Focus on monitoring and controlling the generation of energy and its impact on the environment.

- optical methods and tools used in manufacturing, measuring, and monitoring of energy generation equipment such as solar cells, LED lighting, concentrators, wind turbines, etc.;
- optical monitoring equipment to examine pollution generation and remediation; and
- optical sensing for energy management such as optical fiber strain gauges, optical thermal detection sensors, optical motion sensors etc.

Optical technologies and heat loss management in the home and industrial settings.

This event is part of the Renewable Energy and the Environment Congress, allowing attendees to access to all meetings within the Congress for the price of one and to collaborate on topics of mutual interest.

Dynamic Program

- **8 Plenary Speakers**
  - New - Pathways to Ultra-Efficient Solid-State Lighting
    Mary H. Crawford, Sandia National Laboratories, USA
  - Applying Systems Analysis to Innovation: Solar Energy
    Kevin DeGroat, Program Director, Antares Group, Inc., USA
    Joe Morabito, Director, Alcatel-Lucent, USA
  - Theory and Practice for Nanophotonic Light Trapping
    Shanhui Fan, Stanford University, USA
  - Sustainable Energy & Optical Methods for Monitoring Air Pollution
    Matthew Fraser, Global Institute of Sustainability, Arizona State Univ., USA
  - Opportunities for Optical Designs in Driving Concentrating Photovoltaic Technology
    Sarah Kurtz, Interim NCPV Director, Reliability Group Manager, NREL, USA
  - Army S&T Development: Selected Energy Solutions
    Ed Shaffer, Chief, Energy & Power Division, Army Research Laboratory, USA
Promises and Challenges in Light-Emitting Diodes for High-Power Lighting Applications

E. Fred Schubert and Jaehee Cho, Rensselaer Polytechnic Institute, USA

- 12 Expert invited speakers from academia, industry and government
- 15 Oral presentations on cutting edge research in the field
- Poster presentations
- Postdeadline paper sessions

Chairs

John Koshel, Photon Engineering and Univ. of Arizona, USA
Joseph A. Shaw, Montana State Univ., USA

Sponsor:

OSA®
Renewable Energy and the Environment

November 2-3, 2011, Omni Austin Hotel Downtown, Austin, TX, USA

Four Collocated Meetings Cover Optics and Photonics in Energy Generation and Conservation

NEW! Optical Instrumentation for Energy & Environmental Applications (E2)

Optical Nanostructures and Advanced Materials for Photovoltaics (PV)

Optics for Solar Energy (SOLAR)

Solid State and Organic Lighting (SOLED)

*Register for one meeting and attend any session in the Congress.

Wide Spectrum of Topics Present Optical Solutions for Renewable Energy

- Utilization of optical technologies to develop energy generation equipment
- Optical design and analysis of optics for solar and LED applications
- Instrumentation and optical sensors for energy management
- Methods to measure the impact on the environment
- Optical nanostructures and materials to improve efficiency of solar cells and solar concentrator systems
- Advances in solid state lighting in materials, devices and light management

Latest Advances in Solar and Solid-State Lighting

- **8 Plenary Speakers**
  - **New** - Pathways to Ultra-Efficient Solid-State Lighting
    Mary H. Crawford, Sandia National Laboratories, USA
  - Applying Systems Analysis to Innovation: Solar Energy
    Kevin DeGroat, Program Director, Antares Group, Inc., USA
  - Joe Morabito, Director, Alcatel-Lucent, USA
Theory and Practice for Nanophotonic Light Trapping
Shanhui Fan, Stanford University, USA

Sustainable Energy & Optical Methods for Monitoring Air Pollution
Matthew Fraser, Global Institute of Sustainability, Arizona State Univ., USA

Opportunities for Optical Designs in Driving Concentrating Photovoltaic Technology
Sarah Kurtz, Interim NCPV Director, Reliability Group Manager, NREL, USA

Army S&T Development: Selected Energy Solutions
Ed Shaffer, Chief, Energy & Power Division, Army Research Laboratory, USA

Promises and Challenges in Light-Emitting Diodes for High-Power Lighting Applications
E. Fred Schubert and Jaehee Cho, Rensselaer Polytechnic Institute, USA

- 48 expert invited speakers from academia, industry and government
- 49 oral presentations on cutting edge research in the field
- 24 poster presentations
- Postdeadline paper sessions

Sponsor:

OSA
Optical Instrumentation for Energy and Environmental Applications (E2)

2 November - 3 November 2011, Omni Austin Hotel Downtown, Austin, Texas, United States

Program Overview

Optical technologies are increasingly being used in energy monitoring, control, and production as well as to measure the impact that energy development is having on the environment. In many cases, these optical technologies offer unique capabilities such as the ability to remotely sense water and atmospheric pollution, to measure temperature in hostile environments, and sense minute amounts of trace gases. This meeting will focus on monitoring and controlling the generation of energy and its impact on the environment.

- optical methods and tools used in manufacturing, measuring, and monitoring of energy generation equipment such as solar cells, LED lighting, concentrators, wind turbines, etc.;
  - combustion monitoring
  - pollution detection and monitoring techniques
  - LIDAR monitors of wind turbines
  - fiber optical strain gauges, temperature sensors and leak detectors
  - motion sensors
  - photometric and radiometric sensors
- optical monitoring equipment to examine pollution generation and remediation;
  - trace gas detection
  - environmental remote sensing including multi and hyper-spectral remote sensing
  - LIDAR (DIAL) technologies
  - Aerosol profilers
  - Wired and wireless environmental sensor networks
  - Optical approaches to monitoring greenhouse gas emission and CO2 sequestration
- Optical technologies and heat loss management in the home and industrial settings.
  - Thermal detection sensors
  - Techniques for solar in door lighting
  - Modeling and algorithms for heat management

Online Conference Program
Searchable Conference Program Available Online!

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- Browse sessions by type or day.
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- Plan and print your personal itinerary before coming to the conference.

You may search the program without creating an account; however, you will not be able to create or save a personal itinerary without first creating an account. We strongly recommend that you create a user account first.

Abstracts, Agenda of Sessions and Key to Authors

- [Agenda of Sessions](#)(pdf)
- [Abstracts](#)(pdf)
- [Key to Authors and Presiders](#)(pdf)

Special Events

Welcome Reception
[Plenary Sessions](#)
Poster Session
Post Deadline Sessions
CONFERENCE PROGRAM

Renewable Energy and the Environment

Optical Instrumentation for Energy & Environmental Applications (E2)
Optical Nanostructures and Advanced Materials for Photovoltaics (PV)
Optics for Solar Energy (SOLAR)
Solid State and Organic Lighting (SOLED)

2–3 November 2011
Omni Austin Hotel Downtown
Austin, Texas, USA
Welcome to the Optical Society of America's 2011 Renewable Energy and the Environment Optics and Photonics Congress (OPC) in Austin, Texas. This is the second year of this OPC, with the first being in Karlsruhe, Germany in 2010, but this year two meetings have joined the OPC. The four meetings being held at this Congress are:

- Solid State and Organic Lighting (SOLED; at Karlsruhe in 2010),
- Optics for Solar Energy (SOLAR; in Tucson in 2010),
- Optical Nanostructures and Advanced Materials for Photovoltaics (PV; at Karlsruhe in 2010), and
- Optical Instrumentation for Energy and Environmental Applications (E2; new meeting).

Though the primary focus of this meeting is renewable energy, especially solar, the topics are broadened to include solid-state and organic light sources and the connection between energy and the environment. In the solar arena the PV meeting presents how materials and nanostructures are being used to increase the efficiency of solar energy systems, while the SOLAR meeting addresses the optical design aspects of concentrators and similar optics for the generation of energy. SOLED tackles the source side of the efficient use of energy, including the materials, the optical design, and metrology of solid state and organic LEDs. Finally, E2 takes a look at how energy and environmental issues are intertwined, especially measurement methods, energy management, and the development of instrumentation.

The challenges for all energy optics fields are similar in a number of cases, so there are two joint plenary sessions with a total of seven speakers:

- **Applying Systems Analysis to Innovation: Solar Energy** – Kevin DeGroat, Program Director, Antares Group, Inc., USA and Joe Morabito, Director, Alcatel-Lucent, USA;
- **Theory and Practice for Nanophotonic Light Trapping** – Shanhui Fan, Stanford University, USA;
- **Sustainable Energy and Optical Methods for Monitoring Air Pollution** – Matthew Fraser, Global Institute of Sustainability, Arizona State Univ., USA;
- **Opportunities for Optical Designs in Driving Concentrating Photovoltaic Technology** – Sarah Kurtz, Interim NCPV Director, Reliability Group Manager, NREL, USA;
- **Energy & Power Science and Technology: An Army Perspective** – Ed Shaffer, Chief, Energy and Power Division, Army Research Laboratory, USA; and
- **Promises and Challenges in Light-Emitting Diodes for High-Power Lighting Applications** – E. Fred Schubert and Jaehee Cho, Rensselaer Polytechnic Institute, USA .

As can be seen, these speakers range from industry to academia to government, which gives an excellent overview of the burgeoning energy in optics field. These plenary sessions bring together all attendees of the OPC to present the current challenges for given topic areas, while also encouraging cross-development in other fields. In addition there are 48 invited speakers and 49 contributed papers. In the joint poster session there will be 24 presentations. Finally, postdeadline paper sessions are planned, for which the details will be provided in your registration packets.
We are already planning the 2012 through 2014 Renewable Energy and the Environment OPCs. In 2012 we will be meeting in Eindhoven, The Netherlands. If you are interested in assisting or have ideas for this OPC, please contact the meeting chairs, program committees, OSA staff or me.

Personally, I thank the chairs of the four collocated meetings (see below for a listing), their program committees, and the OSA staff. It could not have been done without your tireless efforts. A final thank you to you, the attendees – this conference is for you – I know that you will enjoy your stay to Austin, Texas.

