Exhibit 2028

Expert Research Group

CONFIDENTIAL EXPERT SUMMARY, EXPERT WITNESS CLIENTS AND CV

Expert: Photovoltaic and Solar Cell Technologies
RE: Maxeon Solar Pte. Ltd v. Canadian Solar, et al. (various actions)
Prepared for: Robert Gaybrick, Esq. of PV Law LLP

EXPERT HIGHLIGHTS

Douglas Ruby, Ph.D.
Consultant to the Photovoltaics Industry
Kona, Hawaii (previously Albuquerque, NM)

Dr. Douglas Ruby is a seasoned expert in photovoltaic and solar cell technologies, with a distinguished career in both research and industry leadership. He has over 30 years of experience leading teams, managing R&D projects, and advancing solar energy technologies.

Dr. Ruby personally conducted seminal research on new PV cell designs and fabrication process development. As a Sandia National Labs researcher, he visited many PV cell and module manufacturers worldwide, and worked closely with them to develop new cost-effective and performance-enhancing designs and processes

Dr. Ruby's professional experience spans multiple roles, emphasizing innovation in crystalline silicon solar cell processing, photovoltaics system development, and industry collaboration. He possesses intricate knowledge of the additional steps in PERC/PERT that make up TOPCon solar cell technology.

Over the course of his career, Dr. Ruby has invented multiple patents related to silicon solar cell fabrication and processing, including innovations in self-aligned selective-emitter processes and metal catalyst techniques for texturing silicon solar cells. Notably, he designed and fabricated the world's first 20% efficient silicon concentrator solar cell.

Disclosure: Dr. Ruby was retained as an expert for Jinko Solar opposed to Hanwha. His work concluded in 2022. The matter settled in 2023.

Expert Witness Experience: Dr. Ruby is an experienced expert witness, having provided trial testimony and participated in depositions for various litigations. More detail is provided on his CV.

Education Summary: Ph.D., Semiconductor Physics, University of Illinois (1985), M.S., Semiconductor Physics, University of Illinois (1980), B.S., Physics, MIT (1978).

General Rate Information: Dr. Ruby charges $600/hr for all expert services including portal to portal travel. Payment terms are net 30. ERG's fees are included in the expert's rates.

To interview or retain this expert contact:

Craig Chambers, MBA
Partner/Senior Client Manager
Mobile: 805-825-5155
craig@expertresearchgroup.com
Expert Research Group LLC

Dr. Ruby's Previous Expert Witness Clients:

Corrs Chambers Westgarth
8-12 Chifley Square, Sydney NSW 2000, Australia
GPO Box 9925, Sydney NSW 2001, Australia
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Acting for Jinko Solar Australia Holdings Co Pty Limited (Jinko Solar or our client) which is a party to proceedings in the Federal Court of Australia brought by Hanwha solar cell companies namely Hanwha Solutions Corporation, Hanwha Q Cells Australia Pty Limited, and Hanwha Global Asset Corporation (Hanwha).
Provided several written reports, many days of inter-expert dialog, and 4 days of witness stand testimony at trial.

Robbins Geller Rudman & Dowd LLP, San Diego, CA
UNITED STATES DISTRICT COURT, DISTRICT OF ARIZONA
MARK SMILOVITS vs. FIRST SOLAR, INC, Defendant
No. 2:12-cv-00555-DGC Case 2:12-cv-00555-DGC Document Filed 08/17/12
CLASS ACTION

Birka-White Law Offices, Danville, CA
U.S. District Court for the Northern District of California.
Michael Allagas, et al. v. BP Solar International Inc. et al.,
Case No. 4:14-cv-00560 filed January 9, 2014
Class Action Case No. 3:14-cv-00560-SI
Provided: Written report, deposition.

Minter Ellison Group, Hong Kong SAR
During July of 2016, I was contracted by MinterEllison to review evidence associated with a dispute between their client ULVAC, Inc. ("ULVAC") and DuPont Apollo (Shenzhen) Limited ("DAS").
Provided: Written report.

Kasling, Hemphill, Dolezal & Atwell L.L.P.
DISTRICT COURT OF THE FOURTH JUDICIAL DISTRICT
OF THE STATE OF IDAHO
Case No. CV OC 0720632
GREG HAGOOD, individually and on behalf of the PARTNERSHIP, GARY MURPHY, DIAMOND COMPUTER RESOURCES, Plaintiffs,
VS.

RICK J. MATHESON and EAGLE SILICON, LLC, an Idaho Limited Liability Corporation, Defendants. Provided: Written report, deposition.

Singularity LLP., representing the plaintiff, Solaria Corporation

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF ALAMEDA

SOLARIA CORPORATION, Plaintiff, v. GCL SOLAR ENERGY, INC.; GCL-POLY ENERGY HOLDINGS, LTD.; GCL SYSTEM INTEGRATION TECHNOLOGY CO., LTD.; and DOES 1 through 10, inclusive, Defendants.	Civil Case No. RG16830545 **FIRST AMENDED VERIFIED COMPLAINT FOR INJUNCTIVE RELIEF AND DAMAGES FOR MISAPPROPRIATION OF TRADE SECRETS AND BREACH OF CONTRACT** **DEMAND FOR JURY TRIAL** ASSIGNED FOR ALL PURPOSES TO: HON. DELBERT C. GEE DEPT. 302 Action Filed: Sept. 9, 2016

Case settled out of court.

