-Sensitized Solar Cells	1959
J.J. Gao, B. Li, Z.D. Liu, X.J. Jiao, J. Zhou, H. Lin and L.T. Li	
Photovoltaic Performance Optimization of Natural <i>Trollius</i> Sensitized Solar Cells	1964
G.J. Yang, S.R. Wang, H. Lin, G. Wang, Y.C. Zhang, F. Hao and H.Y. Chen	
Stability of Dye Sensitized Solar Cells with Glass Frit Sealant	1969
H.Y. Chen, S.R. Wang, H. Lin, G. Wang, S.H. Wang and G.J. Yang	
Electrochemical Synthesis of POT for Electrochromic and Solar Cell Materials	1975
B. Li, H.J. Niu, L. Zhang and X.D. Bai	
Fabrication of TiO₂-ZrO₂ Binary Oxide Electrode with Natural Dye (Rose) for Dye Sensitized Solar Cell Application	1981
T.T. Win, Y.M. Maung and K.K.K. Soe	
A Theoretical Study on Photosensitizers of Solar-Energy Cell: Transition Metal Carboxyphthalocyanine Complexes	1985
L.C. Xuan, Y.R. Guo and Q.J. Pan	
Applications of P-Type NiO in Dye-Sensitized Solar Cells	1989
T.L. Chiang, C.S. Chou, D.H. Wu and C.M. Hsiung	
Investigation of Ion Transport and its Effect on the Photovoltaic Performance in the Quasi-Solid State Dye-Sensitized Solar Cells	1993
Y.F. Tian, Z. Chen and S.J. Li	
Deposition of Nanocrystalline TiO₂ Films on Flexible Titanium Mesh for Dye-Sensitized Solar Cell	1997
K.S. Kao, P.H. Kuo, C.C. Cheng, D.L. Cheng, C.M. Wang and P.S. Hung	
Using Natural Dyes to Prepare Nanoporous TiO₂ Dye-Sensitized Solar Cell	2001
Y.F. Pan	
In Situ Quaternized Gel Electrolyte for Quasi-Solid-State Dye-Sensitized Solar Cell	2005
Y.H. Dai, X.L. Sun, J.L. Wang and M.S. Yang	
Influence from Covering TiO₂ Nanoparticles with Dense Films upon Electron Transport in Dye-Sensitized Solar Cells	2009
Y.D. Hao and S.S. Song	
Preparation of Nanosize Anatase TiO₂ by a Simple, Low-Cost Method and their Performance in Dye Sensitized Solar Cells	2013
L. Liu, X. Peng, X.M. Yu and Y.Q. Feng	
Inkjet Printing Technology for Dye-Sensitized Solar Cells	2018
Y.L. Lin, C.Y. Hsu and C.L. Tai	
Electric Characteristics of MgO-Doped TiO₂ Nanocrystalline Film in Dye-Sensitized Solar Cells	2022
L. Li, X.C. Yang, J.J. Gao, J.Z. Zhao, A. Hagfeldt and L.C. Sun	
Electrophoretic Deposition of TiO₂ Films on Metal Mesh for Dye-Sensitized Solar Cells	2026
D.L. Cheng, Y.C. Hsu, K.S. Kao, H.J. Su, C.H. Liang and C.M. Wang	
Improved Performances of Graphite Counter Electrode for Dye-Sensitized Solar Cells by Incorporating Graphene Nanosheets	2030
S.J. Xu, Y.F. Luo, W. Zhong, X.Y. Liu, Z.H. Xiao and Y.P. Luo	
Solid-State Dye-Sensitized Solar Cells Based on ZnO Nanorod Arrays by Low-Temperature Chemical Bath Deposition	2034
Y.M. Lee, C.H. Lai, Y.T. Chen, M.H. Cai, S.Y. Liou, M.R. Zheng, J.S. Lin and S.W. Yang	
Improvement of the Performance of Dye-Sensitized Solar Cells with TiO₂ Photoanodes in Unsaturated	2038
X. Tang	
Dye-Sensitized Solar Cells Based on Novel Mixed Dyes	2045
T.T. Hung	
Hydrothermal Preparation and Characterization of ZnO with Various Morphologies for Dye-Sensitized Solar Cells	2051
Z. Xiao, W. Zhong, S.J. Xu and Y.P. Luo	
Effect of Graphene Layer Number on the Performances of Graphene Nanosheets Counter Electrode for Dye-Sensitized Solar Cells	2055
S.J. Xu, Y.F. Luo, W. Zhong, Z.H. Xiao, Y.P. Luo and J.H. Lai	