Regards,

R. John Koshel
OSA Board of Meetings, Chair Elect
jkoshel@optics.arizona.edu

E2
John Koshel, Photon Engineering and Univ. of Arizona, USA, General Chair
Joseph A. Shaw, Montana State Univ., USA, General Chair

PV
Thomas Krauss, Univ. of St. Andrews, UK, General Chair
Ralf Wehrspohn, Fraunhofer Inst. for Mechanics of Materials and Martin-Luther-Univ. Halle- Wittenberg, Germany, Program Chair

SOLAR
Joseph Ford, Univ. of California at San Diego, USA, General Chair
Alan Kost, Univ. of Arizona, USA, General Chair
Raymond Kostuk, Univ. of Arizona, USA, General Chair

SOLED
Bernard Kippelen, Georgia Tech, USA, General Chair
Jiangeng Xue, Univ. of Florida, USA, General Chair
Ulrich Lemmer, Univ. Karlsruhe, Germany, Program Chair
Joachim Wagner, Fraunhofer Inst. for Applied Solid State Physics IAF, Germany, Program Chair
Dongxue (Michael) Wang, OSRAM, USA, Program Chair
Renewable Energy and the Environment Program Committee

Optical Instrumentation for Energy and Environmental Applications (E2)

General Chairs
John Koshel, Photon Engineering and Univ. of Arizona, USA
Joseph A. Shaw, Montana State Univ., USA

Committee Members
Ian Ashdown, ByHearts Consulting, Canada
Zuguang Guan, ALOMAR Observatory, Andoya Rocket Range AS, Norway
Mark Phillips, Pacific Northwest Natl. Lab, USA
R. Sai Santosh, Center for Nano Science and Technology, Italy
Greg Smestad, Sol Ideas, USA
Jeffrey R. Taylor, National Ecological Observatory Network (NEON), USA
Blair Unger, BLU Optics, USA
Michael Wojcik, Energy Dynamics Lab, USA
Gerard Wysocki, Princeton Univ., USA

Optical Nanostuctures and Advanced Materials for Photovoltaics (PV)

General Chair
Thomas Krauss, Univ. of St. Andrews, UK

Program Chair
Ralf Wehrspohn, Fraunhofer Inst. for Mechanics of Materials and Martin-Luther-Univ. Halle- Wittenberg, Germany

Committee Members
Lucio Claudio Andreani, Univ. degli Studi di Pavia, Italy
Kylie Catchpole, Australian Natl. Univ., Australia
Ihab El-Kady, Sandia Natl. Labs, USA
Falk Lederer, Friedrich-Schiller-Univ. Jena, Germany
Joachim Loos, Univ. of Glasgow, UK
Albert Polman, FOM Inst. AMOLF, Netherlands
Johannes Upping, Martin Luther Univ., Germany (Chair Helper)

Optics for Solar Energy (SOLAR)

General Chairs
Joseph Ford, Univ. of California at San Diego, USA
Alan Kost, Univ. of Arizona, USA
Raymond Kostuk, Univ. of Arizona, USA

Committee Members
Allen Barnett, Univ. of Delaware, USA
Kylie Catchpole, The Australian Natl. Univ., Australia
Martha Symko Davies, Natl. Renewable Energy Lab, USA
César Domínguez, Univ. Politécnica de Madrid, Spain
Jesse Frantz, US Naval Res. Lab, USA
Mark George, General Plasma Inc., USA
Swee Hoe Lim, Arizona State Univ., USA
Nasser Karam, USA
Jun Ke, Univ. of Hong Kong, Hong Kong
John Koshel, Photon Engineering and Univ. of Arizona, USA
Fred Leonberger, MIT, USA
Patrick Meada, Palo Alto Res. Ctr., USA
Anastasios Melis, Univ. of California at Berkeley, USA
Ugur Ortabasi, United Innovations, USA
Ioannis Papakonstantinou, CERN-European Organization for Nuclear Res., Switzerland
Peter Peumans, Stanford Univ., USA
Greg P. Smestad, Solar Energy Materials and Solar Cells, USA
Georgios Veronis, Louisiana State Univ., USA
Roland Winston, Univ. of California at Merced, USA
Yong Hang Zhang, Arizona State Univ., USA

Solid State and Organic Lighting (SOLED)

General Chairs
Bernard Kippelen, Georgia Tech, USA
Jiangeng Xue, Univ. of Florida, USA

Program Chairs
Ulrich Lemmer, Univ. Karlsruhe, Germany
Joachim Wagner, Fraunhofer Inst. for Applied Solid State Physics IAF, Germany
Dongxue (Michael) Wang, OSRAM, USA

Committee Members - OLED
Chihaya Adachi, Kyushu Univ., Japan
Klaus Bonrad, Merck KGaA, Germany
Brian d’Andrade, Exponent, USA
Anil Duggal, GE, USA
Russell Holmes, Univ. of Minnesota, USA
Ioannis (John) Kymissis, Columbia Univ., USA
John de Mello, Imperial College London, UK
Hideyuki Murata, Japan Advanced Inst. of Science and Technology (JAIST), Japan
Franky So, Univ. of Florida, USA

Committee Members - OLED
Hirosi Amano, Nagoya Univ., Japan
Norbert Linder, OSRAM/Siemens, China
Yongio Park, Samsung LED, South Korea
U. T. Schwarz, Univ. Regensburg / Fraunhofer IAF, Germany
Seth Coe Sullivan, QD Vision, USA
C.C. Yang, National Taiwan Univ., Taiwan

Committee Members - Lighting Systems
Mike Lu, Acuity Brands Lighting, USA
Special Events

Opening Plenary Session
Wednesday, 2 November 2011, 08:00-10:00
Capital Ballroom A

Army S&T Development: Selected Energy Solutions

Future forces need alternatives and efficient conversion for resilient operations. Alternative energy, energy storage, and conversion technologies provide higher efficiency, higher density solutions adaptable to military requirements.

Ed Shaffer, Chief, Energy & Power Division, Army Research Laboratory, USA

Dr. Edward Shaffer is currently Director for the Sensors & Electronic Devices Directorate, Army Research Lab, overseeing development efforts in power and energy, electronics, and sensor technologies. Dr. Shaffer received the B.S. degree from the US Military Academy; the M.S. and E.E. degrees from the Massachusetts Institute of Technology; and the Ph.D. in Electrical Engineering from Auburn University. He served in a variety of technical and leadership positions as a US Army officer, including tours in Germany, Korea and the United Kingdom, and as an Associate Professor in the Department of Electrical Engineering & Computer Science at the US Military Academy.

Dr. Shaffer was also a Senior Design Engineer with Solectria Corporation in Woburn, MA. As Chief of the Energy & Power Division at ARL, he supervised efforts in high energy batteries, fuel cells, and continuous and pulsed wideband gap power electronic materials and devices. He is currently Lead of the US Army RDECOM Power and Energy Technology Focus Team, serves as senior Army representative on the OSD Energy and Power Community of Interest, and is Chair of the Interagency Power Group Steering Committee. His awards include the Legion of Merit; he is a Senior Member of IEEE and is a licensed Professional Engineer.

Pathways to Ultra-Efficient Solid-State Lighting

In this presentation, we review materials and device roadblocks to achieving ultra-efficient lighting based on inorganic LEDs. We present emerging research approaches for overcoming these roadblocks and enabling new functionality in lighting.

Mary H. Crawford, Sandia National Laboratories, USA

Mary Crawford is a Senior Scientist in the Semiconductor Material and Device Sciences Department at Sandia National Laboratories in Albuquerque, NM. She received a Ph.D. degree in physics from Brown University with a focus on excitonic effects and gain in ZnSe-based quantum wells and laser diodes. She joined Sandia National Laboratories in 1993 and worked on the development of novel vertical-cavity surface-emitting lasers (VCSELs), including AlInGaP red VCSELs and intracavity frequency-doubled VCSELs, and wide-bandgap nitride materials for UV LEDs.

In 2000, Dr. Crawford embarked on a two-year entrepreneurial leave and worked as Senior Scientist and Director of Research and Development at Uniroyal Optoelectronics in Tampa, FL. There she was involved in epitaxial growth and characterization of InGaN-based near-UV, blue, and green LEDs and led R&D to support new LED products. She returned to Sandia in 2002 and has continued research and development of nitride-based materials and optoelectronic devices. Her most recent studies involve AlGaN deep UV (< 340 nm) LEDs and laser diodes for applications including bioagent sensing and water purification, and spectroscopic studies of radiative and nonradiative processes in blue/green InGaN materials for solid-state lighting. She is presently on the senior leadership council of Sandia’s Energy Frontier Research Center on Solid-State Lighting Science and has co-authored more than 100 publications.
Applying Systems Analysis to Innovation: Solar Energy

A Systems Analysis for photovoltaics identifies positive reinforcements for solar development (global solar value creation). There are three high leverage points: photovoltaics and smart grids, photovoltaic industry supply chains, and pressure for sustainable development.

Joe Morabito, Director, Alcatel-Lucent, USA

Joe Morabito received his training in Materials/Engineering Science at Notre Dame with honors (B.S. 1963) and his Ph.D. from the University of Pennsylvania (1967). He then went, as a postdoctoral fellow, to the University of California at Berkeley (1968) and as a visiting scientist (1969) to the Philips Research Laboratories, Eindhoven, The Netherlands. He joined Bell Laboratories in 1970 and is the author of 81 publications and six patents covering a broad range of technology development for advanced telecommunications systems, business development, environmental sciences, and renewable energy. He received the Bell Labs Fellow Award in June, 2005. He has served on the editorial boards of Thin Solid Films and the Journal of Surface and Interface Science. He has also been active as a consultant to the National Science Foundation, the Electrical Power Research Institute (EPRI) and the Department of Energy in the area of solar energy, a member of the Industrial Advisory Council at Penn State, a member of the Advisory Committee of the EPA National Pollution Prevention Center at the University of Michigan, and the Advisory Committee on Environmental Health and Safety issues at the Oak Ridge National Laboratory and on the internal research programs at the National Renewable Energy Laboratory (NREL), the Board of Directors of the Research and Development Council of New Jersey, the Selection Committee for Industrial Ecology Grants by the AT&T Foundation and on the Advisory Board of the Multi-Lifecycle Engineering Research Center at the New Jersey Institute of Technology (NJIT). He is currently Senior Director of Integrated Robust Design and Compliance Engineering Center for Alcatel-Lucent - Bell Laboratories. He recently served as 2008 Chairman of the DOE Solar Energy Program.

Kevin DeGroat, Program Director, Antares Group, Inc., USA

Kevin DeGroat is Program Director for the Antares Group, Inc., a clean energy engineering firm in business since 1992. Mr. DeGroat has been a consultant on clean energy and environmental policy and research programs since 1985. His primary clients have been in the US Department of Energy Office of Energy Efficiency and Renewable Energy and the Office of Electricity Delivery and Energy Reliability, including the Solar Energy Technology Program, the Federal Energy Management Program, the Geothermal Technology Program, the Building Technologies Program and the Biomass Program. He has also worked with Sandia National Laboratory, the National Renewable Energy Laboratory and the California Energy Commission with a focus on research and development program planning and budgeting, research peer review, renewable energy market analysis, and technology roadmapping. His educational background includes graduate work at the University of Minnesota HHH Institute of Public Affairs focused on public policy with an energy and environmental technology core, and undergradu ate study in Public Administration at Hamline University.
Special Events continued

Tutorial Session
Wednesday, 2 November 2011, 10:30-12:15
Austin South

Introduction to Energy and Environmental Optics
10:30-11:15
Overview of Optical Remote Sensing Systems for Environmental Studies

Joseph A. Shaw, Electrical and Computer Engineering Department, Montana State University, USA.

Dr. Shaw conducts research developing optical remote sensing systems and using them to study climate, weather, and atmospheric optical effects. His current research focuses on polarimetric and radiometric spectral imaging and lidar measurements of the natural Earth environment. He enjoys photographing natural optical phenomena and using his photos to understand and teach about optics and nature. Recognition for his work includes the Presidential Early Career Award for Scientists and Engineers and the Vaisala Award from the World Meteorological Organization. Dr. Shaw is a Fellow of both the Optical Society of America (OSA) and SPIE.