H.R.D. Singapore Pte Ltd. v. Jinko Solar
I was hired by Jinko Solar in 2019 to provide technical advice for their defense in a case alleging premature degradation of their module performance. No report or deposition was requested.

Douglas Scott Ruby (Doug)
(505) 270-6661 cell
Albuquerque, NM 87120 USA
pvexpert@outlook.com

EDUCATION:

1985 Ph.D. in Semiconductor Physics, University of Illinois, Dr. Greg Stillman, advisor.
1980 Master of Science, Semiconductor Physics, University of Illinois, Urbana, IL.
1978 Bachelor of Science, Physics, Massachusetts Institute of Technology, Cambridge, MA.

WORK EXPERIENCE:

07/01/2008 to present
Douglas Ruby, Ph.D., Consultant to the Photovoltaics Industry
Specializing in PV cell and system design and performance modeling,
PV cell and module test procedures, measurement protocols and performance analysis,
PV cell and module fabrication process development.

Clients:

Cabot Superior Micropowders, Albuquerque, New Mexico
Skyline Solar, Inc., Mountain View, CA
NanoGram Corporation, Milpitas, CA
Solar Implant Technologies, Santa Clara, CA
SVTC Solar, San Jose, CA
NetCrystal Inc, Mountain View, CA
SunCore Corporation, Irvine, CA
Solar Power Industries, Belle Vernon, PA
Semitracks, Inc., Albuquerque, NM
SolarWorld Industries America, Hillsboro, OR
US Dept. of Energy, Solar Energy Technologies, Washington, DC
SpecialChem, Paris, France
CIMA NanoTech, Saint Paul, MN
Bloo Solar, Sacramento, CA
Sunpreme, Sunnyvale, CA
Tessera, San Jose, CA
Bandgap Engineering, Woburn, MA
Nuance Systems, Portland, OR
Dow Corning, Midland, MI
PowerMark, Port Saint Lucie, FL
SierraTherm, Watsonville CA
Solar Energy Research Institute of Singapore, National University of Singapore
Jiangsu Linyang Solarfun Co., Ltd.
Kuwait Institute of Scientific Research (KISR)
Solexel Inc, Milpitas, CA
Solar3D, Santa Barbara, CA
Silicon Solar Solutions, Fayetteville, AR
REC Cells Pte Ltd, Singapore
SunPower Corporation, Philippines

Barrday Inc., Ontario Canada
Izar Solar, Champaign, IL
China Sunergy, Nanjing, China
Burns and Roe Enterprises, Inc., Oradell NJ
GEN3 Partners, Inc., Boston, MA
Robbins Geller Rudman & Dowd LLP, San Diego, CA
Birka-White Law Offices, Danville, CA
Minter Ellison Group, Hong Kong SAR
Solaria Corp, Fremont, CA
Corrs Chambers Westgarth for Jinko Solar Australia Holdings Co Pty Ltd, for proceedings in the Federal Court of Australia brought by Hanwha Solutions Corporation

Activities as a PV Consultant include:

1. work with PV cell manufacturers to improve the performance and reduce the cost of their cell designs and fabrication processes,
2. provide due diligence and technical expertise on technology selection, conceptual layouts, specification development, and energy production estimates for PV power plant proposals,
3. use of numerical modeling to pinpoint sources of loss mechanisms and to determine technical requirements necessary for cost-effective PV cell and module performance.
4. provide expert witness services for legal proceedings requiring photovoltaic technology expertise.
5. Authored and presented 3-Day Short Course on Silicon PV Manufacturing and Technology to PV manufacturers worldwide.
6. PV module, array and system performance measurements and comparison with energy-production model predictions.

11/18/1985 to 1/28/2008
Sandia National Laboratories, Albuquerque, New Mexico.
Principal Member of Technical Staff

Team Leader of PV Cell Development Team and $2M/year semiconductor fabrication facility. Directed 7 team members, authored annual operating plan, directed all PV cell research projects. Responsible for tasks and milestones of Si cell research and maintaining quality control.

Director of Crystalline Silicon Research Cooperative, a government/industry consortium for mutually beneficial research consisting of representatives from the entire US Si-PV manufacturing and research communities.

Contract monitor and advisor for several R&D contracts in the DOE Concentrator Initiative Program 1990-1993, closely involved and providing technical feedback for manufacturers developing Concentrator Photovoltaics systems.

Charter member of the PV Manufacturing Technology Program Implementation Committee, a DOE/National Lab group directing $11M/year in industry-contracted DOE research.

Successfully led two 3-year competitively awarded projects as Principal Investigator in silicon solar cell processing, submitting original proposals, building successful interdisciplinary teams, authoring review presentations, and meeting all milestones.

Initiated and directed a graduate student research program at the University of New Mexico with Prof. Charles Fleddermann resulting in several graduate student thesis projects in solar cell fabrication processing to improve solar cell performance.

Authored competitively evaluated proposal to DOE Hydrogen Program to lead a multidisciplinary team in a project to improve efficiency and cost-effectiveness of PV-powered water-electrolysis for hydrogen production. The proposal was successfully approved but never funded due to government budget shortfalls.

Selected to serve as subarea chairman of 2000 IEEE PV Specialists Conference in Silicon Cell Processing.

Invited to serve as Session Chairman of PV session at 1999 ASME Renewable Energy Conference.

Directed graduate student research program contract at Georgia Institute of Technology with Prof. Ajeet Rohatgi. Managed $2.8M solar cell research and development contract.