Chapter 3: Other Types of Solar Cells

Optical, Electrical and Photo-Electrical Characteristics of Bio-Polymeric Complex of Natural Chromatophore & Development of Non-Silicon Solar Cells S.S. Pradhan and A. Sarkar	2061
Preparation and Microstructural Properties of Gallium Doped Zinc Oxide Thin Films for Organic Solar Cells C. Lan, H. Wang, Z.Y. Zhong, T. Zhang, C.Y. Yang and J. Hou	2073
Crystallographic Parameter and Optical Absorption Measurement of CuInSe₂ Thin Films for Solar Cells A.A.I. Al-Bassam and U.A. Elani	2077
Efficient Hybrid Infrared Solar Cells Based on P3HT and PbSe Nanocrystal Quantum Dots Z.N. Tan, W.Q. Zhang, D.P. Qian, H. Zheng, S.Q. Xiao, Y.P. Yang, T. Zhu and J. Xu	2083
On the Role of Graphene in Polymer-Based Bulk Heterojunction Solar Cells F. Yu, M. Bahner and V.K. Kuppa	2089
Post and <i>In Situ</i> Characterization of Strain Control and Crystal Quality in Quantum Well Solar Cell Structure Y.P. Wang, M. Deura, M. Sugiyama and Y. Nakano	2103
Development of ZnTe-Based Solar Cells T. Tanaka, M. Miyabara, K. Saito, Q.X. Guo, M. Nishio, K.M. Yu and W. Walukiewicz	2107
Fabrication and Characterization of Fullerene / Dibenzo-Tetrathiafulvalene Solar Cells A. Suzuki, K. Yano and T. Oku	2111
The Properties of ZnO Nanorods for Organic-Inorganic Solar Cell Fabricated by Wet Chemical Method S.J. Jo, T. Ban, A. Abidov, J.H. Lee, D. Lee, N.J. Park, S.W. Jeong, J. Ahn and S.J. Kim	2116
Solvent Effects on the Electrical and Optical Properties of Nanocomposited MEH-PPV:TiO₂ Films for Organic Solar Cells Application F.S.B. Zahid, P.S.B.M. Saad and M. Rusop	2121
Effects on Structural, Electronic Transport & Optical Properties of Doped & Undoped ZnTe Thin Films for CdTe/CdS Solar Cells G.H. Tariq and M. Anis-ur-Rehman	2125
Investigation of Pulsed Laser Annealing of CdS Layers Designed for Thin-Layer Solar Cells P. Shindov, R. Kakanakov, L. Bedikyan, S. Kaneva and T. Anastasova	2134
MoSe₂/Polypyrrole Solar Cell S.P. Shukla, H.S. Patel, K.D. Patel and V.M. Pathak	2138
Modification of Thin Film Surface Morphology by Thermal Annealing Process to Enhance Organic Photovoltaic Solar Cell Performance N.H. Yusoff, N.I.A. Azes and S. Buniran	2144
SnO₂ Thin Films Prepared by APCVD for Organic Solar Cells Application D. Hatem and M.S. Belkaid	2149
Modeling of Cascade Solar Cell Ga_{0.5}In_{0.5}P /GaAs Using AMPS-1D B. Dennai, H.B. Slimane and A. Helmaoui	2157
1.6 MeV Electron Irradiation on the Characteristics of CdTe Thin Film Solar Cells M.Y. Fang, J.Q. Zhang, L.H. Feng, L.L. Wu, W. Li, B. Li, G.G. Zeng and W.W. Wang	2162
Degradation of Polymer Solar Cells Based on P3HT:PCBM System H.Z. Yu	2169
Optical Absorption Study of Molybdenum Diselenide and Polyaniline and their Use in Hybrid Solar Cells H.S. Patel, J.R. Rathod, K.D. Patel, V.M. Pathak and R. Srivastava	2176
Optical Band Gap Decrement of Nanocomposited MEH-PPV:CNTs Thin Film for Organic Solar Cells P.S.M. Saad, M.H. Zainal, F.S. Zahid, Z. Zulkifli and M. Rusop Mahmood	2191
Photovoltaic Characteristics of Hybrid MEH-PPV and TiO₂ Nanoparticle Based Organic Solar Cells F.S. Zahid, P.S.M. Saad, M.Z. Musa and M. Rusop Mahmood	2196

Feasibility for Enhancing Power Conversion Efficiency of P3HT/C₆₀ Polymer Solar Cell by Adding Donor-Acceptor Block Copolymer as a Compatibilizer	2203
N. Rattanathamwat, J. Woothikanokkhan, N. Nimtsiriwat, C. Thanachayanont and U. Asawapirom	
Synthesis of Crystalline ZnSe Nanowires by Pulsed Laser Deposition for Application in Polymer-Inorganic Solar Cells	2207
J.S. Lai, L. Chen, X.N. Fu, J. Sun, Z.F. Ying, J.D. Wu and N. Xu	
Green and Economic Transparent Conductive Graphene Electrode for Organic Solar Cell: A Short Review	2214
R. Ahmad, M.S. Shamsudin, M.Z. Sahdan, M. Rusop and S.M. Sanip	
Study of MoSe₂ Crystal as a Photoelectrochemical Solar Cell	2220
D. Sahay, R. Parmar, R.K. Shah and R.J. Pathak	
Effect of Annealing Temperature on the Optical Parameters of CdS Thin Films Prepared by Thermal Evaporation Method	2224
T. Gaewdang, N. Wongcharoen and T. Wongcharoen	
Study of Photoelectrochemical Solar Cell Using WSe₂ Crystal	2228
R. Parmar, D. Sahay, R.J. Pathak and R.K. Shah	
Fabrication of ZnS Thin Film Buffer Layer in Solar Cell by Radio Frequency Sputtering Method	2234
Z.C. Chang, Y.C. Lin, C.Y. Chen and C.C. Chen	
Influence of Cathode Work Functions on the Photovoltaic Properties of MEH-PPV: TiO₂ Bulk Heterojunction Solar Cell	2239
F.S. Zahid, P.S. Mohamad Saad, M. Mohamed Zahidi and M. Rusop Mahmood	
Preparation and Characterization of Chemical Bath Deposited CdS Thin Films for Solar Cells	2244
Z.H. Xie and J.K. Li	
Study Phase Separation of Donor: Acceptor in Inkjet Printed Thin Films of Bulk Heterojunction Organic Solar Cells Using AFM Phase Imaging	2249
V. Fauzia, A.A. Umar, M.M. Salleh and M. Yahaya	
Study the Electrical Properties and the Efficiency of Polythiophene with Dye and Chlorophyll as Bulk Hetero-Junction Organic Solar Cell	2254
H. Salleh, E.A.E.A. Ghapur, N.A. Nik Aziz, W.A. Dhafina, A. Hamizah, A.R.N. Laily and H. Che Hassan	
Theoretical Studies of InGaN/GaN Multiple Junction Solar Cell with Enhanced Tunneling Junction Diode	2261
S. Hussain, G. Ali, H. Mehmood, M. Omar and T. Zaidi	
Performance of P3HT:PCBM Organic Solar Cell with ZnO Buffer Layer	2265
M.S. Alias, S.A. Kamaruddin, C.A. Norhidayah, N. Sarip, N. Nayan and S.M. Zainizan	
Characterization of Nanostructured Heterojunction Solar Cells of CdS/Cd_{2x}(CuIn)_{1-x}S₂ Grown by Chemical Spray Pyrolysis	2270
H.S. Al-Jumaili, M.Z. Al-Rawi and Y. Al-Douri	
Effect of Iodine Concentration in MWCNTs for MEH-PPV Based Organic Solar Cell Applications	2275
P.S. Mohamad Saad, F.S. Zahid and M. Rusop Mahmood	
Electrical and Physical Properties of Nanocomposited MEH-PPV: CNTs for Organic Solar Cells Application	2281
P.S. Mohamad Saad, F.S. Zahid and M. Rusop Mahmood	
Nitrogen Doping of Amorphous Carbon by Aerosol-Assisted Chemical Vapor Deposition for Carbon-Based Solar Cell Applications	2285
A.N. Fadzilah, D. Kamaruzaman, Y.M. Siran, S.A.M. Rejab, A.J. Asis, S. Tahiruddin and M.R. Mahmood	
The Effect of Donor:Acceptor Ratio on the Generated Photocurrent of Inkjet Printed Blended Poly (3-Octylthiophene-2,5-Diy) and (6,6)-Phenyl C₇₁ Butyric Acid Methyl Ester Bulk Heterojunction Organic Solar Cells	2291
V. Fauzia, A.A. Umar, M.M. Salleh and M. Yahaya	
Plasmon-Enhanced Luminescence Useful for Wavelength Shifting in Solar Cells	2296
L. Li, W.X. Lu and Y.L. Lu	
Performance Improvement of Inverted Polymer Solar Cells Using V₂O₅ as an Anode Buffer Layer	2301
L. Shen, X.D. Zhang, W.B. Guo, C.X. Liu, D. Wei and S.P. Ruan	