11:15-12:15
Applied Photometry, Radiometry, and Measurements of Optical Losses: Systems, Methods, Techniques for Energy and Environmental Applications

Part 1, Direct Approaches 11:15-11:45
Part 2, Remote Studies 11:45-12:15

Michael A. Bukshtab, Michael A Bukshtab Consulting, USA.

Michael A Bukshtab received M.S. and Ph.D. degrees in Optical Design and Spectroscopy and in Physical Optics from The Technical University of Fine Mechanics & Optics and from Vavilov’ State Optical Institute, and had post-doctoral tenure analyzing high-purity silica glasses & specialty fibers in The Institute of Silicate Chemistry, Academy of Sciences - all in St. Petersburg (Leningrad), Russia. His M.S thesis received Best-Diploma award among nearly 30 Leningrad’s technical universities and was published in “Measurement Techniques” in 1978. Michael’s monograph “The Low Loss Measurement Techniques”, was published in 1988 by Energoatomizdat, Moscow-Leningrad. Another book: M.A. Bukshtab, A. S. Doynikov, and V. N. Koromilichenko, “Photometry and Radiometry for Engineers” (editors M. A. Bukshtab and A. A. Wolkenstein) by Polytechnika, Leningrad (St. Petersburg), 1991, was announced for publication, proofs were printed, but manuscript was left unpublished, as Michael immigrated to the USA. Michael was elected by employees the Board Chairman of Leningrad Institute of Telecommunications, where he served from 1989 until immigrating in 1991. In USA Michael worked on design, development, and fabrication of optical systems and components for such companies as Sandoz, Corning, Pirelli, Kodak, CIENA, Lucent, and GE Advanced Materials. Michael latest experience via Michael A Bukshtab Consulting includes investigation of various optical properties: detection of color-shifting, polarization-dependent, backreflection, backscattering and other low-loss related phenomena, designing all-optical wavelength-switching and cross-connect systems and OADM networks, working on terabit optical routers and fiber backplanes, investigating EUV lithography systems, interferometric and diffraction-based positioning sensors, improving fiber-laser and EDFA-based air-to-ground ranging lidars. Michael has either authored or co-authored more than 30 Patents or Invention Certificates and participated in more than 70 Scientific Publications and Conference Presentations: book Applied Photometry, Radiometry, and Measurements of Optical Losses is being published in Springer Series in Optical Sciences.
Special Events continued

Joint Poster Session with refreshments
Wednesday, 2 November 2011, 18:00-19:00
Capital Ballroom B

Conference Reception —
Texas BBQ at the Six Lounge
Wednesday, 2 November 2011, 19:15-20:30
117 W. 4th St., Austin, TX
http://www.sixlounge.com/2.0/#/about2/

Joint Plenary Session
Thursday, 3 November 2011, 08:00-10:00
Capital Ballroom A

08:00
Theory and Practice for Nanophotonic Light Trapping
Shanhui Fan; Stanford University, USA.

08:30
Sustainable Energy & Optical Methods for Monitoring Air Pollution
Matthew Fraser; Global Institute of Sustainability, Arizona State University, USA.

Shanhui Fan is an Associate Professor of Electrical Engineering at the Stanford University. He received his Ph.D in 1997 in theoretical condensed matter physics from the Massachusetts Institute of Technology (MIT), and was a research scientist at the Research Laboratory of Electronics at MIT prior to his appointment at Stanford. His research interests are in computational and theoretical studies of solid state and photonic structures and devices, especially photonic crystals, plasmonics, and meta-materials. He has published over 220 refereed journal articles that were cited over 13,000 times, has given over 170 invited talks, and was granted 39 US patents. Prof. Fan received a National Science Foundation Career Award (2002), a David and Lucile Packard Fellowship in Science and Engineering (2003), the National Academy of Sciences Award for Initiative in Research (2007), and the Adolph Lomb Medal from the Optical Society of America (2007). Dr. Fan is a Fellow of the American Physical Society, the Optical Society of America, the SPIE, and the IEEE.

Prof. Matt Fraser is the Director of Research Development in the Global Institute of Sustainability (GIOS) at Arizona State University (ASU) as well as an Associate Professor in the School of Sustainability (SOS) at ASU.

In leading the research development team at GIOS, Dr. Fraser is directly involved in initiating and promoting interdisciplinary research projects across ASU and building teams of researchers to respond to the grand challenges of global sustainability. The research portfolio at GIOS is valued at approximately $10M per year and spans renewable energy and energy efficiency, water sustainability and climate, urban ecology and ecosystem services and international development and social sustainability.

As a faculty member, Dr. Fraser directs his own research projects on urban air quality. Dr. Fraser’s research focuses on using organic speciation and receptor modeling to apportion ambient pollutants to their original source. To tackle this complex problem, Dr. Fraser’s research group has been involved in field monitoring programs, source characterization studies, emission inventory preparation, and analytical method and instrument development projects.

Recently, Prof. Fraser has worked to initiate a series of research grants on the sustainability of energy systems, including:

Energize Phoenix – a $25M collaborative effort between the City of Phoenix, Arizona State University and Arizona Public Service to catalyze an energy efficient culture in central Phoenix (funded by US Dept. of Energy)

The Green Apple Study investigating the indoor air quality and health outcomes of energy efficiency retrofits with the specific goal of quantifying how sealing a building envelope impacts indoor air pollution and associated health effects (funded by US Dept. of Housing and Urban Development)

Dr. Fraser received his Bachelors of Science (with University Honors) in Chemical Engineering from Carnegie Mellon University and his Masters and Ph.D. in Environmental Engineering Science from Caltech. Prior to joining the School of Sustainability at ASU, Prof. Fraser was on the faculty of Rice University in the Department of Civil and Environmental Engineering.
**Special Events continued**

**09:00**  
**Opportunities for Optical Designs in Driving Concentrating Photovoltaic Technology**  
Sarah Kurtz; Interim NCPV Director, Reliability Group Manager, NREL, USA.

Sarah Kurtz obtained her PhD in 1985 from Harvard University and has worked since then at the National Renewable Energy Laboratory, in Golden, CO. She is best known for her contributions to developing multijunction, GaInP/GaAs solar cells and for supporting the Concentrator Photovoltaic (PV) industry. Currently, she is managing the Reliability Group at NREL and working to facilitate the growth of the PV industry through improved performance of PV in the field.

**09:30**  
**Promises and Challenges in Light-Emitting Diodes for High-Power Lighting Applications**  
E. Fred Schubert; Rensselaer Polytechnic Institute, USA.

E. Fred Schubert is the Wellfleet Senior Constellation Professor at Rensselaer Polytechnic Institute. He made pioneering contributions to the field of compound semiconductor materials and devices, particularly to the doping of compound semiconductors and to the development and understanding of light-emitting diodes. He authored the books *Doping in III–V Semiconductors* (1992), *Delta Doping of Semiconductors* (1996), and *Light-Emitting Diodes* (1st edition 2003 and 2nd edition 2006). He is co-inventor of more than 30 US patents and co-authored more than 300 publications. He is a Fellow of the APS, IEEE, OSA, and SPIE and has received several awards.

**Postdeadline Papers Presentations**  
The committees of E2, SOLAR and SOLED accepted postdeadline papers for presentation. The purpose of postdeadline session is to give participants the opportunity to hear new and significant materials in rapidly advancing areas. Only those papers judged to be truly excellent and compelling in their timelines were accepted.

For more information, including the schedule and locations see the Update Sheet with copies of the Postdeadline papers attached.

**Joint Postdeadline Paper Session**  
Wednesday, 17:00-18:00  
Senate Room
## Agenda of Sessions — Wednesday, 2 November

<table>
<thead>
<tr>
<th>Time</th>
<th>Senate</th>
<th>Austin North</th>
<th>Capital Ballroom A</th>
<th>Austin South</th>
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<tr>
<td>07:00–18:00</td>
<td>SOLAR</td>
<td>SOLED</td>
<td>PV</td>
<td>E2</td>
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<td>Registration Open</td>
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<td>08:00–10:00</td>
<td>JWA • Renewable Energy Plenary Session, Capital Ballroom A</td>
<td>Esther Hoffman Beller Award Presentation</td>
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<td>10:00–10:30</td>
<td>Coffee Break, Capital Ballroom Foyer</td>
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<td>10:30–12:30</td>
<td>SRWB • CPV Systems</td>
<td>SDWB • Novel OLED Materials</td>
<td>PWB • Photon Management in Solar Cells: Dielectric Nanostructures I</td>
<td>EWB • Introduction to Energy and Environmental Optics TUTORIAL (Ends at 12:15)</td>
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<td>(Ends at 12:00)</td>
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<td>12:30–14:00</td>
<td>Lunch (on your own)</td>
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<tr>
<td>14:00–16:00</td>
<td>SRWC • CPV Design and Components</td>
<td>SDWC • OLED Device Physics</td>
<td>PWC • Photon Management in Solar Cells: Dielectric Nanostructures II</td>
<td>EWC • Sensors for Atmospheric Trace Gases and Aerosols</td>
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<tr>
<td>16:00–16:30</td>
<td>Coffee Break, Capital Ballroom Foyer</td>
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<td>16:30–18:00</td>
<td>Joint Postdeadline Paper Session (Starts at 17:00)</td>
<td>SDWD • Quantum Dot LED’s (Ends at 17:30)</td>
<td>PWD • Photon Management in Solar Cells: Plasmonic Nanostructures</td>
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<td>18:00–19:00</td>
<td>JWE • Joint Poster Session, Capital Ballroom B</td>
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<td>19:15–20:30</td>
<td>Conference Reception, Six Lounge</td>
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</table>

### Key to Conference Abbreviations

- **E2**: Optical Instrumentation for Energy & Environmental Applications
- **PV**: Optical Nanostructures and Advanced Materials for Photovoltaics
- **SOLAR**: Optics for Solar Energy
- **SOLED**: Solid State and Organic Lighting
### Agenda of Sessions — Thursday, 3 November

<table>
<thead>
<tr>
<th>Time</th>
<th>Senate</th>
<th>Austin North</th>
<th>Capital Ballroom A</th>
<th>Austin South</th>
</tr>
</thead>
<tbody>
<tr>
<td>07:00–17:00</td>
<td>SOLAR</td>
<td>SOLED</td>
<td>PV</td>
<td>E2</td>
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<td>Registration Open, Capital Ballroom Foyer</td>
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<tr>
<td>8:00–10:00</td>
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<td>JThA • Joint Congress Plenary Session, Capital Ballroom A</td>
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<tr>
<td>10:00–10:30</td>
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<td>Coffee Break, Capital Ballroom Foyer</td>
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<tr>
<td>10:30–12:30</td>
<td>SRThB</td>
<td>SDThB</td>
<td>PThB</td>
<td>ETHB</td>
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<td></td>
<td>• Planar Optical Concentrators and High Efficiency Concepts</td>
<td>• LED Materials and Devices</td>
<td>• Nanostructured Materials with Enhanced Efficiency</td>
<td>• Optical Design of Components and Subsystems for Energy and Environment (Ends at 12:15)</td>
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<tr>
<td>12:30–14:00</td>
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<td>Lunch (on your own)</td>
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<tr>
<td>14:00–16:00</td>
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<td>SDThC</td>
<td>JThC</td>
<td>ETHC</td>
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<tr>
<td></td>
<td>See Joint PV/Solar Capital Ballroom A</td>
<td>• Novel Devices and Lighting Systems (Ends at 15:30)</td>
<td>• Joint PV/Solar Concepts of Light Trapping and Photon Transport</td>
<td>• Laser Systems for Trace Gas Sensing and Combustion Diagnostics (Ends at 16:15)</td>
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<td>16:00–16:30</td>
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<td>Coffee Break, Capital Ballroom Foyer</td>
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<td>16:30–18:30</td>
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<td>PThD • Photon Management in Organic Solar Cells</td>
<td>ETHD • Testing and Development of Solar Energy Systems and Materials</td>
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</tbody>
</table>

### Key to Conference Abbreviations

- **E2**: Optical Instrumentation for Energy & Environmental Applications
- **PV**: Optical Nanostructures and Advanced Materials for Photovoltaics
- **SOLAR**: Optics for Solar Energy
- **SOLED**: Solid State and Organic Lighting
### Optics for Solar Energy

**10:30–12:00**

**SRWB • CPV Systems**

Ioannis Papakonstantinou; University College, London, England, Presider

**SRWB1 • 10:30**

Invited

Amonix Concentration Photovoltaic Power Plants, Geoffrey S. Kuey; Amonix, USA. Energy modeling has been used to increase both the rated power and energy yield. Solar power generators deployed in 2011 exceed previous performance by more than 10%.