Initiated and successfully conducted several direct industry joint experiments with most major US Si solar cell manufacturers, resulting in numerous publications and several process improvements adopted by industry into manufacturing production lines.

SPECIFIC SKILLS:

PV module, array and system performance measurements and comparison with energy-production model predictions. Development of improvements to predictive model algorithms.
PC1D modeling of solar cell device physics to predict cell behavior and determine performance-limiting mechanisms.
Design of experiments statistical analysis.
Quality control and management of semiconductor processes using Statistical Process Control (SPC).
Silicon and compound semiconductor concentrator and one-sun solar cell design, fabrication, and performance analysis.
Accelerated ultraviolet-light exposure-testing of solar cells for performance degradation studies.
Controlled-atmosphere, solar cell busbar soldering.
Toxic gas detection systems, fire suppression systems in solar cell fab cleanroom.
Plasma-enhanced chemical vapor deposition of silicon oxides and nitrides.
Selective Reactive Ion Etching of silicon devices.
Plasma-texturing of silicon surfaces.
Photolithography and image reversal.
Low-temperature surface and bulk defect passivation.
Atmospheric-pressure chemical vapor deposition of silicon dioxide.

PATENTS:

United States Patent: “Silicon Solar Cells Made By A Self-Aligned, Selective-Emitter, Plasma-Etchback Process,” Issued February 16, 1999, Patent Number 5,871,591.

United States Patent: "Method For Fabricating Silicon Cells," Issued August 11, 1998, Patent Number 5,792,280.

United States Patent: "Metal Catalyst Technique for Texturing Silicon Solar Cells," Issued December 11, 2001, Patent Number 6,329,296.

United States Patent: "Silicon Cells Made by a Self-Aligned, Selective-Emitter, Plasma-Etchback and Texture Process," Issued July 18, 2000, Patent Number 6,091,021.

United States Patent: "Alternating Current Photovoltaic Building Block," Issued June 15, 2004, Patent Number 6,750,391,B2.

ADDITIONAL ACHIEVEMENTS:

> Designed and fabricated world's first 20% efficient Si concentrator solar cell.
> Ph.D. Thesis: A Study of Electron Traps in VPE GaAs Grown With Added Oxygen
> Received Best Paper Award at 1999 ASME Renewable Energy Conference.
> Bachelor's Thesis: A Study of Linewidths in Rydberg States of Atomic Sodium
> College-level studies in German language/ conversational speaker.

REFERENCES:

Gregory Kolb Solar Power System Consultant 1205 Lawrence Court NE Albuquerque, NM 87123 505-228-3378 greg.kolb@solarreserve.com	Dr. Paul Basore Chief Engineer, Solar Energy Technologies at U.S. Department of Energy (DOE) 1-650-455-8858 **paul.basore@ee.doe.gov**
James Gee Senior Scientist Applied Materials Inc. Santa Clara, CA 95054 (505) 328-0975 james_gee@amat.com	Dick Swanson President & Chief Technical Officer emeritus SunPower Corporation San Jose, CA 95134 (408) 991-0908 rswanson@sunpowercorp.com
John Wohlgemuth, PhD Principle Reliability Physicist National Renewable Energy Lab Golden, CO 303-384-7982 john.wohlgemuth@nrel.gov	Ajeet Rohatgi, Ph.D. Founder, Chief Technical Officer Suniva, Inc. Norcross, GA 30092 404-894-7692 ARohatgi@suniva.com

Recommendations:
as Owner of Douglas Ruby, Ph.D., Consultant to the Photovoltaic Industry

I had the distinct pleasure of working with Dr. Douglas Ruby in a class action involving defective solar panels. Dr. Ruby provided expert analysis and testimony regarding the defective design and related manufacturing soldering defects associated with a solar panel junction box. Dr. Ruby was diligent, insightful, creative and tough. His work was supported by impeccable science, and his testimony was instrumental to our being able to settle a nationwide class action for over $40 million. We hope to work with Dr. Ruby in the future and would highly recommend

him to all others in need of his unique talents. January 31, 2024
David Birka-White Principal Attorney at Birka-White Law Offices managed Douglas directly.

"Doug is one of the most knowledgeable experts in the area of silicon solar cell design, processing and applications. His accomplishments include significant work in concentrator and multicrystalline cells. As the contact monitor at Sandia, Doug demonstrated keen understanding of the problems and technical leadership that helped us to achieve program goals." February 29, 2012
Dimitri Krut, Sr Staff Engineer & Lab Manager, Spectrolab
was with another company when working with Douglas at Douglas Ruby, Ph.D.

"Douglas is a well respected and well known silicon wafer solar cell and module expert with many years of professional expertise, both at public research institutes and in industry. His expertise covers the broad range from solar cell device processing to characterization and modeling of solar cells." February 28, 2012
Top qualities: Expert, Good Value, High Integrity
Armin ABERLE, Deputy CEO at Solar Energy Research Institute of Singapore, Professor at National University of Singapore, Director, Silicon Photovoltaics Department at Solar Energy Research Institute of Singapore, hired Douglas as a Technology consultant in 2010

"Doug is a knowledgeable PV expert who helped my company in its early stages. He provided excellent insight on cell architectures and process parameters to improve cell performance. Doug is easy to work with and a good communicator." February 24, 2012
Top qualities: Personable, Expert, High Integrity
Ed Murrer, hired Douglas as a PV consultant in 2008.