Investigation of Recombination Process of P3HT: PCBM Organic Solar Cell	2305
E.K. Chiew, M. Yahaya and A.P. Othman	
Towards Ultra Thin and High Efficiency ZnxCd1-xS/CdTe Solar Cell by AMPS 1D	2310
M.S. Hossain, M.A. Matin, M.A. Islam, M.M. Aliyu, T. Razikov, K. Sopian and N. Amin	
Investigation for Optimum Structure of CdS:O/CdTe Solar Cell from Numerical Analysis	2315
M.A. Islam, S. Hossain, N. Amin, M.M. Aliyu, Y. Sulaiman and K. Sopian	
Bulk-Heterojunction Solar Cells Based on Poly(3-hexylthiophene) and (6,6)-phenyl-C61-butyric-acid Methyl Ester on Polyethylene Terephthalate Substrates	2320
Y. Yanagi, T. Okukawa, A. Yoshida, M. Ohzaki, T. Yanagidate, Y. Arai, H. Kataura, S. Fujii and Y. Nishioka	
Effects of Surface Treatment on the Performance of PEDOT: PSS/n-GaN Schottky Solar Cells	2324
Q. Feng, K. Du, Y.K. Li, P. Shi and Q. Feng	
Effect of Various Structures on the Efficiency of Organic Solar Cells	2328
K.L. Chen, D.W. Chou, C.J. Huang, J.C. Ke, W.R. Chen and T.H. Meen	
Effect of Substrate Temperature on One-Step Magnetron-Sputtered Cu(In,Ga)Se₂ Thin Films for Solar Cells	2333
G.S. Liu, H.N. Li, X.Y. Shen, Z.Q. Hu and H.S. Hao	
Crystal Structure and Photoelectric Property of Thin-Film Solar Cell Materials Cd_{1-x}Zn_xS	2338
F.C. Wan, W.J. Lu, F.L. Tang, Y.D. Feng, Z.M. Wang and Y. Wang	
Effect of Partial Pressure of Precursors on Atomic Layer Deposited Zinc Oxide Films as TCO Material in Solar Cell Application	2345
S. Sinha and S.K. Sarkar	
The Study of CIGS Absorption Layer Grown by Two-Step Growth Method for Thin-Film Solar Cell	2350
L.Z. Hsieh, X.M. Duan and M.J. Jeng	
Efficiency Organic/Inorganic Composite Thin Film Solar Cells	2354
J.M. Ye	
A New Anode for Photovoltaic Solar Cells	2358
M.W. Li and N.H. Sun	
Flexible Photovoltaic Solar Cells with Nickle Oxide Buffering Layer	2362
N.H. Sun and Y.W. Ge	
Fabrication and Characterization of CIASe Thin Film Photovoltaic Absorbers Using CIAS Nanocrystals	2366
B. Zhu, C.J. Zhu, S. Chang, Y.W. Zhang and C.Z. Wang	
A Novel Photosynthetic Bacteria Solar Cell	2370
L.Q. Wang, X.X. Deng and L. Tian	
Preparation and Properties of Ag Nanofilms for Organic Solar Cells	2374
Y.L. Wang, J.Y. Ye and R.F. Zeng	
Study on Nickle Oxide Thin Film as Buffering Layer in Photovoltaic Solar Cells	2378
N.H. Sun and Y.F. Ren	
Characterizations of Nitrogen Doped Cupric Oxide Thin Films Deposited on Different Substrates for Solar Cell Applications	2382
P.K. Ooi, M.A. Ahmad, S.S. Ng and M.J. Abdullah	
Low Cost Electro-Deposition of Cuprous Oxide P-N Homo-Junction Solar Cell	2387
F. Arith, S.A.M. Anis, M.M. Said and C.M.I. Idris	
Optimal Design for Photovoltaic and Photothermal Hybrid Solar Cells of Solar Powered Aircraft	2393
K.W. Sun and M. Ni	
Hybrid Solar Cells Based on CdS Nanowire Arrays	2399
D.O. Grynko, O.M. Fedoryak, P.S. Smertenko, N.A. Ogurtsov, A.A. Pud, Y.V. Noskov and O.P. Dimitriev	
Influence of Silicon Texturization on the Photovoltaic Properties of CuPc/n-Si Hybrid Solar Cells	2407
Z.F. Liu and Y.T. Liu	
Growth of ZnO Nanostructures at Different Reactant Concentrations for Inverted Organic Solar Cell	2412
C.C. Yap, A. Abu Bakar, M. Yahaya and M.M. Salleh	