**SRWB2 • 11:00**

Invited

Luminescent Solar Concentrators: Applications and Advances, Amanda Chatten; Imperial College, UK. The luminescent solar concentrator provides unique design flexibility and the opportunity to concentrate both diffuse and direct sunlight. We will review recent advances and applications ranging from power generating windows to portable charging cloth.

### Solid State and Organic Lighting

**10:30–12:30**

**SDWB • Novel OLED Materials**

Jiangeng Xue; University of Florida, United States, Co-Presider

Jian Li, Arizona State University, United States, Co-Presider

**SDWB1 • 10:30**

Invited

High Efficiency White Organic Light Emitting Device Using A Single Emitter, Jian Li1; 1University of Arizona, USA. The white organic light emitting diodes (WOLEDs) with high power efficiency (>100 lm/W) are considered as strong candidates for next generation illumination devices. Especially, WOLEDs use environmentally benign organic materials and their fabrication cost can be significantly reduced with potential roll-to-roll processing technology. To date, however, the white electroluminescent (EL) spectrum is generated using multiple emitters embedded in a comparably complex device structure. In this presentation, we will discuss some of our efforts towards the development of efficient WOLEDs using a single emitter, which include our progress on 1) excimer-based WOLEDs, and 2) the design and the synthesis of broadband phosphorescent emitters for lighting applications.

**SDWB2 • 11:00**

Invited

Rational Design of Host/Charge Transport Molecules for Blue OLEDs, Asanga Padmaperuma1; 1Pacific Northwest National Laboratory, USA. Charge balance and excition confinement are key factors in achieving high EQE in OLEDs. We demonstrate that a combination of HTL, ETL and host with appropriate energy levels can provide high EQE.

### Optical Nanostructures and Advanced Materials for Photovoltaics

**10:30–12:30**

**PWB • Photon Management in Solar Cells: Dielectric Nanostructures I**

Ralf Wehrspohn; Fraunhofer IWM Halle, Germany, Presider

**PWB1 • 10:30**

Invited

Light Trapping in Nano-textured Silicon Thin Film Solar Cells, Rahul Desai1; 1Jacobs University Bremen, Germany. The optics of thin-film microcrystalline silicon solar cells with integrated 3-D pyramidal-like surface texture was investigated. The influence of the dimensions of the surface texture on the quantum efficiency and short circuit current was evaluated.

**PWB2 • 11:00**

Invited

Optical Properties of Quantum Dot Intermediate Band Solar Cells; Elisa Antonio, Antonio Marti and Antonio Luque; Instituto de Energía Solar, Universidad Politécnica de Madrid, Spain. Simple quantum calculations have permitted to model the quantum efficiency in quantum dot intermediate band solar cells in agreement with measurements. Furthermore, far and near field structures have been studied to assess possible absorption improvement.

### Optical Instrumentation for Energy & Environmental Applications

**10:30–12:30**

**EWB • Introduction to Energy and Environmental Optics**

John Koskel, University of Arizona and Photon Engineering, United States, Presider

**EWB1 • 10:30**

Tutorial

Overview of Optical Remote Sensing Systems for Environmental Studies, Joseph A. Shaw1; 1Electrical and Computer Engineering Department, Montana State University, USA. This presentation will review some of the fundamental principles employed in active and passive environmental remote sensing systems, ranging from passive radiometric imaging to active range-gated laser scattering measurements. The principles will be illustrated with examples of real sensor systems.

**EWB2 • 11:15**

Tutorial

Applied Photometry, Radiometry, and Measurements of Optical Losses: Systems, Methods, Techniques for Energy and Environmental Applications - Part I, Direct Approaches, Michael A. Bukshtab1; 1Michael A Bukshtab Consulting, USA. Methodologies and measurement systems for combustion diagnostics, remote sensing, pollution detection ringdown, pulsed, resonator, calorimetric, interferometric, acoustooptic, polarization, active and passive - are analyzed versus direct techniques.
Continued SRWB • CPV Systems—
High Efficiency Solar Cells at Solar Junction, Human Yuen1; ‘Solar Junction, USA. Solar Junction has adopted the lattice matched dilute nitride material system to overcome today’s multi-junction technology limitations. Advantages of this technology to CPV systems and the achievement of 43.5% efficiency will be discussed.

SDWB • Novel OLED Materials—Continued
Tandem OLEDs based on Organic Semiconductor Heterojunction as Charge Generation Layer, Dongye Ma1; ‘Changchun Institute of Applied Chemistry, Chinese Academy of Science, China. Abstract not available.

PWB • Use of PLD-grown Moth-eye ZnO Nanostructures as Templates for MOVPE Growth of InGaN-Based Photovoltaics, Dave Rogers1, V. E. Sandan2, F. Hosseini Tehrani3, S. Gautier4, G. Orza5, T. Moudakir6, M. Molinari6, M. Troyon7, M. Peres8, M. J. Soares8, A. J. Neves9, T. Monnet10, B. McGonigal10, J. N. Chapman10, H. J. Drouhin11, M. Razaqi11, A. Ougazzaden11, ‘Nanovation, France; 2Center for Quantum Devices, Northwestern University, USA; 3LSI, Ecole Polytechnique, France; 4LERPS, University de Metz & Supélec, France; 5Supélec/UMI 2958, Georgetech-CNRS, France; 6LIMN, University de Reims Champagne Ardennes, France; 7Departamento De Fisica/1LN, Universidade de Aveiro, Portugal; 8Department of Physics & Astronomy, University of Glasgow, United Kingdom; 9Georgia Institute of Technology, Georgia Tech-CNRS, France. ZnO-based thin films and nanostructures are used in many photovoltaic devices. This talk will overview these and present the potential of moth-eye ZnO nanostructures for use as buffer layers in novel InGaN-based photovoltaics.

SDWB4 • 12:00
Environmentally Stable Al-doped ZnO Transparent Electrode for Organic Optoelectronic Devices, Dhriti S. Ghosh1, Tong L. Chen1, Danny Krantz2, Stephanie Cheylan1, Valeria Praneri1,2, ‘Optoelectronics, ICFO-The Institute of Photonic Sciences, Spain; 3CREA- Institució Catalana de Recerca i Estudis Avançats, Spain. Al-doped ZnO (AZO) transparent electrodes capped with oxidized ultrathin Ni are proposed. The novel structure show enhanced stability in damp heat and also leads to OLED efficiencies as high as those of similar ITO-based devices.

SDWB5 • 12:15
Transparent Organic Light-Emitting Diodes with LiF:Al Composite Cathodes, Bo Qu1, Zhijian Chen1, Lixin Xiao1, Qihuang Gong2, ‘Peking University, China. A transparent and electrical conductive layer comprising LiF and Al was designed and obtained successfully. The TOLED with LiF composite cathode showed acceptable electroluminescent behavior of both top and bottom emission.

PWB4 • 12:00
3D Photonic Crystal as Intermediate Reflector Layers in Micromorph Tandem Cells, Ralf R. Wehrspohn1,2, Johannes Upping2, Andreas Bielawny2, ‘Institute of Physics, University of Halle, Germany; 3Fraunhofer Institute for Mechanics of Materials, Germany. Unbalanced currents in serial-connected tandem solar cells are a major limitation of their performance. We will show that an embedded 3D photonic crystal acting as an intermediate reflector can balance the currents.

PWB5 • 12:15
Performance of Large Period Engineered Grating for Solar Cell Applications, Emiliano R. Martini1, Juntao Li2, Yikun Liu2, Jianying Zhou1, Thomas Krauss1, ‘Physics and Astronomy, University of St. Andrews, United Kingdom; 3State Key Laboratory of Optoelectronic Materials and Technologies, SunYat-sen University, China. We study engineered large period gratings for thin-film silicon solar cells. Numerical calculations indicate that such gratings outperform conventional gratings over a wide range of wavelengths, incident angles and for both polarizations.
Wednesday, 2 November

**Optics for Solar Energy**

14:00–16:00

SRWC • CPV Design and Components

Raymond Kostuk; University of Arizona, United States, Presider

**Solid State and Organic Lighting**

14:00–16:00

SDWC • OLED Device Physics

Bernard Kippelen; Georgia Tech, United States, Presider

**Optical Nanostructures and Advanced Materials for Photovoltaics**

14:00–16:00

PWC • Photon Management in Solar Cells: Dielectric Nanostructures II

Thomas Krauss; University of St. Andrews, United Kingdom, Presider

**Optical Instrumentation for Energy & Environmental Applications**

14:00–16:00

EWC • Sensors for Atmospheric Trace Gases and Aerosols

Joseph Shaw; Montana State University, United States, Presider

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SRWC1 • 14:00

A CPV Thesis, David Schulte; Banyan Energy, Inc., USA. The viability of a concentrator modular scale technology is determined by five interrelated factors: economic benefit, cell performance under concentration, thermal management, optical performance and manufacturability.

SRWC2 • 14:30

Lenticulated Köhler Integrator for a Utility-Scale CPV System, Brian Wheeler; College of Optical Sciences, University of Arizona, USA. LP1’s X-1 Köhler design adapts to the limitations of the CAP metric are discussed in the context of CPV systems with arrayed multifunction receiver cells.

SRWC3 • 14:45

Design, Optimization and Characterization of Secondary Optics for a Dish-Based 1000x CPV System, I. Guillaume Bole, Tom Conroy, Blake Coughenour, and Roger Angel; College of Optical Sciences, University of Arizona, USA. This paper presents a novel design of a solar secondary optics used in a dish-based CPV system at 1000x. Different optimizations were conducted as well as experiments to determine its optimum configuration.