"Douglas has extensive experience in the field of silicon solar cells and is very well qualified to assist companies to achieve performance improvements." February 24, 2012
Andrew Blakers, Director, Centre for Sustainable Energy Systems, Australian National University, was with another company when working with Douglas at Douglas Ruby, Ph.D.

"From our mutual work, I found out that Douglas is one of the biggest experts in the PV field. He knows this field inside out." February 24, 2012
Dan Shilo, Director General, PV Experts Israel, was with another company when working with Douglas at Douglas Ruby, Ph.D.

"Doug performed an audit of PV module measurement capability of the Florida Solar Energy Center. He performed the service in a timely fashion and provided an excellent report of the results." April 21, 2010
Top qualities: Expert, Good Value, High Integrity
John Wohlgemuth, Current: Principle Reliability Physicist at NREL Past: Program Manager at BP Solar, hired Douglas as a Auditing of PV module measurements in 2009

"Doug Ruby contracted to us at Skyline Solar. His analysis was insightful and thorough. Doug is an expert in Solar Cell modeling and the physics of solar cells. He is a great resource when a technical conundrum is creating a dispute or controversy in a company." November 3, 2010
Top qualities: Great Results, Expert, High Integrity
Teresa Trowbridge, hired Douglas as a Engineering in 2009

"Doug is an expert in the field of silicon wafer based photovoltaic manufacturing process. He greatly contributed to our project's success and was easy to work with." April 30, 2009
Top qualities: Great Results, Expert, Good Value
Kurt Laetz hired Douglas as a Technology & Process Consultant in 2008

"Doug is a great communicator and explains photovoltaics concepts at a level that everyone can understand. He can also go into depth on a number of topics, providing expert insight even to veterans in the solar industry." April 6, 2009
Top qualities: Personable, Expert, High Integrity
Chris Henderson hired Douglas for Engineering Training in 2009

"We had hired Doug as a consultant to help us in the Photovoltaic Device area. Doug has lots of experience in c-Si based Solar Cells - device physics and technology. He was able to easily articulate the areas of improvement with solid reasoning. He helped us put together a technological roadmap to achieve our goals. Doug is very professional and friendly to work with. He has very good teaching skills as well." January 27, 2009
Top qualities: Expert , Good Value , High Integrity
Sanjay Thekdi , hired Douglas as a Photovoltaic Consultant in 2008

"Doug completed a device performance modeling project for our solar cell product development. Doug's work was very helpful in our understanding of the key factors driving performance in our particular device structure. This understanding helped focus development priorities on the most important factors. I found Doug to be very easy to work with, and his work product was excellent and on time. I would hire Doug again without hesitation." January 26, 2009
Top qualities: Great Results , Expert , High Integrity
Ron Mosso hired Douglas as a PV Device Consultant in 2008

"Doug has extensive experience in solar cells. He was able to quickly pinpoint the areas of improvement in our solar cells. We were able to prioritize the development depending on the expected improvements and were able to reach many of our milestones. His technical input has been very useful for our development and has ranged from device fabrication to characterization." January 25, 2009
Uma Srinivasan , *Principal Device Development Engineer/Manager (Solar R&D) , NanoGram Corporation* worked directly with Douglas at Douglas Ruby, Ph.D.

"Doug did a great job for us. His ability to explain observed data and predict the results of tests before they were run saved us many hours of lab time and gave us the theoretical validation that we needed early in our development cycle. Doug is a very easy person to deal with and he was able to tailor his explanations to his audience whether it was a room full of Ph.D.'s or senior execs." January 6, 2009
Top qualities: Great Results , Personable , Expert
Bill Sanders hired Douglas as a PV Consultant in 2008

"Doug did some technical consulting for us in the space of crystalline silicon solar cell passivation, operation under concentrated sunlight and anti-reflection coatings. Doug has a deep working knowledge of what works and can provide detailed recipes that will work. He's a great asset to anyone in the solar cell space." January 2, 2009
Top qualities: Expert , Good Value , On Time
Peter Peumans hired Douglas as a Technical Consultant in 2008

"Doug has been of great help for our solar cell project. His hands on knowledge helped us with various aspects of testing and characterization. He also did extensive PC1D simulations to help validate our solar cell concept and to help illuminate some of our technical issues. His experience in PV has helped us to move forward more rapidly." December 24, 2008
Top qualities: Personable , Expert , High Integrity
Henry Hieslmair hired Douglas as a Business Consultant in 2008

"Doug offers years of experience in the area of PV and can bootstrap a PV development effort or add breadth to an existing development effort. He is easy to work with and has excellent contacts within the industry as well." December 11, 2008
Top qualities: Personable , Expert , Good Value
Jim Hunter , hired Douglas as a PV Consultant in 2008

"Doug is one of the solar industry's most experienced PV cell scientists. He brings a valuable depth of knowledge and clear, methodical approach to engineering design problems. The output of his work hit every technical objective and was done on time." December 11, 2008
Top qualities: Expert , On Time , High Integrity
Bob MacDonald hired Douglas as an Engineering Consultant in 2008

Principal Member of Technical Staff at Sandia National Laboratories

"Doug and I had numerous work related interactions during the time we worked together on several different projects. He was a good source of knowledge when I had a question on the device physics in photovoltaic semiconductors. His education background and experience in the PV field makes him a good resource for device and production related issues." December 15, 2008
Jason Finn , *Member of Technical Staff , Sandia National Laboratories*
worked with Douglas at Sandia National Laboratories