Atomic Layer Deposition of Molybdenum Oxide for Solar Cell Application	2417
D.K. Nandi and S.K. Sarkar	
Study of Al/Organic/ITO Polymer Solar Cell on Glass Substrate	2422
Y.T. Chang, J.H. Su, Y.T. Shih and Y.L. Shih	
Effect of Solvent Used in the Preparation of Aluminum-Doped ZnO as Electron Acceptor Layer on the Characteristic of its Hybrid Solar Cell	2428
A. Aprilia, P. Wulandari and R. Hidayat	
ZnSe Thin Film Buffer Layer for CIGS Solar Cells Deposited from Chemical Solution with Variety Complexing Agents	2434
L.Y. Chen and C. Fang	
Study on Solar Materials with New Solar Cell Structure Using Surface Selective Etching and Periodical Barrier Technology	2438
K.F. Yarn, C.K. Kuo, I.T. Hsieh and W.C. Chang	
Investigation of Annealing Effect on Optoelectronic Performance of Active Layer in Poly Organic Solar Cell	2442
C.K. Wang, H. Ma, M. Li, X. Gong and C.X. Li	
Investigation of Thin Film Solar Cells on CdS/CdTe Base with Different Back Contacts	2448
G. Khrypunov, A. Meriuts, H. Klochko, T. Shelest and A. Khrypunova	
A Solar Cell Based on a Hybrid Film of P3HT and Magic Cubic-Like PbS	2453
P. Wang, A.M. Wang, Z.H. Zhang, L.B. Fan, Y. Lei, M.Y. Yang, Y.G. Zhang and P.J. Li	
Improve Efficiency of Organic Solar Cell by Adding Dispersed ZnO Nanoparticles	2457
Y.M. Lu, Y.F. Wu and L.C. Hsu	
Nickle Oxide Based Bulk Heterojunction Flexible Solar Cells	2466
B.J. Lu, N.H. Sun, M.W. Li and H.Z. Dong	
Anode Buffer Layer of Organic Solar Cells and Recent Developments	2470
X. Ran, N.T. Wai and X.J. Liang	
Application of Wide Band Oxide Semiconductor in Bulk Heterojunction Solar Cells	2476
J.M. Ye	
Fabrication of Polymer Solar Cells on Flexible Substrate	2480
E.S. Rosa and S. Shobih	
Investigation on the Effect of Gallium on the Efficiency of CIGS Solar Cells through Dedicated Software	2486
H. Ullah, B. Marí and H.N. Cui	
Glass/ITO/PbS/P3HT/Al: A Hybrid Film Solar Cell	2491
P. Wang, L.B. Fan, M.Y. Yang, Z.H. Zhang, X.B. Zhu, Y.G. Zhang and P.J. Li	
The Influence of the Fullerene on the Optical Constants of the Photoactive Blend Film of a Polymer Solar Cell	2495
P. Morvillo, E. Bobeico and S. Esposito	
A Heterojunction Film Solar Cell of Glass/ITO/CdS/PbS/Al	2501
P. Wang, L.B. Fan, L.J. Sun, Z.H. Zhang, X.B. Zhu, Y.G. Zhang and P.J. Li	
Critical Electric Field of InGaN p-i-n Solar Cell	2505
D.Y. Lin and C.Y. Chi	
The Suitability of Organic Solar Cells for Different Indoor Conditions	2510
B. Minnaert and P. Veelaert	
Analysis of Temperature Characteristics of an AlGaAs/GaAs/Ge Triple-Junction Solar Cell by IS	2516
Y.Q. Zhang, W.J. Cao and A.M. Liu	
Controlled Fabrication of the CdS Nanocrystals Films and its Application in Hybrid Solar Cells	2520
W.W. He, H.M. Jia and Y. Lei	
Effect of Solvent Annealing for Efficient Polymer Solar Cells	2524
M.H. Seo, K.J. Kim, B.Y. Han, G.S. Anand, S.H. Kim, S.W. Lee and S.W. Kang	
Study on the Buffer Layer of CIS Thin Film Solar Cell by Separate-Melting Chemical Bath Deposition Methods	2528
K.L. Wong, H.E. Chen and W.L. Chen	
A Solar Cell Made by a Hybrid Film of P3HT and Cubic-Like PbS	2532
P. Wang, L.B. Fan, Z.H. Zhang, Y. Lei, Y.G. Zhang and P.J. Li	