SRWC4 • 15:00

Materials for Fresnel Lenses in Concentrating Photovoltaics, Balf Leutz; Concentrator Optics, GMBH, Germany. Abstract Fresnel lenses for CPV are made of PMMA or silicone-on-glass (SOG). We discuss these optical materials in terms of spectral transmission, refractive index, longevity, bankability and cost. Thermal expansion is most critical.

SDWC1 • 14:00

Organic Electronics: A World of Interfaces, Angel Rubio; Princeton University, USA. This talk gives an overview of the definition and measurement of molecular energy levels that are central to carrier injection into, and transport through, organic-based devices. [1] J. Hwang et al, Materials Science and Engineering, R 64, 1-31 (2009)

SDWC2 • 14:30

Multiperiod Gratings in a High Refractive Index Material for Enhanced OLED Outcoupling, Artfat Pradana; Integrated Systems and Photonics, Christian-Albrechts-Universität zu Kiel, Germany. We produce multiperiod gratings in Ta2O5 using nanoimprint lithography in combination with RIE. The photoluminescence spectrum of an emitter layer on a multiperiod grating is demonstrated to exhibit multiple peaks of enhanced emission.

SDWC3 • 14:45

Highly Efficient Blue Electrophosphorescent Device Using a Weak Electron Transporting Material, Linxin Xiao; Boyuan Qi, Xing Xing; Peking University, China. Over 20% of external quantum efficiency of blue electrophosphorescence is achieved by employing a weak electron transporting material. It shows an alternative way to design materials for blue electrophosphorescent devices.

SDWC4 • 15:00

Conductive Low-Inx Layer: A New Opportunity for Outcoupling Enhancement in OLEDs, SeungHyup Yoo; Electrical Engineering, Korea Advanced Institute of Science and Technology, Republic of Korea. A novel electrode structure utilizing low-index properties of conductive polymers is explored for outcoupling enhancement in OLEDs.

PWC1 • 14:00

Light Trapping in Thin Film Silicon Solar Cells with Mono and Bimimensional Photonic Patterns, Angelo Bozóki, Marco Lisčič, Lucio C. Andreani; University of Pavia, Italy. We investigate light trapping in thin film silicon solar cells with 1D and 2D photonic patterns. Absorbance and short-circuit current density are calculated with scattering matrix formalism and compared with Lambertian limits.

PWC2 • 14:15

Optimization of Silicon Solar Cells using Backside Diffraction Gratings, Markus Wellenrodt, Rainer Hautober; Health & Environment Department, Nano Systems, AIT Austrian Institute of Technology GmbH, Austria. This numerical study investigates the influence of backside diffraction gratings on the efficiency of silicon solar cells. In particular, the dependence of the optimum grating period and modulation depth on the silicon thickness is determined.

PWC3 • 14:30

Decreasing the Thickness of Crystalline-Silicon Solar Cells below 40 µm and Increasing their Light Absorption with Surface Nanoflattener, Yves De Pauw, Frederic Dross, Ivan Gordon, Jef Poortmans; imec, Belgium. Three methods for fabricating crystalline-silicon solar cells thinner than 40 µm down to 1 µm are presented, together with the integration of three nanostructuring schemes - texturing, photonic crystals, plasmons - to boost their light absorption.

PWC4 • 15:00

Combining Front and Back Grating Structures for Broadband Absorption Enhancement in Thin-Film Silicon Solar Cells, Aimi Abass, Trae Treadwell, Andrey Alekseev, Bjorn Maas; Marc Burgelman; Department of Information Technology, Ghent University, Belgium; Department of Electrical and Computer Engineering, The University of Texas at Austin, USA; Department of Information Technology, Ghent University-imec, Belgium; Department of Physics, University of Mons, Belgium. We investigate the possibilities of enhancing absorption in thin-film silicon solar cells with grating structures on the front ITO and back Ag contacts simultaneously. Broadband enhancement from complementary effects of each grating is demonstrated.

EWC3 • 14:30

Spectroscopic Instruments for Airborne Measurements of Atmospheric Trace Gases, Alan Fried; Dirk Richter, Peter Weibring, James Dib恕, Scott Spuler, Matthew Teichmann; National Center for Atmospheric Research, USA; Applied Physics Group, National Security Division, Pacific Northwest National Laboratory, USA. Investigators at the National Center for Atmospheric Research have developed and deployed a state-of-the-art instrument based upon difference frequency generation absorption spectroscopy to carry out such investigations on various airborne platforms.

EWC4 • 15:00

Atmospheric Vertical Profiling of Multiple Chemicals with an External Cavity Quantum Cascade Laser Heterodyne Radiometer, Tracy Tsai, Damien Windmann, Neil Nadenoff, Rebecca Rose; Gerard Wysocki; Electrical Engineering, Princeton University, USA; Space Science and Technology, STFC Rutherford Appleton Laboratory, United Kingdom. We present a 60 MHz resolution ground-based EC-QCL heterodyne radiometer capable of spectroscopic sensing of five molecules. High spectral resolution allows for retrieval of vertical atmospheric concentration profiles from transition line shapes.
Components—Continued

SRWC • CPV Design and Components—Continued

1College of Optical Sciences, The University of Arizona, USA; 2Steward Observatory, The University of Arizona, USA. Concentrator system conversion efficiency may be characterized by using measurements of the optical components. Techniques of characterizing radiometric throughput via geometric ray shadowing, optical efficiency, and cell efficiency are presented.

SDWC • OLED Device Physics—Continued

SDWC • OLED Device Physics—Continued

Efficient Green and Blue Electrophosphorescent Light Emitting Diodes using a Combination of Solution and Vacuum-Processed Materials. Wojciech Haske1, Sung-Jin Kim1, Denie Cai1, Ehsan M. Najafabadi1, Canek Fuentes-Hernandez1, Bernard Kippen1, Julie Leroy1, Carlos Zuniga1, Yadong Zhang1, Annabelle Scarpaci1, Huiyang Li1, Lingyun Zhu1, John S. Sears2,3, Seth R. Marder2,3, 1School of Electrical and Computer Engineering, Georgia Institute of Technology, USA; 2School of Chemistry and Biochemistry, GA Institute of Technology, USA; 3Center for Organic Photonics and Electronics, Biochemistry, GA Institute of Technology, USA. We report two efficient white OLED structures with efficacy up to 100 lm/W. One structure involves using three different down-conversion phosphors. The other integrates a blue-emitting OLED with other integrates a blue-emitting OLED with white phosphorescent emitters. We present a full scattering model for nano-textured materials. We give an overview on recent progress in the synthesis, fabrication and integration of advanced nanostructured materials for efficient light trapping in high-efficiency thin-film silicon solar cells.

SRWC • 15:30
Defining System Conversion Efficiency for Dish-Based Solar Concentrator PV, Blake Coughenour1, Guillaume Butel1, Roger Angel2; 1College of Optical Sciences, The University of Arizona, USA; 2Steward Observatory, The University of Arizona, USA. Concentrator system conversion efficiency may be characterized by using measurements of the optical components. Techniques of characterizing radiometric throughput via geometric ray shadowing, optical efficiency, and cell efficiency are presented.

SDWC • OLED Device Physics—Continued

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SRWC • 15:45
Concentrating Photovoltaic Systems Using Micro-Optics, William Sweatt1, Greg Nielson1, Marat Okandan1; 1Sandia National Lab, USA. Molded plastic micro-optics with 100X solar gain are described. A ±40 acceptance cone is allowed so the lens arrays can be mounted on one-axis heliostats and give achromatic, stationary images on photo-voltaic cells.

SDWC • 15:45
High Efficiency White Organic Light-Emitting Devices, Sang-Hyun Eom1, Edward Wresniwski1, Jaewon Lee1, Neetu Chopra1, Debasis Bera1, Paul Holloway1, Franky So1, Jungeng Xue1; 1Materials Science and Engineering, University of Florida, USA. We report two efficient white OLED structures with efficacy up to 100 lm/W. One structure involves using three different emitters in the same emitting layers, while the other integrates a blue-emitting OLED with down-conversion phosphors.

SDWC • OLED Device Physics—Continued

Efficient Green and Blue Electrophosphorescent Light Emitting Diodes using a Combination of Solution and Vacuum-Processed Materials. Wojciech Haske1, Sung-Jin Kim1, Denie Cai1, Ehsan M. Najafabadi1, Canek Fuentes-Hernandez1, Bernard Kippen1, Julie Leroy1, Carlos Zuniga1, Yadong Zhang1, Annabelle Scarpaci1, Huiyang Li1, Lingyun Zhu1, John S. Sears2,3, Seth R. Marder2,3, 1School of Electrical and Computer Engineering, Georgia Institute of Technology, USA; 2School of Chemistry and Biochemistry, GA Institute of Technology, USA; 3Center for Organic Photonics and Electronics, Biochemistry, GA Institute of Technology, USA. We report two efficient white OLED structures with efficacy up to 100 lm/W. One structure involves using three different down-conversion phosphors. The other integrates a blue-emitting OLED with other integrates a blue-emitting OLED with white phosphorescent emitters. We present a full scattering model for nano-textured materials. We give an overview on recent progress in the synthesis, fabrication and integration of advanced nanostructured materials for efficient light trapping in high-efficiency thin-film silicon solar cells.

SRWC • 16:00–16:30 Coffee Break, Capital Ballroom Foyer
Optical Nanostructures and Advanced Materials for Photovoltaics

16:30-18:00
PWD • Photon Management in Solar Cells: Plasmonic Nanostuctures
Thomas Krauss; University of St. Andrews, UK, Presider

Plasmonic and High Dielectric Constant Nanostuctures for Light Trapping, Mark Brongersma; Stanford University, USA. Nanocomposite and high index dielectric nanostuctures have gained significant interest for their ability to boost the energy conversion efficiency of photovoltaic cells. I will discuss recent progress in the development of such structures.

SDWD1 • 16:30 Invited
Steady Progress of Colloidal Quantum Dot Led (QLED) Technologies, Vladimir Bulovic; Electrical Engineering and Computer Science, M.I.T., USA. State of the art colloidal quantum dot led structures are advancing both the QLED efficiencies and the operating lifetimes. The talk will contrast advantages of DC-driven and AC-driven QLED structures.

SDWD2 • 17:00 Invited
Quantum Dot Based Light Emitting Diodes, Changhee Lee; Seoul National University, Democratic People’s Republic of Korea. Quantum dots (QDs) have attractive properties for full-color displays and solid-state lightings. Here, we present several approaches for improving the performance of QD-LEDs. In addition, we present a versatile QD patterning method that can allow well-defined in-scale patterns, leading to the realization of high-resolution, full-color QD displays.

17:00–18:00 JWD • Joint E2/SOLAR/SOLED Postdeadline Session, Senate (see page 25)

JWE1 Solar Energy Concentrators and their Optimization and Analysis with the OptisWorks Solar Package, Günther Hasnüt, 1; OPTIS, France. Optis has developed tools put together in the OptisWorks Solar Package which can change the sun position by macros calculating and optimizing the efficiency of such concentrators based on reflective or refractive materials.