"I worked with Doug on a number of collaborations on development of solar cell technology between 1990 and 2003 while he was at Sandia Laboratories. This was done both under a CRADA from my previous company as well as part of a industry-wide consortium, which developed innovative and advanced concepts for solar cell fabrication. Doug's participation and leadership exhibited a high scientific standard and he maintained an outstanding professional caliber of experimentation during all this work." December 11, 2008
Top qualities: Expert , Good Value , Creative
Juris Kalejs hired Douglas as a R&D project leader in 1990 , and hired Douglas more than once

Student at University of Illinois at Urbana-Champaign

"Douglas was a student with me at MIT and I know him to be very smart, dedicated, hard working and high achieving. I also went to the University of Illinois with Douglas and have kept in touch with him over the years. I know he is a knowledgeable leader in the field of Photovoltaics with extensive experience and achievements." December 11, 2008
Todd Sauke, Ph.D. , *Student , University of Illinois at Urbana-Champaign*
studied with Douglas at University of Illinois at Urbana-Champaign

"I studied with Doug Ruby at the University of Illinois and have kept in touch with him on a regular basis since that time. I have known Doug to be a thoughtful and conscientious person and

can definitely recommend him." December 11, 2008
Darcy Escovedo , *Student , University of Illinois at Urbana-Champaign*
studied with Douglas at University of Illinois at Urbana-Champaign

Partial List of Publications and Presentations

Kanber, H., et al. "Correlation Between Chemical and Electrical Profiles in Si^+ and Se^+ Implanted Bulk and Epitaxial GaAs," **The Conference Record of the 1981 Electronic Materials Conference,** Santa Barbara, California.

Kwok, S. P., et al. "Backgating Effect in Ion Implanted GaAs VPE Buffer Layers," **The Conference Record of the 1983 Electronic Materials Conference,** Burlington, Vermont.

DeJule, R. Y., et al. "Constant Capacitance DLTS Circuit for Measuring .High Purity Semiconductors," **Solid State Electronics,** (1985), p. 28 and p. 639.

Ruby, D. S., K. Arai, and G. E. Stillman. "Deep Level Electron Traps in VPE GaAs Grown with Oxygen Injection," **Journal of Applied Physics.** (July 15, 1985).

Ruby, D. S., et al. "DLTS Study of Electron Traps in VPE GaAs Grown with Intentionally Added Oxygen," **The Conference Record of the 1985 Electronic Materials Conference,** Boulder, Colorado.

Ruby, D. S. "A Technique for Soldering GaAs Concentrator Solar Cells," **The Conference Record of the 19th IEEE Photovoltaics Specialists Conference,** New Orleans. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1987), pp. 1502-1503.

Ruby, D. S. "Safety Considerations for High-Efficiency Crystalline-Silicon Solar Cell Fabrication," **The Conference Record of the 20th IEEE Photovoltaics Specialists Conference,** Las Vegas. (Piscataway; The Institute of Electrical and Electronics Engineers, Inc., 1988), pp. 523-528.

Ruby, D. S. "GaAs/Ge Tandem-Cell Space Concentrator Development," **IEEE Trans. Electron Devices.** (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1990), Vol. 37, pp. 455-463.

Ruby, D. S., and J. D. McBrayer. "The Effects of Different Diffusion Sources on Silicon Solar Cell Recombination Properties," **The Conference Record of the 21st IEEE Photovoltaics Specialists Conference,** Kissimmee. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1990), pp. 311-316.

Ruby, D. S., et al. "A Comparison of Diffusion Sources for Silicon Solar Cells on the Basis of Performance and Cost," edited by D. S. **Ruby. The Conference Record of the 1990 DOE/Sandia Crystalline Photovoltaic Technology Project Review Meeting.** (Albuquerque: Sandia National Laboratories, 1990), SAND90-1821, pp. 145-150.

Ruby, D. S., and W. Kent Schubert. "The Effects of Concentrated Ultraviolet Light on High-Efficiency Silicon Solar Cells," **The Conference Record of the 22nd IEEE Photovoltaics Specialists Conference,** Las Vegas. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1991), pp. 111-117.

Gee, J. M., et al. "Process Development for High-Efficiency Silicon Solar Cells," **The Conference Record of the Sixth International PVSEC**, New Delhi, (1992) pp. 25-32.

Ruby, Douglas S., and Jules D. Levine. "Low-Temperature Emitter-Passivation for Silicon Solar Cells," **The Conference Record of the llth E. C. Photovoltaic Solar Energy Conference,** Montreux, Switzerland. (Harwood Academic Publishers, 1992), pp. 385-388.

Ruby, D. S., et al. "Simplified Processing for 23%-Efficient Silicon Concentrator Solar Cells," **The Conference Record of the 23rd IEEE PVSC,** Louisville. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1993), pp. 172-177.

Basore, P. A., et al. "Simplified High-Efficiency Silicon Cell Processing," **The Conference Record of the 7th International PV Science and Engineering Conference,** Nagoya, Japan. (November 1993), pp. 61-64.

Basore, P. A., et al. "Simplified High-Efficiency Silicon Cell Processing," **Solar Energy Materials and Solar** Cells, Vol. 34, (1994), pp. 91-100.