Improvement of Radiation Resistance of Multijunction GaInP/Ga(In)As/Ge Solar Cells with Application of Bragg Reflectors	
V.M. Lantratov, V.M. Emelyanov, N.A. Kalyuzhnny, S.A. Mintairov and M.Z. Shvarts	2536
Ta Doped Zinc Oxide as a New Anode for Photovoltaic Solar Cells	
N.H. Sun	2542
Optical Characterization and XPS Study of ZnGa₂O₄ Thin Films for Organic Solar Cells	
Z.Y. Zhong, C.Y. Yang and J.H. Gu	2546
Illumination Time Dependent Degradation of C₆₀ Solar Cell Efficiencies	
M. Imran	2551
Effect of Eosin-Y Coating Temperature on the Performance of Inverted Bulk Heterojunction Organic Solar Cells	
R.T. Ginting, C.C. Yap, M. Yahaya and M.M. Salleh	2557
Reduction of Crack Formation in Transcription of Cu(In,Ga)Se₂ Thin Film Solar Cell Structure	
Y. Abe, T. Minemoto and H. Takakura	2562
Effects of PCBM Loading and Thermal Annealing on Nanomorphology of Blend of Polymer/Fullerene Thin Films Solar Cells: Impact on Charge Carrier Mobility and Efficiency	
T.S. Shafai and O. Oklobia	2566
Evaluation of Organic Thin Film Solar Cells Using 3-Diode Equivalent Circuit Model with Inverted Diode	
Y. Sakurada, Y. Ota, H. Watanabe, H. Murata and K. Nishioka	2572
Flexible Photovoltaic Solar Cells Based on AZO Anode	
N.H. Sun, X.C. Bai, M.W. Li and B.L. Yao	2576
ZnO Nanorod Arrays Coated with Eosin-Y at Different Concentrations for Inverted Bulk Heterojunction Organic Solar Cells	
E.L. Lim, C.C. Yap, M. Yahaya and M.M. Salleh	2580
Optical Spectrum Analysis of CuInSe₂ Materials Applied in Solar Cell	
X.W. Wang, Z.H. Deng and Y. Zhang	2585
A Class of Semiconducting Polymers as Potential Materials for Polymer Solar Cells	
X.H. Xie, W. Shen, R.X. He and M. Li	2591
Influence of Plasmonic Light-Scattering by Gold Nano-Island Structures on the Quantum Efficiency of Organic Solar Cells	
B.Z. Wang, X.P. Zhang and J. Zhang	2599
The Development of CZTS Thin Films for Solar Cells	
N.J. Ji, K.G. Liu and Z.Q. Ma	2604
PEDOT:PSS Thin Film as Transparent Electrode in ITO-Free Organic Solar Cell	
Z.A. Rahman, K. Sulaiman, A.S. Abu Bakar and M. Rusop	2608
Efficiency Improvement of Solar Cell with ZnO Nanotip Array Prepared by Aqueous Solution Deposition	
M.K. Lee, N.R. Cheng, C.H. Fan and C.F. Yen	2613
Effect of Electric Field Treatment on the Performance of Organic Salt Doped Solar Cell	
N. Syamin, C.C. Yap, M. Yahaya and M.M. Salleh	2617
Properties of Heterojunction Solar Cells Based on Organic Phosphorescent Material: PPQF	
J.Y. Wang, J.P. Du, X.J. Zhang and Z.M. Wang	2622
Effect of Heat Treatment on the Crystal Structure and Optical Band Gap of Cigs Thin Films	
L. Han, T.Z. Ding, Y.L. Wang, L.M. Chao and T. Shang	2626
Synthesis of a New Platinum Metallopolyyne for Organic Solar Cells	
L. Li, X.X. Sun, Y. Hu and Q.H. Wu	2630
Preparation of SnS₂, SnS₂:Cu, SnS Nanocrystals and Assembly of Thin Film Solar Cell with the Novel Structure of FTO/SnS₂:Cu/SnS/Sn	
M. Yao, C.W. Shi, Y.R. Zhang, B. Li and L. Tao	2634
Charge Carrier Dynamics of Active Material Solar Cell P3HT:ZnO Nanoparticles Studied by Muon Spin Relaxation (μSR)	
L. Safriani, R. Risdiana, A. Bahtiar, A. Aprilia, R.E. Siregar, R. Hidayat, T.P.I. Saragi, I. Kawasaki and I. Watanabe	2639
Organic-Inorganic Solar Cell Based on Sprayed MEH-PPV/ZnO Nanorods Layers	
F.A. Mahmoud, A.B. Shehata, H. Mohamed and W. Magdy	2643