JWE2 LED Phosphor Modeling and Color Optimization in OptisWorks, Günther Hasnüt, 1; OPTIS, France. OPTIS has developed in OptisWorks an editor for LED phosphor dyes which take into account physics based measureable spectra information as well as the volume scattering by the Hyeney-Greenstein equations.

JWE3 Design Method of High Efficient LED Freeform Optical System for Aeronautical Ground Light, Shang Wang,1, Fei Chen1, Quan Chen1, Zhili Zhao1, Zong Qin1, Sheng Liu1; Design Method of High-Efficient LED Freeform Optical System for Aeronautical Ground Light, JWE3 • 16:30, Invited

JWE4 Process Development for Carbothermal Reduction and Nitridation Synthesis of alpha-SiAlON Film Solar Cells, Shyan-Lung Chung1, Shu Chi Huang1; 1Chemical Engineering, National Cheng Kung University, Taiwan. When doping with Eu2+ as an activator, optical adsorption from 420 to 650nm was observed. By using a light at 380 nm as an excitation source, a luminescent radiation from 220 to 500nm. When doping with Eu2+ as an activator, optical adsorption from 420 to 650nm was observed. By using a light at 380 nm as an excitation source, a luminescent radiation from 220 to 500nm.
Infrared-to-Visible Upconversion by Yb3+-Er3+ Energy Transfer in Oxide Glass-Ceramics, A-Young Moon, Mo-Ion Yoo, Daeyoung Lee, Woon-Young Lee, Ki-Soo Lim, P. Babu; Physics Department, Chungbuk National University, Republic of Korea. "Giant Degree and PhD College, India. Oxide glass-ceramics containing CaF2 nanocrystals doped with 1 mol% Er and 2 mol% Yb ions have been prepared and characterized. Upconverted visible emissions under 980 nm excitation are found to be enhanced due to CaF2 nanocrystals.

Plasmonic Enhanced Light Absorption of Solar Cells with Metal Nanoparticles, Fang Liu, Di Qu, Qi Xu, Wanlu Xie, Tinghua Huang; Tsinghua University, China. The plasmonic enhanced absorption for solar cell with metal nanoparticles deposited on top and inside of the active layer of solar cells has been simulated and investigated experimentally.

3D-FDTD Analysis of Absorption Enhancement in Nanostructured Thin Film Solar Cells, Jerónimo Buencuerpo, María Luisa Dotor, Luis Enrique Muniec-Camunic, Pablo A. Postigo; MBE, IMM-CNMT-CSIC, Spain. We investigate 1D-2D photonic crystals for light absorption enhancement on thin film photovoltaics (Si, GaAs as an InP) by FDTD. A comparison with RCWA and TMM is presented. The absorption is increased substantially for these systems.

Near Field Radiative Heat Transfer Measurement, Ning Gu, Karthik Sasihithlu, Arvind Narayanaswamy; 1Dept of Electrical Engineering, Columbia University, USA; 2Institute of Applied Physics, Berlin, Germany. Using an improved experimental setup, we measured near field radiative heat transfer that may benefit TPV to a value as small as 0.5 mW/K. The experimental data is compared with modified proximity approximation prediction.

Observations of Human-made Debris in Earth Orbit, Heather Cowardin; NASA-JSC/ESGC-JACORS, USA. Pollution is generally considered contaminants of Earth's surface, hydrosphere and atmosphere, but there is another problem overhead, everyday space debris. This paper discusses observational methods used to characterize the growing debris population.

Characterization of a Quantum Cascade Laser Based Emissivity Monitor for CORSAIR, Maung Lwin, A-Young Moon, Mi-Yeon Yoo, Dae-Young Lee, Woon-Young Lee, Ki-Soo Lim, P. Babu; 1Physics Department, Chungbuk National University, Republic of Korea; 2Govt. Degree and P.G. College, India. The QCL based emissivity monitor was designed to obtain emissivity uncertainty goal of ±0.00015 (3σ) for the CORSAIR blackbody. The laser power stability and temperature distribution of the system are analyzed.

The National Ecological Observatory Network’s Fundamental Instrument Unit: The Challenges of Managing Thousands of Environmental Sensors, Jeffrey R. Taylor; Ed. Ayres; Hongzuo Lou; Henry W. Loecher; Fundamental Instrument Unit, National Ecological Observatory Network, USA; Institute of Arctic and Alpine Research, University of Colorado, USA. NEON’s Fundamental Instrument Unit must implement >45,000 environmental sensors at 60 instrument sites across the US. The observation strategy for managing these sensors, as well as the preliminary plan for automated quality control, is presented.

A Tele-Operated Gas Analyzer, Libing Ren, Haoyun Wei, Yan Li; Precision Instruments, Tsinghua university, China. A remote operable gas analyzer was designed and depicted in this paper. There’s no geographical restriction on using it and it’s easy to maintain. It's especially suitable for long-term and large-scale detection of polluted gases.
08:00-10:00  |  JThA • Joint Plenary Session
Bernard Kippelen, Georgia Tech, United States, Presider

JThA1 • 08:00  |  Invited
Theory and Practice for Nanophotonic Light Trapping, Shanhui Fan1; Stanford University, USA. We present studies of light management in solar cells from a rigorous electromagnetic perspective. We discuss the statistical temporal couple theory formalism, and the practical considerations to achieve simultaneously light trapping and anti-reflection.

JThA2 • 08:30  |  Invited
Sustainable Energy & Optical Methods for Monitoring Air Pollution, Matthew Fraser1; Global Institute of Sustainability, Arizona State University, USA. Development of optical sensors capable of rapid quantification of pollutants that today are measured through slow responding instruments will be discussed.

JThA3 • 09:00  |  Invited
Opportunities for Optical Designs in Driving Concentrating Photovoltaic Technology, Sarah Kurtz1; Global Institute of Sustainability, Arizona State University, USA. The photovoltaic industry has grown dramatically; concentrating photovoltaic products are generating interest, but would benefit from optical techniques developed for other industries. This talk will give an overview and highlight the opportunities.

JThA4 • 09:30  |  Invited
Promises and Challenges in Light-Emitting Diodes for High-Power Lighting Applications, E. Fred Schubert1; OSRAM Sylvania, USA. We will discuss the origin of the efficiency droop as well as ways to reduce the droop.

10:00-10:30  |  Coffee Break, Capital Ballroom Foyer
Concentrators and High SRThB • Planar Optical centrator Regions in Photovoltaic Modules, Thermal Effects of Holographic Planar Con-
optical response in a planar micro-optic solar tor. Using a cladding material with a non-linear common-plane Spectrum-splitting Con-
modifying the spectrum on cell temperature and violet and infrared spectral bands. The effect of USA.
Computing Engineering, University of Arizona,
decrease in panel operating temperature.
area of the panel configuration produces a net presented. The low concentration and increased planar concentrator photovoltaic modules is elded data of the thermal properties of holographic Experimental and mod-
1Electrical and Computer Engineering, University of Delaware, USA.
1Optoelectronics, SAMEER, India. VCSels and LEDs at near and mid infrared wavelengths are very useful for trace gas sensing. We have developed methane gas sensor with IR LED at 3.38 μm and developing multi-gas sensing by tuning laser diode for detecting traces of pollutant gases.

SRThB • Planar Optical Concentrators and High Efficiency Concepts—Continued

SRThB2 • 11:00 Reactive Self-Tracking Solar Concentration, Katherine Baker1, Jason Karp1, Justin Hallas1, Joseph Forr1; 1UC San Diego, USA. We present a design for a reactive self-tracking solar concentrator. Using a cladding material with a non-linear optical response in a planar micro-optic solar concentrator allows for wide-angle acceptance without violating étendue.

SRThB3 • 11:15 Thermal Effects of Holographic Planar Concentrator Regions in Photovoltaic Modules, Jose E. Castillo1, Juan M. Ruseo1, Glenn Rosenberg2, Raymond Kostak3; 3Prism Solar Technologies, Inc., USA; 1Electrical and Computing Engineering, University of Arizona, USA. Experimental and modeled data of the thermal properties of holographic planar concentrator photovoltaic modules is presented. The low concentration and increased area of the panel configuration produces a net decrease in panel operating temperature.

SRThB4 • 11:30 Common-plane Spectrum-splitting Concentrating Photovoltaic Module Design and Development, Tian Gu1, Michael W. Haney2; 1Electrical and Computer Engineering, University of Delaware, USA. A novel tiled micro-optical CPV concept is described. Within each unit cell, spectrally selective elements are laterally displaced on a common plane to enhance conversion efficiency and reduce packaging costs in high-performance PV modules.

SRThB5 • 11:45 Spectral Characterization of the Temperature Performance of Silicon Solar Cells, Juan M. Ruseo1, Deming Zhang2, Shelby D. Vornsdor3, Oxin Zara1, Raymond Kostak1; 1Electrical and Computing Engineering, University of Arizona, USA. The solar spectrum illuminating silicon photovoltaic cells is modified to eliminate ultraviolet and infrared spectral bands. The effect of modifying the spectrum on cell temperature and electrical performance is evaluated.

SDThB2 • 11:00 Invited Surface Plasmon Coupled Light-Emitting Diodes, Yang Kaui1, Chen-Hsiung Huang1, Shao-Ying Ting1, Chih Hsiuh1, Che-Hao Liu1, Chih-Yen Chen1, Jeng-Yue Huang2, Yen-Cheng Liu1, Cheng-Yen Chen1, Kun-Ching Shen1, Chih-Feng Lu1, Dong-Ming Yeh1, Jyh-Yang Wang1, Wen-Hung Chuang2, Yuan-Wen Kang1, Chih-Chang Tsai1, Chih-Yung Su1; 1Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan. The results of light-emitting diode fabrication with surface plasmon coupling with the dipole in its quantum wells are reviewed, including internal quantum efficiency enhancement, reducing the droop effect, and producing partially polarized output.

SDThB3 • 11:30 Process Development for Synthesis of High-Performance Dynizide Phosphor, Shyan-Lung Chang1, Shiyue Juan Huang1; 1Chemical Engineering, National Cheng Kung University, Taiwan; 2Chemical Engineering, National Cheng Kung University, Taiwan. We report the development of a new method for the synthesis of a yellow oxynitride phosphor (i.e.,Ca2+SiAlONeu2+) based on SHS reactions. The synthesized product emits in 400-670nm centered at 555nm upon excitation at 380nm.

SDThB4 • 11:45 Optical Thin Film Filters for UV and Blue LEDs, Dong Xue (Michael) Yang1; 1Central Research Labs, OSRAM Sylvania, USA. A model to design and simulate thin film filter for LED and solid state lighting was developed, where a quarter-wave stack was used as a building block to design Distributed Bragg Reflector (DBR).