Ruby, D. S. "Manufacturing of Silicon Concentrator Solar Cells," **The Conference Record of the First E. U. International Workshop on Crystalline Silicon Solar Cell**s, Avila, Spain, (April 19-21, 1994).

Rohatgi, A., Z. Chen, P. Doshi, T. Pham, D. **Ruby,** "High Efficiency Silicon Solar Cells by Rapid Thermal Processing," **Applied Physics Letters 65,** (October 17, 1994), pp. 2087-2089.

Fleddermann, C. B., and K. N. Wroblewski, and D. S. **Ruby,** "Measurement of Deposition Uniformity in PECVD of Silicon Nitride and Silicon Oxide," **The Conference Record of the 47th Annual Gaseous Electronics Conference,** Gaithersburg, Maryland, Oct. 1994.

Ruby, D. S., W. L. Wilbanks, and C. B. Fleddermann. "A Statistical Analysis of the Effect of PECVD Deposition Parameters on Surface and Bulk Recombination in Silicon Solar Cells," **The Conference Record of the First WCPEC,** Waikoloa, Hawaii. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1994), pp. 1335-1338.

Doshi, P., et al. "Rapid Thermal Processing of High-Efficiency Silicon Solar Cells with Controlled In-situ Annealing," **The Conference Record of the First WCPEC,** Waikoloa, Hawaii. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1994), pp. 1299-1302.

Chen, Z., A. Rohatgi, and D. **Ruby.** "Silicon Surface and Bulk Defect Passivation by Low Temperature PECVD Oxides and Nitrides," **The Conference Record of the First WCPEC,** Waikoloa, Hawaii. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1994), pp. 1331-1334.

Witt, C. E., et al. "Recent Progress in the Photovoltaic Manufacturing Technology Project," **The Conference Record of the First WCPEC,** Waikoloa, Hawaii. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1994), pp. 2262-2270.

Schubert, W. K., et al. "A Simple Single-Photomask Process for Fabrication of High-Efficiency Multicrystalline Silicon Solar Cells," **The Conference Record of the First WCPEC,** Waikoloa, Hawaii. (Piscataway: The Institute of Electrical and Electronics Engineers, Inc., 1994), pp. 1327-1330.

Ruby, D. S., W. L. Wilbanks, C. B. Fleddermann, and J. I. Hanoka, "The Effect of Hydrogen-Plasma and PECVD-Nitride Deposition on Bulk and Surface Passivation in String-Ribbon Silicon Solar Cells," **Proc. 13th European PV Solar Energy Conference,** Nice, France, October 1995, pp. 1412-1414.

Rohatgi, A., P. Doshi, M. Ropp, L. Cai, A. Doolittle, S. Narasimha, T. Krygowski, K. Tate, D. Yang, J. Rand, D. S. **Ruby,** and D. Meier, "Improved Understanding and Optimization of RTP and PECVD Processes for High-Efficiency Silicon Solar Cells," **Proc. 13th European PV Solar Energy Conference,** Nice, France, October 1995, pp. 413-416.

Ruby, D. S., W. L Wilbanks, C. B. Fleddermann, M. D. Rosenblum, S. Roncin, and S. Narayanan, "Optimization of Plasma Deposition and Etching Processes for Commercial Multicrystalline Silicon Solar Cells," **The Conference Record of the 25th IEEE PVSC,** Washington D.C., May 1996, pp. 637-640.

Mitchell, R. L., C. E. Witt, H. P. Thomas, L. 0. Herwig, D. S. **Ruby,** and C. C. Aldrich, "Benefits from the U.S. Photovoltaic Manufacturing Technology Project," **The Conference Record of the 25th IEEE PVSC,** Washing ton D.C., May 1996, pp. 1215-1218.

Narasimha, S., S. Kamra, A. Rohatgi, C. P. Khattak, and D. **Ruby,** "The Optimization and Fabrication of High Efficiency HEM Multicrystalline Silicon Solar Cells," **The Conference Record of the 25th** IEEE **PVSC,** Washing ton D.C., May 1996, pp. 449-452.

Ruby, D. S., C. B. Fleddermann, M. Roy and S. Narayanan, "Self-Aligned Selective Emitter Plasma-Etchback and Passivation Process for Screen-Printed Silicon Solar Cells," **Sixth Workshop on the Role of Impurities and Defects in Silicon Device Processing**, Snowmass, CO, August 1996, pp. 268-272.

Ruby, D. S., C. B. Fleddermann, M. Roy and S. Narayanan, "Self-Aligned Selective-Emitter Plasma-Etchback and Passivation Process for Screen-Printed Silicon Solar Cells," **Technical Digest of the 9th International Photovoltaic Science and Engineering Conference,** Miyazaki, Japan, November 1996, pp. 111-112.

Ruby, D. S., C. B. Fleddermann, M. Roy and S. Narayanan, "Plasma Processing Applied to Crystalline-Silicon Solar Cells," NREL/SNL **Photovoltaics Program Review Meeting,** Lakewood, CO, November 1996, pp. 745-750.

Doshi, P., A. Rohatgi, M. Ropp, Z. Chen, D. **Ruby,** and D.L. Meier, "Rapid thermal processing of high-efficiency silicon solar cells with controlled in-situ annealing," **Solar Energy Materials and Solar Cells,** 41/42, July 1996, pp. 31-39.

Ruby, D. S., P. Yang, M. Roy and S. Narayanan, "Recent Progress on the Self-Aligned, Selective-Emitter Silicon Solar Cell," **The Conference Record of the 26th IEEE PVSC,** Anaheim CA, September-October 1997, pp. 39-42.