The Effect of Cesium Carbonate Modified Layer on the Performance of Organic Solar Cells J.M. Hu, S.W. Xie, J. Wen and X.M. Liang	2647
Deposition of Cu₂ZnSnS₄ Thin Film by Pulsed Laser Deposition and Assembly of Thin Film Solar Cell with the Novel Structure of FTO/CdS/Cu₂ZnSnS₄/Mo M. Yao, C.W. Shi, Y.R. Zhang and X.Y. Dai	2652
A New Buffering Layer of Photovoltaic Solar Cells M.W. Li, N.H. Sun, Y.W. Ge and B.L. Yao	2656
Optimization of the Metal Finger of a Silicon Concentrator Solar Cell S.S. Lou, P.D. Han, P. Liang, Y.P. Xing, S.X. Hu and H.S. Zhu	2660
Effects of PPV-g-PSFu Graft Copolymer on Morphology and Power Conversion Efficiency of Bulk Heterojunction Solar Cell Base on P3HT/C₆₀ Blends N. Seeponkai, J. Wootthikanokkhan and C. Thanachayanont	2664
Fabrication of Simple GaAs Solar Cell by Zn Diffusion Method S.P. Chang	2668
The Role of CdS Buffer Layer in ZnO Nanowire Arrays/SnS Thin Film Solar Cells Z. Hu, W.G. Yang, S. Liu, K. Tang, L.J. Wang and W.M. Shi	2673
Preparation of Cu₂ZnSnS₄ Film by Printing Process for Low-Cost Solar Cell Q.M. Chen, X.M. Dou, Z.Q. Li, S.Y. Cheng and S.L. Zhuang	2677
Study on the Small Molecule Organic Solar Cells with Anode Buffer Layer A.F. Wang	2683
Study on the Output Characteristics of Organic Photovoltaic Cells Z.Y. Zhong, C.Y. Yang and J.H. Gu	2687
Synthesis of a New Platinum Acetylide Polymer with a Pyrimidine Moiety for Organic Solar Cells L. Li, X.X. Sun, Y. Hu and Q.H. Wu	2691
Preparation of the Three Main Layers of CdS/CdTe Thin Film Solar Cells Using a Single Vacuum System S.N. Alamri, M.S. Benghanem and A.A. Joraid	2695
Effect of Dye Coating Duration on the Performance of Inverted Type Organic Bulk Heterojunction Solar Cell Based on Eosin-Y Coated ZnO Nanorod Arrays M. Yahaya, C.C. Yap and M.M. Salleh	2700
Diode Characteristics of Nanocomposited MEH-PPV: I-MWNTs with Different Types of Metal Contact Organic Solar Cells P.S.M. Saad, F.S.S. Zahid and M. Rusop	2706
The Influence of Thickness on the Properties of Sb₂Te₃ Thin Films and its Application in CdS/CdTe Thin Film Solar Cells S.B. Hu, R.Z. Tang, C.J. Tian, W. Li, L.H. Feng, J.Q. Zhang and L.L. Wu	2710
Band Gap Optimization by Ga and S Additions in CuInSe₂ for Solar Cell Absorber Applications B. Munir and K.K. Ho	2715
Carbon-Based Solar Cell from Amorphous Carbon with Nitrogen Incorporation A.N. Fadzilah, D. Kamaruzaman and M. Rusop	2720
Study of Anode Modification and Bias Voltage Treatment on Organic Solar Cells with Rubrene/ C₆₀ Heterojunctions B. Wu, P.Y. Liu, Z.G. Chen and J. Cao	2724
“Internal” Resistivity and Quantum Efficiency in Organic/Hybrid Solar Cells H.L. Kwok	2729
Analyse of Indium Loss in Preparation of CuInSe₂ Flims for Solar Cells L. Sha, Y.L. Wang and S.L. Ban	2734
Effects of Pd and Ni Metals Electrolessly Deposited on Si Nanowires on Properties of Photoelectrochemical Solar Cell W.L. Liu, Y.L. Hsieh, S.H. Hsieh and W.J. Chen	2739
Plasmon-Enhanced Cell Efficiency in Hybrid Solar Cell Based on CdS Nanorod and Poly (3-Hexylthiophene) X.M. Liu, F.M. Fu and W.M. Guo	2743
A Study of Fabrication Nanopowders of Cu₂ZnSnS₄ for Solar Cells Absorbers K.L. Wong, W.L. Chen and S.H. Wang	2747

Degradation Mechanism of III-V Triple Junction Solar Cells Analyzed Using Step Stress Tests	
H.F. Hong, J. Wei, M.H. Chiang, Z.H. Shih, W.Y. Uen, Y.R. Hsu, C.B. Chung and Y.M. Lee	2751
Application of Electrochemical Impedance Spectroscopy in Organic Solar Cells with Vertically Aligned TiO₂ Nanorod Arrays as Buffer Layer	
Y.C. Zhang, X.J. Jiao, C. Zhou, H.P. Shen, F. Hao, K. Hotozuka and H. Lin	2757
High Performance Flexible Solar Cells with CdTe Thin Film	
Q.Q. Wu and X.Y. Chang	2763
Photovoltaic Solar Cells with Metal Oxide Semiconductor Anode and Mutilayer	
X.Y. Chang and Q.Q. Wu	2767
CdTe Solar Cells on Flexible Metallic Substrates	
J.J. Wu, H.C. Wu and C.Z. Zhao	2771
Performance Enhancement of Organic Solar Cells with the LiF/Al Cathode Structure by the Pyromellitic Dianhydride Layer	
S.S. Oh, D.H. Yeo, K.H. Park, H.B. Kim, M.H. Ha, H.J. Oh, M.W. Park, J.S. Park, D.W. Park, D.G. Jung, H.Y. Chae, H.S. Kim, J.H. Boo and E.Y. Nam	2775
Research on ZnS Buffer Layer by RF Magnetron Sputtering for Cu(In,Ga)Se₂ Solar Cells	
Y.Q. Hua, J. Yu, R.F. Chen, C. Chen and R.L. Xu	2778
Efficiency Inorganic Thin Film Solar Cells with Flexible Substrate	
N.H. Sun	2782
Effect of PMMA and Graphene Addition on the Performances of Organic Solar Cells	
C.F. Ou and P.Y. Chen	2786
Organic Bulk Heterojunction Solar Cell Based on Rosebengal: ncTiO₂ and Parameter Extraction by Simulation	
C.O. Sreekala, P.F. Saneesh, K.S. Sreelatha, A. Krishnashree and M.S. Roy	2791
Effect of Pulsed-DC Power on the Zinc Oxide Window Layer of CIGS Solar Cells Deposited by In-Line Sputtering Methods	
C.L. Jin, H.N. Shim, E.S. Cho and S.J. Kwon	2798