EThB3 • 11:00 Invited Efficient Light-Trapping in Periodic Nanostructured Thin Crystalline Silicon Solar Cells, Gang Chen1; 1MIT, USA. We theoretically and experimentally show that simple periodic pyramid structures on the order of the wavelength can greatly enhance absorption for solar cell applications and potentially reduce silicon mass up to two orders of magnitude.

EThB4 • 11:15 Whole-Facility particulate Emission measurement of a Process Water Treatment Facility using Agile: A 3-Wavelength Elastic Lidar, Michael Wójcik1, 1Energy Dynamics Laboratory, USA. Agile, an elastic lidar system is used to measure the particulate emissions from a fracture mining petroleum process water treatment facility. Particulate emissions were found to be low for the two kinds of water treatment studied.

EThB5 • 11:30 Quantum Cascade Laser-based CO2 isotope Sensors for Carbon Sequestration and Environmental Monitoring, Matthew Escarra1, 2Sentinel Photonics, USA; 1Energy Dynamics Laboratory, USA. A quantum cascade (QC) laser for detecting 12CO2, 13CO2, and 18OCO in carbon sequestration leak and environmental monitoring. The parallel development of a compact and efficient QC laser-based isotopic ratiometer will also be discussed.

EThB6 • 11:45 A Field-Deployable Multi-Spectral Imaging System for Indirect CO2 Leak Detection through Vegetation Imaging, Joseph A. Shaw1; 1Electrical Engineering, Montana State University, USA. To reduce human influence on the global environment, carbon capture and sequestration <CCS) is proposed as a means of collecting CO2 generated through industrial and consumer processes and sequestering it to prevent atmospheric emission.
SRThB • Planar Optical Concentrators and High Efficiency Concepts—Continued

Another type of lightguide-based concentrators, losses by reabsorption and escape could be minimized. New phosphors and filters facilitate this. Another type of lightguide-based concentrators, diffraction-based, is discussed as well.

SDThB • LED Materials and Devices—Continued

A novel LED light extraction technique based on evanescent wave coupling, Xue-Lun Wang1, Guo-Dong Hao1, Tokio Takahashi1; 1Nanotechnology Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Japan. A novel light extraction technique based on coupling of evanescent waves in a ridge structure is reported. This technique can extract directly light outside the escape cone, which cannot be achieved with the conventional techniques.

SDThB6 • 12:15

Energy-Saving Bottom-Lit LED Backlight with Angle-Control Freeform Lens, Zeng Qiu1, Kai Wang1, Shang Wang1, Sheng Liu1,2; 1Division of MOEMS, Wuhan National Laboratory for Optoelectronics, China, 2School of Mechanical Science and Engineering, Huazhong University of Science & Technology, China. A novel light extraction technique based on bottom-lit LED backlight on the direction of incident light was studied. Freeform lens was utilized to enhance the efficiency to make displays more energy-saving.

PThB • Nanostructured Materials with Enhanced Efficiency—Continued

Absorption of Silicon Nanowire Arrays on Silicon and Silica Substrates, Bjorn C. Sturmberg1, Kokou B. Dossou1, Lindsay C. Botten2, Ana A. Ananyan1, Christopher G. Poulton1, C. Martijn de Sterke1, Ross C. McPhedran1; 1CUDOS and School of Mathematical Science, University of Technology Sydney, Australia, 2Centre for Innovation Competence (CIC), University of Halle-Wittenberg, Germany. 3SiLi-nano, University of Halle-Wittenberg, Germany. Sm3+-doped barium borate glasses are investigated for their potential as superstrate for CdTe solar cells. A 3.2 mm thick, 1 mol% Sm3+-doped glass superstrate enables an increase in the external quantum efficiency of approximately 2%.

NOTES

1:20–12:30 Lunch (on your own)
Joint Optical Nanostructures and Advanced Materials for Photovoltaics/Optics for Solar Energy

14:00–18:00

JThC • Concepts of Light Trapping and Photon Transport
Raymond Kostuk; University of Arizona, United States, President

JThC1 • 14:00

All new: New Photonic Materials and Devices for Solar Energy Conversion, Harry A. Atwater1; Renison Institute and Kavli Nanoscience Institute, California Institute of Technology, USA. I will describe approaches to control of light-matter interactions leading to enhanced light-trapping and absorption, as well as increased open circuit voltage and enhanced quantum efficiency in low-cost flexible thin film photovoltaic structures.

JThC2 • 14:30

Plasmonic Photovoltaics: Linking Nanophotonics with Carrier Transport Considerations, Stefan Maier1; Imperial College London, United Kingdom. The direct linking of electrodynamic with carrier transport modeling in three dimensions enables prediction of the properties of plasmonic solar cells. Examples for both the III/V and the Si materials system will be presented.

JThC3 • 15:00

Light Trapping and Quantum Semiconductor Structures for High-Efficiency Photovoltaics, Edward T. Yu1, Claiborne O. McPheters2; Xiaohan Li1, Daniel M. Schaadt2; Dongzhi Hu2; 1Microelectronics Research Center, University of Texas at Austin, USA; 2Air Force Research Laboratory, USA. We demonstrate and characterize an OPO-based, NIR-DIAL source that produces 243 mJ per pulse with a spectral linewidth of 157 MHz FWHM and has a frequency switching rate of 2 Hz.

JThC4 • 15:30

Photon Transport in Luminescent Solar Concentrators based on Semiconductor Nanoparticles, Derya Sahin1, Boaz Ilan1, David F. Kelley2; UC Merced, USA. Photon transport in luminescent solar concentrators using semiconductor nanoparticles is modeled by Monte Carlo simulations. Using quantum dots proves to be highly efficient, while using aligned nanorods reduces the escape of light significantly.

JThC5 • 15:45

Near-field Light Focusing by Wavelength-sized Dielectric Spheroids for Photovoltaic Applications, Manuel J. Mendes1, Ignacio Tobias1, Antonio Mardé1, Antonio Luque2; E.T.S.I. Telecommunications, Instituto de Energia Solar, Universidad Politecnica de Madrid, Spain. We explore the near-field concentration properties of dielectric spheroidal scatterers with wavelength sizes, using a separation-of-variables method. Such “mesoscopic lenses” are optimized for maximum light enhancement in photovoltaic applications.

16:00–16:15

ETHC • Laser Systems for Trace Gas Sensing and Combustion Diagnostics
Gerard Wysocki; Princeton University, United States, President

ETHC1 • 14:00

Broadband Femtosecond Sources for Greenhouse Gas Spectroscopy and Trace-Gas Sensing, Tyler W. Nolte1, Todd Johnson1, Mark Zahniser1, John B. McManus1, Mark Zahniser1, Da- vid D. Nevens2, Ryan M. McGovern3, Mike Agesen4, William F. Brewer5; 1Aerodyne Research, Inc.; 2NIST Boulder, USA. We describe several approaches for producing broadband femtosecond sources in the mid-infrared for applications in atmospheric spectroscopy. Using a 3.3 μm source, measurements of CH4 and H2O concentrations in atmospheric conditions are described.

ETHC2 • 14:15

Compact Quantum Cascade Laser Instrument for High Precision Trace Gas Measurements, John B. McManus1, Mark Zahniser1, David D. Nevens2, Ryan M. McGovern3, Mike Agesen4, William F. Brewer5; 1Aerodyne Research, Inc.; 2NIST Boulder, USA. We demonstrate and characterize an OPO-based, NIR-DIAL source that produces 243 mJ per pulse with a spectral linewidth of 157 MHz FWHM and has a frequency switching rate of 2 Hz.

ETHC3 • 14:45

A 243 mJ, Eye-Safe, Frequency Agile, Optical Parametric Oscillator-Based DIAL Transmitter, Robert Foltynowicz1; 1USURF, USA. We report the design and characterization of a 243 mJ, eye-safe, frequency-agile, OPO-based DIAL transmitter with a spectral linewidth of 157 MHz FWHM and a frequency switching rate of 2 Hz.

ETHC4 • 15:00

Kilohertz Rate, One-Dimensional Thermometry in Reacting Flows Using Femtosecond-CARS Line Imaging, Warrana D. Kadatila1, Hans U.斯塔ffier1, Saeed Roy2, James R. Gordi2; 1Spectral Energies, LLC, USA; 2Air Force Research Laboratory, USA. We report 1D thermometry at 1 kHz using fs coherent anti-Stokes Raman scattering (fs-CARS) line imaging. Collision-free single-shot measurements are reported in combustion temperatures >2000K demonstrating the technique in chemically reacting flows.

ETHC5 • 15:15

Beyond FTIR - Using Broadly Tunable QC Lasers to Extend Spectroscopic Monitoring Capabilities in Energy and Environmental Applications, Ronald K. Hanson1, Ronald K. Hanson1; 1USURF, USA. We report the design and characterization of a 243 mJ, eye-safe, frequency-agile, OPO-based DIAL transmitter with a spectral linewidth of 157 MHz FWHM and a frequency switching rate of 2 Hz.

ETHC6 • 15:45

Laser Spectroscopy and Optical Diagnostics of Combustion Processes, Ronald K. Hanson1, Ronald K. Hanson1; 1USURF, USA. We report the design and characterization of a 243 mJ, eye-safe, frequency-agile, OPO-based DIAL transmitter with a spectral linewidth of 157 MHz FWHM and a frequency switching rate of 2 Hz.

16:00–16:30

Coffee Break, Capital Ballroom Foyer
16:30–18:30
PThD • Photon Management in Organic Solar Cells
Mark Brongersma; Stanford University, United States, Presider

PThD1 • 16:30 • Invited
Constructing Precise Morphology for High Performance Printable Polymer Solar Cells, Xiaoniu Yang; Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, China. Hereby we present a few approaches to construct precise morphology towards high-performance device for printable polymer solar cells based mainly on P3HT:PCBM composite, which could be potentially produced by using roll-to-roll technique.

PThD2 • 17:00 • Invited
Morphology and Performance of Polymer-Based Solar Cells, Michael E. Mackay; University of Delaware, USA. Excitons in polymer-based solar cells are short lived placing great emphasis on construction of a nanoscale morphology of electron donor and acceptor. Here we discuss how processing affects the morphology and subsequent performance.

PThD3 • 17:30
Using Localized Plasmon Resonances to Enhance Absorption Efficiency in Thin-film Organic Solar Cells, Khan Q. Le; Ami Abu; Bjorn Mazz; Peter Bienstman; Andrea Alu; Electrical and Computer Engineering, The University of Texas at Austin, USA; Ghent University, Belgium; University of Mons, Belgium. We propose the use of localized surface plasmon modes excited by square metallic gratings to enhance the optical absorption of thin-film organic solar cells. Broadband absorption enhancement of up to 29% is theoretically demonstrated.

PThD4 • 17:45
Using Localized Plasmon Resonances to Enhance Absorption Efficiency in Thin-film Organic Solar Cells, Khan Q. Le, Ami Abu, Bjorn Mazz, Peter Bienstman, Andrea Alu; Electrical and Computer Engineering, The University of Texas at Austin, USA; Ghent University, Belgium; University of Mons, Belgium. We propose the use of localized surface plasmon modes excited by square metallic gratings to enhance the optical absorption of thin-film organic solar cells. Broadband absorption enhancement of up to 29% is theoretically demonstrated.