Krygowski, T., A. Rohatgi, D. **Ruby,** "Simultaneous P and B Diffusion, in-situ Surface Passivation, Impurity Filtering and Gettering for High-Efficiency Silicon solar Cells," **The Conference Record of the 26th IEEE PVSC,** Anaheim CA, September-October 1997,pp.19-24.

Mitchell, R. L., C. E. Witt, H. P. Thomas, R. King, D S. **Ruby** and C. C. Aldrich, "Progress Update on the PVMaT Project," **The Conference Record of the 26th IEEE PVSC,** Anaheim CA, September-October 1997, pp. 1073-1076.

Ruby, D. S., C. B. Fleddermann, M. Roy and S. Narayanan, "Self-Aligned Selective-Emitter Plasma-Etchback and Passivation Process for Screen-Printed Silicon Solar Cells," *Solar Energy Materials and Solar Cells,* **48** 1997, pp. 255-260.

Ruby, D. S., et al., "Manufacturing Improvements in the Photovoltaic Manufacturing Technology (PVMaT) Project," **Conf. Rec. of 2nd World Conference on PV Energy Conv.,** Vienna Austria, July 1998, pp. 1969-1973.

Rohatgi, A., Narasimha, S., and **Ruby,** D. S., "Effective Passivation of the Low Resistivity Silicon Surface by a Rapid Thermal Oxide/PECVD Silicon Nitride Stack and its Application to Passivated Rear and Bifacial Si Solar Cells," **Conf. Rec. of** 2nd **World Conference on PV Energy Conv.,** Vienna Austria, July 1998, pp. 1566-1569.

Moschner, J., Doshi, P., **Ruby,** D. S., et al., "Comparison of Front and Back surface Passivation Schemes for Silicon Solar Cells," **Conf. Rec.** of 2nd **World Conference on PV Energy Conv.,** Vienna Austria, July 1998, pp. 1894-1897.

Ruby, D. S., P. Yang, S. Zaidi, S. Brueck, M. Roy and S. Narayanan, "Improved Performance of Self-Aligned, Selective-Emitter Silicon Solar Cells," **Conf. Rec. of 2nd World Conference on PV Energy Conv.,** Vienna Austria, July 1998, pp. 1460-1463.

Ruby, D. S., P. Yang, S. Zaidi, S. Brueck, M. Roy and S. Narayanan, "Improved Performance of Self-Aligned, Selective-Emitter Silicon Solar Cells," 8th **Workshop on Crystalline Silicon,** Copper Mountain, CO., August 1998, pp. 225-228.

Ruby, D. S., P. Yang, S. Zaidi, S. Brueck, M. Roy and S. Narayanan, "Plasma Etching, Texturing, and Passivation of Silicon Solar Cells," **Proc. Of NCPV Project Review Meeting,** Denver, **CO.,** September 1998, pp. 430-436.

Gee, James M., Saleem H. Zaidi, and Douglas S. **Ruby,** "Advanced Silicon Space Solar Cells using Nanotechnology," **Micro- and Nano-Satellite Technology Conference 99.**

Ruby, Douglas S., Pin Yang, Saleem Zaidi, Madhu Roy, S. Narayanan, "Plasma Texturing, Etching and Passivation of Multicrystalline Silicon Solar Cells," **Renewable and Advanced Energy Systems for the 21st Century,** Maui, HI, April 1999. Winner of 1999 Best Paper Award.

Saleem H. Zaidi, James M. Gee, Douglas S. **Ruby** and S. Brueck, "Characterization of Si Nanostructured Surfaces," 44th **SPIE Annual Meeting,** July 1999.

Ruby, D.S., Zaidi, G.H., Roy, M., et al., "Plasma texturing of silicon solar cells," **9th Workshop on Crystalline-Silicon Solar Cell Materials and Processes,** Breckenridge, August 1999, pp. 179-182.

R. J. Buss, D. S. Ruby, G. A. Hebner and P. Yang, "Modeling a Dry Etch Process for Large-Area Devices," **9th Workshop on Crystalline-Silicon Solar Cell Materials and Processes,** Breckenridge, August 1999, pp. 175-178.

Keith Matthei, Ghazi Darkazalli, and Douglas S. Ruby, "Design of a High-Throughput Plasma-Processing System," **9th Workshop on Crystalline-Silicon Solar Cell Materials and Processes,** Breckenridge, August 1999, pp. 183-188.

C. Edwin Witt, Richard L. Mitchell, Martha Symko-Davies, Holly P. Thomas, Richard King, and Douglas S. Ruby, Current Status and Future Prospects for the PVMaT Project, 11th **PVSEC,** Soporo, Japan, September 1999.

D. S. Ruby, T. F. Ciszek and B. L. Sopori, "Research Needs of c-Si Technology Required to Meet Roadmap Milestones," NCPV Project Review Meeting, Denver, April 2000.

D. S. Ruby, S. H. Zaidi, S. Narayanan, "PLASMA-TEXTURIZATION FOR MULTICRYSTALLINE SILICON SOLAR CELLS," **28th IEEE Photovoltaic Specialists Conference,** Anchorage, September 2000, pp. 75-78.