Chapter 4: Technology of Quantum Dots

Application of InN Based Quantum Dot in Reducing Short Circuit Current Variation of Solar Cell above Room Temperature	
M.A. Rashid, F. Malek, A.N. Al-Khateeb, F.A. Rosli, M.A. Humayun and N.H. Ramly	2805
Two Sizes CdSe Quantum Dots Co-Sensitized TiO₂-Nano-SiO₂ Hybrid Photoelectrodes for Solar Cells Applications	
R.B. Wang, H.H. Niu and L. Wan	2810
Synthesis of CdS/CdCO₃ Core/Shell Structural Nanocrystals Potentially Used for Solar Cell via Hydrothermal Route	
R.H. Xu, J.B. Wen and F.Z. Ren	2814
ZnO Porous Plate Films Application in Quantum Dot Sensitized Solar Cells	
X.M. Lü, X.P. Zou, J. Cheng, G.Q. Teng, X.M. Meng, Z. Sun, G.Q. Yang, C.L. Wei, H.Y. Feng and Y. Yang	2820
Fabrication of Highly Fluorescent Cadmium Based Aqueous Phase Colloidal Quantum Dots for Solar Cell Applications	
A. Arivarasan, S. Ganapathy and R. Jayavel	2824
MOCVD Grown Quantum Dot-in-a-Well Solar Cells	
A. Majid, L. Fu, C. Jagadish and H. Tan	2830
Germanium Quantum Dot Sensitized TiO₂ Solar Cells	
M. Abbas, B. Ali, S.I. Shah and P. Akhter	2836
Nanocoral PbS Films Schottky Solar Cell	
A.S. Obaid, A.A. Dihe, B.M. Salih, Z. Hassan, Y. Al-Douri and M. Bououdina	2847
Research Progress of Quantum Dot Solar Cell	
W. Cui, C. Wang and Y. Yang	2852
The Simulation of PbSe Quantum Dots Luminescent Solar Concentrator Based on GoldSim Software	
T.Y. Xu, W.Z. Gao, T.Q. Zhang, K. Bi, W.W. Zhai and Y. Zhang	2857

Application of ZnO Nanostructure by Hydrothermal Growth in Quantum Dot Sensitized Solar Cells	2861
B.L. Zhang, X.P. Zou, X.M. Lv, G.Q. Yang, C.L. Wei, Z. Sun, Z.B. Huang and H.Q. Zhou	
Optical and Photovoltaic Properties of CdS/Ag₂S Quantum Dots Co-Sensitized-Solar Cells	2865
A. Tubtimtae and M.W. Lee	
Preparation and Photoluminescent Properties of Ce³⁺, Yb³⁺ Co-Doped YF₃ Nanophosphors for Solar Cells	2869
S.W. Li and M. Yue	
Minimization of Open Circuit Voltage Fluctuation of Quantum Dot Based Solar Cell Using InN	2873
F.A. Rosli, M.A. Rashid, F. Malek, M. Othman, A.A. Zaidi and M.A. Humayun	
3D-ZnO Nanorods Photoelectrodes for Quantum-Dot Sensitized Solar Cells	2877
Y.L. Chen, W.Y. Fu and P. Lv	
Intermediate Band Solar Cells	2881
A. Martí and A. Luque	
Downconversion for Solar Cells in Sr₃Gd(PO₄)₃:Tb, Yb Phosphors	2889
J.Y. Sun, Y.N. Sun, J.C. Zhu, J.H. Zeng and H.Y. Du	
Optimizing Quantum Dot Solar Concentrators with Thin Film Solar Cells	2893
W.G.J.H.M. van Sark, C. De Mello Donegá and R.E.I. Schropp	
Near-Infrared Quantum Cutting Nanophosphors for Solar Cells	2899
S.W. Li	
Application of Nano-SiO₂ on Photoanode of Quantum Dots Sensitized Solar Cells	2903
R.B. Wang, L. Liu, L. Wan and J.Z. Xu	
Near Infrared Quantum Cutting for Solar Cells in CeF₃:Yb³⁺ Nanophosphors	2907
S.W. Li	
Anisotropic Nanostructure ZnO Photoelectrodes for CdS/CdSe Quantum Dot Sensitized Solar Cells	2911
J.J. Tian	
Application of Finite Difference Method in Modeling Quantum Dot Superlattice Silicon Tandem Solar Cell	2917
J. Huang, J.L. Jiang and A. Sabeur	
Research Progress of Quantum Dot Intermediate Band Solar Cell	2921
S.Y. Ma, L. Shi, L.D. Chen and L.Z. Feng	
Performance Comparison for Different Material Quantum Dot Single Intermediate Band Solar Cells	2925
W.S. Wei, F. Shan, S.Y. Zhao and Q.B. Zhang	
Simulation and Size Optimization of PbSe Quantum Dots Luminescent Solar Concentrator	2933
T.Y. Xu, Y. Zhang, K. Bi and T.Q. Zhang	
Study on Photoelectrochemical Performance of ZnO Nanotube /CdSeQuantum Dot-Sensitized Solar Cell	2937
P.F. Tao, J. He, C.J. Liang, J.P. Han, L.Q. Qin and Q. Pang	

Chapter 5: Engineering Support in Manufacturing of Solar Cells

Machining Characteristics of Multilayered Thin Film Solar Panels in Diamond Wire Sawing and Grinding	2943
H. Huang, A.S. He, C.W. Kang, Y.X. Zhang, F.J. Chen, H. Huang, S.H. Yin, X.P. Xu and Y.H. He	
Surface Texture Analysis of Fixed and Free Abrasive Machining of Silicon Substrates for Solar Cells	2948
C.C.A. Chen and P.H. Chao	
A Study of the Simulation of a Light Trapping Module for Increasing the Absorption Efficiency of Solar Cells	2952
W.L. Liu, G.Y. Lin and H. Yang	
Preparation of Micro-Sized Silver Powder Utilized in Paste for Solar Cell Grid Electrode	2956
Y. Zheng, G.Y. Gan, L. Zhang, J.K. Yan, J.H. Du, J.M. Zhang and J.H. Yi	