PThD5 • 18:00
Simulating and Optimizing the Performance of Fluorescent Dyes and 3D Microtextures for Luminescent Solar Concentrators, Gaetano Hamura; OTPIS, France. Development of a simulation software taking into account the fluorescent dyes and the shape of the light guide applying 3D virtual textures to reduce reflection.

PThD6 • 18:15
Testing of Solar Thermal Systems, Saranpal “Sunny” Rai; Intertek, USA. A description of standards & certifications available for Solar Thermal products and a detailed examination of the Solar Rating & Certification Corporation (SRCC) certification, which is currently the most recognized standard in the US.
Key to Authors and Presiders

(Bold denotes Presider or Presenting Author)

A

Abass, Aimi.-PThD3, PWC4
Abruzzi, Agnese.-PThD6
Adler, Florian.-EThC1
Agnese, Mike.-PThD6
Ahrenkiel, Richard K.-EThD3
Alu, Andrea.-PThD3, PWC4
Andreati, Lucio Claudio.-PWC1
Antolín, Elsa.-PWB2
Angel, Roger.-SRWB, SRWC3, SRWC5
Apedale, Thomas.-EWC2
Asatryan, Ara A.-PThB5
Atwater, Harry A.-JTBC1
Ayres, Ed.-JWE16

B

Baber, P.-JWE10
Baker, Katherine.-SRThB2
Ballif, Christophe.-PWC6
Ballet, Christoph.-PWC6
Barlow, Stephen.-SDWC5
Barraud, L.-PWC6
Berga, Debasis.-SDWC6
Bernacki, Bruce E.-EThB2
Bertran, Peter.-PThD3, PWC4
Billett, A.-PWC6
Botten, Lindsay C.-PThB5
Bugnon, G.-PWC6
Bienstman, Peter.-PWC4
Bienstman, Peter.-PWC4

C

Cai, Danke.-SDWC5
Cannon, B. D.-EThB2
Castillo, Jose E.-SRThB3
Cendes, Richard.-EThB5
Chapman, J. N.-PWC6
Charegne, J. T.-PWC6
Chatten, Amanda.-SRWB2
Chen, Cheng-Yen.-SDThB2
Chen, Chih-Yen.-SDThB2
Chen, Fei.-JWE3
Chen, Gang.-PThB3
Chen, Kung-Shih.-PThD5
Chen, Quan.-PWC6
Chen, Tong L.-PWC6
Chen, W.-PWC6
Chen, Wei.-PThB2
Chen, Z.-PWC6
Chen, Zhijian.-SDWB5, SDWC3
Chen, Z.-PWC6
Chen, Z.-PWC6
Chen, Z.-PWC6
Chen, Z.-PWC6
Chen, Z.-PWC6
Chen, Z.-PWC6

D

Cossington, D.-JWE16
Crouse, David T.-PWC6
Crook, P.-PWC6

E

Danilov, Victor.-JWE23
Day, Timothy.-EWC5
de Boer, Dick.-SRThB6
de Sterke, C. Martin.-PThB5
DeGroot, Kevin.-JWA
Depauw, Valerie.-PWC3
Despezie, Matthieu.-PWC6
Dewan, Rahul.-PWB1
Diddams, Scott.-EThC1
Ding, L.-PWC6
Dossou, Kooko B.-PThB5
Dotor, Maria Luisa.-JWE12
Dross, Frederic.-PWC3
Drouhin, H. J.-PThB3
Du, Qing Guo.-JWE6
Duong, Dung (pronounced Young).-SDThC3
Dyba, Marcel.-PThB6

F

Fahr, Stephan.-PThB4
Fan, Shanhui.-JThA1
Fink, Manfred.-EThB7
Folvynowicz, Robert.-EThC3
Ford, Joseph.-SRThB2
Fraser, Matthew.-JTBC1
Fried, Alan.-EWC3
Fuentes-Hernandez, Canek.-SDWC5

G

Gautier, S.-PWB3
Ghosh, Dhriti Sundar.-SDWB4
Ginger, David S.-PThB5
Gmachl, Claire.-PWC6
Gollub, Jonah.-PWB2
Gong, Longwen.-EWC5
Gong, Qihuang.-SDWB5, SDWC3
Gord, James R.-EThC4
Gordon, Ivan.-PWC3
Granchini, Giulia.-PThB6
Griffin, Robert.-EWC5
Gu, Ning.-JWE13
Gu, Tian.-SRThB4

H

Hainberger, Rainer.-PWC2
Hallas, Justin.-SRThB2
Hamel, Michael W.-SRThB4
Han, S.-PWC6
Hansen, Ronald K.-EThC6
Hao, Guo-Dong.-SDThB5
Hasegawa, Kazuo.-JWE24
Haske, Wojciech.-SDWC5
Hasna, Gunther.-JWE1, JWE2, PThB6
Haug, Franz Josef.-PWC6
Holloway, Paul.-SDWC6

I

Ilan, Boaz.-JThC4
Ito, Hiroshi.-JWE24

J

Jager, Klaus.-PWC5
James, Thomas L.-PWB2
Jee, Sang Won.-PThB1
Johnson, Todd.-EThC1
Jovanov, Vladislav.-PWB1
Jung, Jin Young.-PThB1

K

K-Y. Jen, Alex.-PThB5
Kahn, Antoine.-SDWC1
Kam, Chan-Hun.-JWE6
Karp, Jason.-SRThB2
Kasahara, Kenichi.-JWE21
Kasebier, Thomas.-JWE7
Kawai, Hiroiyuki.-JWE24
Kelley, David F.-JTBC4, SRThB
Khaleque, Tanjima.-PWB3
Kiang, Yuan Wei.-SDThB2
Kim, Jeewhan.-PWB4
Kim, Sung Jin.-SDWC5
Kinsey, Geoffrey S.-SRWB1
Kippelen, Bernard.-SDWC, SDWC5
Kirchartz, Thomas.-PThB4
Knipp, Dietmar.-PThB, PWB1
Koschel, John.-EWB, JWA
Kostuk, Raymond.-JThC, SRThB3, SRThB5, SRWC
Krauss, Thomas.-JWE8, PWB5, PWC, PWD
Krautz, Danny.-SDWB4
Kroll, Matthias.-JWE7
Kulatilaka, Waruna.-EThC4
Kuo, Yang.-SDThB2
Kurute, Sarah.-JThA3

L

Lanser, El.-PWB2
Latvakoski, Harri.-JWE15
Le, Khai Quang.-PThD3, PWC4
Le, Loan.-EThB5
Lederer, Falk.-PWB4
Lee, Changhee.-SDWB2
Lee, Dae Young.-JWE10
Lee, Jegwon.-SDWC6
Lee, Jung Ho.-PThB1
Lee, Woo Young.-JWE10
Leroy, Julie.-SDWC5
Leutz, Rafael.-EThB, SRWC4
Lewicki, Rafael.-EWC5
Li, Huisang.-SDWC5
Li, Jian.-SDWB, SDWB1
Li, Juntao.-JWE8, PWB5
Li, Xioaohan.-JTBC3
Li, Yan.-JWE17
Liao, Che Hao.-SDThB2
Lim, Ki-Soo.-JWE10
Lin, Chenxi.-JWE9, PThB2
Liscidini, Marco.-PWC1

Renewable Energy and the Environment • 2–3 November 2011

23
**Postdeadline Session**

**Senate**


**Wednesday, 2 November, 17:00–18:00**

**JWD • E2/SOLAR/SOLED**

**Postdeadline Session**

Joseph Ford; Univ. of California at San Diego, United States, Presider

**JWD1 • 17:00**

Numerical Simulation of Micro-optical Structures for Enhancing Efficiency of Solar Panels, R. Dey1, E.V. Bordatchev1, M. Tauhiduzzaman1, H. Reshef1; Centre for Automotive Materials and Manufacturing, National Research Council of Canada, Canada. Four types of elongated planar arrays of micro-optical structures (triangular, rectangular, concave and convex) are numerically simulated. The results allow comprehensive understanding how the photovoltaic performance of solar panels can be improved.

**JWD2 • 17:15**

AGILE: Axially Graded Index Lens as a non-tracking solar concentrator, O. Solgaard1, R. Dauskardt2; Electrical Engineering, Stanford Univ., USA, Material Science and Engineering, Stanford Univ., USA. The Axially Graded Index Lens (AGILE) explicitly takes advantage of the fact that the density of electromagnetic radiation modes is proportional to the square of the Refractive Index to create non-tracking solar concentrators.

**JWD3 • 17:30**

An Airborne Spectrometer and Retrieval Development Project for Air Quality Measurements, J. Leitch1, T. Valle1, C. Hardesty1, T. Delker1, B. Baker1, J. Eskin1, K. Chance1, X. Liu1, S. Janz1; Pickering, J. Wang1; Ball Aerospace, USA; Smithsonian Institution/Smithsonian Astrophysical Observatory, USA; NASA/Goddard Space Flight Center, USA; University of Nebraska, USA. The NASA-funded GeTOASO Instrument Incubator project will develop an airborne spectrometer, participate in field campaigns, and test trace gas and aerosol retrieval performance in support of a proposed space-based air quality sensor in orbit.

**JWD4 • 17:45**

Efficiency Improvement in Top-Emitting Organic Light Emitting Diodes Using Color Conversion Layer, T. Schwab1, S. Hofmann1, M. Thomschke1, K. Leo1, B. Lüssem1; TU Dresden, Institut für Angewandte Photophysik, Germany. We present top-emitting organic light emitting diodes (OLEDs) using internal color conversion layers (CCL). It is shown that pure conversion is realized with CCLs inside the electron transport layer of the OLED providing enhanced efficiency.

(Note: pdp papers are located on the Technical Digest CD Rom)

**Postdeadline Key to Authors and Presiders**

Baker, B.-JWD3
Bordatchev, E.V.-JWD1

Chance, K.-JWD3

Dauskardt, R.-JWD2
Dey, R.-JWD1

Eskin, J.-JWD3
Ford, Joseph-JWD
Hardesty, C.-JWD3
Hofmann, S.-JWD4

Janz, S.-JWD3
Leitch, J.-JWD3
Leo, K.-JWD4
Liu, X.-JWD3
Lüssem, B.-JWD4

Pickering, K.-JWD3
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Schwab, T.-JWD4
Solgaard, O.-JWD2

Tauhiduzzaman, M.-JWD1,
Thomschke, M.-JWD4

Vaidya, N.-JWD2
Valle, T.-JWD3

Wang, J.-JWD3
OSA OPTICS & PHOTONICS CONGRESS

Renewable Energy and the Environment 2012

11–15 NOVEMBER 2012 ■ EINDHOVEN, THE NETHERLANDS

Optical Instrumentation for Energy and Environmental Applications (E2)

Optical Nanostructures and Advanced Materials for Photovoltaics (PV)

Optics for Solar Energy (SOLAR)

Solid State and Organic Lighting (SOLED)

Paper Submission Deadline:
8 July 2012 (12:00 EDT; 16:00 GMT)