B.M. Damiani, R. Ludemann, D.S. Ruby, S.H. Zaidi, A. Rohatgi, "DEVELOPMENT OF RIE-TEXTURED SILICON SOLAR CELLS," **28th IEEE Photovoltaic Specialists Conference,** Anchorage, September 2000, pp. 371-374.

Saleem H. Zaidi, James M. Gee, and Douglas S. Ruby, "DIFFRACTION GRATING STRUCTURES IN SOLAR CELLS," **28th IEEE Photovoltaic Specialists Conference,** Anchorage, September 2000, pp. 395-398.

C. Edwin Witt, Richard L. Mitchell, and Martha Symko-Davies; Richard King, Douglas S. Ruby, "TEN YEARS OF MANUFACTURING R&D IN PVMaT - TECHNICAL ACCOMPLISHMENTS, RETURN ON INVESTMENT, AND WHERE DO WE GO NEXT," **28th IEEE Photovoltaic Specialists Conference,** Anchorage, September 2000.pp.1502-1504.

Martha Symko Davies et al., "Decade of PV Industry R&D Advances in Silicon Module Manufacturing," **28th IEEE Photovoltaic Specialists Conference,** Anchorage, September 2000, pp. 1460-1463.

S.H Zaidi, D.S. Ruby, and J.M. Gee, "Characterization of Random Reactive Ion Etched-Textured Silicon Solar Cells," **IEEE Trans. Electron Devices,** Vol. 48, No. 6, June 2001, pp. 1200-1206.

D. S. Ruby, S. H. Zaidi, B. M. Damiani, A. Rohatgi, "RIE-Texturing of Multicrystalline Silicon Solar Cells," **PVSEC-12,** Cheju, Korea, June 2001, pp. 273-274.

A. Ebong, D.S. Ruby, et al., "Belt Furnace Gettering and Passivation of n-Web Silicon for High-Efficiency Screen-Printed Front-Surface-Field Solar Cells," **Progress in Photovoltaics,** Vol 9, No. 5, Sept-Oct. 2001, pp. 327-332.

Ruby, Douglas S., et al., "RIE-Texturing of Industrial Multicrystalline Silicon Solar Cells," SAND 2002-1550C, **29th** IEEE **Photovoltaic Specialists Conference,** New Orleans, May 2002, pp. 146-149.

Ruby, Douglas S., et al., "PVMaT Advances in the Photovoltaic Industry and the Focus of Future PV Manufacturing R&D," **29th** IEEE **Photovoltaic Specialists Conference,** New Orleans, May 2002, 1444-1447.

Ruby, Douglas S.; Gee, James; et al., "Enhanced Near IR Absorption in Random, RIE-Textured Silicon Solar Cells: The Role of Surface Profiles," **29th IEEE Photovoltaic Specialists Conference,** New Orleans, May 2002, pp. 142-145.

D. S. Ruby, S. H. Zaidi, S. Narayanan, B. M. Damiani, A. Rohatgi, "RIE-Texturing of Multicrystalline Silicon Solar Cells," **Solar Energy Materials and Solar Cells,** 74 (2002), pp. 133-137.

A. Ebong, Y.H. Cho, M. Hilali, A. Rohatgi, D. Ruby, "Rapid thermal technologies for high-efficiency silicon solar cells," **Solar Energy Materials and Solar Cells,** 74 (2002), pp. 51-55.

RIE-TEXTURING OF INDUSTRIAL MULTICRYSTALLINE SILICON SOLAR CELLS, Douglas S. **Ruby**, Saleem Zaidi, S. Narayanan, Satoshi Yamanaka, Ruben Balanga, ASME Int'l Solar Energy Conference, Kona, HI, March 2003.

D.H. MacDonald, D.S. **Ruby**, et al., "Texturing Industrial Multicrystalline Silicon Solar Cells," **Solar Energy,** Vol 76, (2004), pp. 277-283.

RIE-TEXTURING OF INDUSTRIAL MULTICRYSTALLINE SILICON SOLAR CELLS, Douglas S. Ruby, Saleem Zaidi, S. Narayanan, Satoshi Yamanaka, Ruben Balanga, Trans. of ASME, **Journal of Solar Energy Engineering,** Feb. 2005, pp. 146-149.

Analysis and Proposal for High-Efficiency Electrolysis for Cost-Effective Hydrogen Production, D. Ruby, Sandia National Laboratories and S. Cohen, Teledyne Energy Systems, Inc., DOE Solar Energy Technology Program Project Review Meeting, Denver, 2004.

Final LDRD Report: Ultraviolet Water Purification Systems for Rural Environments and Mobile Applications, SAND2005-7245, Unlimited Release, Printed November 2005, Mary H. Crawford, Michael A. Banas, Semiconductor Material and Device Sciences Department, Michael P. Ross, Douglas S. Ruby, Jeffrey S. Nelson, Solar Technologies Department, et al.

SANDIA REPORT, SAND2006-101297, Printed October 2006
Integrating Nano-Enabled Wireless Systems, Sean J. Hearne, Steven C. Seel, Kent B. Pfeifer, Kenneth Peterson, Blake Jakaboski, Doug Ruby, Frederick T. Mendenhall, David Adams, Larry Weinstein, Glenn G. Amatucci.

"ZnO Nanostructures as Efficient Antireflection Layers in Solar Cells", Yun-Ju Lee, Douglas S. Ruby, David W. Peters, Bonnie B. McKenzie, and Julia W. P. Hsu, NANO LETTERS, 2008, Vol. 8, No. 5, pp. 1501-1505