'Just Clean Enough': Wet Cleaning for Solar Cell Manufacturing Applications	
K. Wostyn, W. Baekelant, J. Rip, M. Haslinger, K. Kenis, H. Struyf, M. Claes, P.W. Mertens and S. De Gendt	2960
Non-Destructive Characterization of Micro-Sized Defects in the Solar Cell Structure	
R. Macku, P. Koktavý and P. Škarvada	2964
PN Junction Defects Detection in Solar Cells Using Noise Diagnostics	
P. Paračka, P. Koktavý and R. Macku	2968
Absorption Enhancement of Solar Concentrators via New Surface Photonic Designs	
Y.L. Lu, L. Li and K.A. Reinhardt	2972
Influence Factors on the Size of Spherical Silver Powder Used for Solar Cell Top Electrode Paste	
S. Zhang, Y.L. Zhu and J. Song	2977
Solar Cell Surface Texturing Combined Wet Etching and Ultrasonic Vibration	
Y. Chao, Y.T. Wu, J. Yu and L.Q. Wu	2984
Analytical Model of Thermal Stress for Encapsulation and Service Process of Solar Cell Module	
G.H. Sun, S.L. Yan and G. Chen	2988
Studying Light Soaking of Solar Cells by the Use of Solar Simulator	
T.U. Nærland, B.R. Olaisen and L. Arnberg	2992
Thin Film Solar Cells and their Development Prospects in Yunnan	
X.Y. Wang, Q. Wu, H.Y. Li, H.D. Ju, H. Yang, J.L. Luo, L.Y. Pu, S. Du and H. Wang	2998
Investigation of Defects in Solar Cells and Wafers by Means of Magnetic Measurements	
R. Buchwald, S. Köstner, F. Dreckschmidt and H.J. Möller	3002
Application of Improved Moment Invariants and SVM in the Recognition of Solar Cell Debris	
Y.Q. Wang, D. Tian, D.Y. Song, A.L. Cai, Y.F. Liu and S.Y. Huang	3012
Evaluation of Taiwanese Solar Cell Industry Operational Performance Using Two-Stage Data Envelopment Analysis	
H.E. Chueh and J.Y. Jheng	3018
The Application of Infrared Image Technology in the Detection of Local Defects of Solar Cell Module	
Y.Q. Wang, P.C. Zhang, S.Y. Wang, J.F. Xiong, A.L. Cai, P.P. Huang and R.X. Sun	3022
A Nano-Particle Synthesis Technology Dedicated to Solar Cells Applications	
R. Najjar, S. Boutami, C. Cayron, N. Baclet, V. Muffato, P. Labeye, A. Kean, S. Saranu and E. Quesnel	3026
Preparation and Optical Properties of Gallium-Titanium Codoped Zinc Oxide Transparent Conductive Films for Solar Cells	
T. Zhang, H. Wang, Z.Y. Zhong, C.Y. Yang and J. Hou	3032
Design of Thin Films Removal on Solar-Cells Silicon-Wafers Surface	
P.S. Pa	3036
Optimization of Porous SiO₂ Antireflective (AR) Coatings Used in Encapsulating Solar Modules	
J. Tian, S.K. Deng and P.Z. Yang	3041
Automatic Test System for the Basic Properties of Solar Cells	
J.J. Tu and G.W. Liang	3048
Solar Cell Defects Detection Using Lock-In Amplifier	
I.F. Leong, J.J. Fang and J. Liao	3053
The Efficiency Limits of Solar Cells	
L. Li and F.J. Zong	3057
LIBS for the Analysis of Metallurgical and Solar Grade Silicon	
S. Darwiche, M. Benmansour, N. Eliezer and D. Morvan	3061
Applications of Photonic Crystals in Solar Cells	
Y. Hao, X.H. Sun, L.D. Jiang, X. Zhang and G.L. Wang	3065
Developments of Solar Cell Materials and Fabrication Technology and their Effects on Energy Conversion Efficiency	
Y.D. Yang, P. Wu, J. Deng, M. Barati and A. McLean	3070
New Product Development Model for Solar Cells	
A.H.I. Lee, T.N. Liu, J.S. Chen and C.Y. Lin	3079

Application of Heuristic Genetic Algorithm for Parameters Optimization of a Solar Cell Manufacturing Process	3083
T.H. Hou, C. Lin and K.Y. Lin	
The Photoelectric Conversion Efficiency Research at Color Solar Cell	3088
W.D. Jheng, S.H. Chen and Z.H. Lin	
Research of Solar Cell Surface Defect Detection System Based on Machine Vision	3093
M.L. Feng, X.J. Zhou and J.G. Yu	
Study of Top Triangular Nano-Grating on Solar Cell Using Rigorous Coupled Wave Analysis	3098
X.M. Jin, D.A. Cattarusa and M.J. Marshall	
Evaluation for the Light Transmission Property of Solar Glass	3104
Y.G. Han and H.B. Chen	
Electrolysis Process for Preparation of Solar Grade Silicon	3108
X.Y. Zou, H.W. Xie, Y.C. Zhai, X.C. Lang and J. Zhang	
Predictive Maintenance through Condition Monitoring at Diffusion Equipment of a Solar Cell Manufacturing Environment	3114
S. Nurhaiza and M.K.A. Mohd Arrifin	
Ca-Si Alloy Addition Followed by Acid Leaching as a Route to Solar-Grade Silicon	3120
P. Zou, K.X. Wei, W.H. Ma, K.Q. Xie, J.J. Wu and T. Luo	
Preparation Development of High-Quality Solar-Grade Multi-Crystalline Silicon by Directional Solidification	3126
H.J. Su, J. Zhang, L. Liu and H.Z. Fu	
Study on Purification of Solar Grade Polysilicon	3130
J.X. Liu and H. Qiu	
The Development of Conductive Pastes for Solar Cells	3134
J.T. Tsai, C.Y. Huang and S.T. Lin	
Development of Inorganic Gas Barrier Material in Solar Cell Devices for Planarization Properties and Sublimate Defect Reduction	3138
S. Takei	
Preparation and Formation Mechanism of the Highly Dispersive Silver Powders Used for the Front Paste of the Solar Cell	3143
C.Y. Jiao, T.B. Xu and G. Ren	