

Excitonic Solar Cell Conference 2008

9-12th September 2008

Final Report

The Excitonic Solar Cell Conference 2008 (ESC2008) was held at the University of Warwick, UK, on the 9th-12th September 2008. The conference was specifically focussed on the scientific issues underlying the development of excitonic solar cells, including the characterisation, function and modelling of dye-sensitized, organic and hybrid devices. The conference attracted a total attendance of 154 scientists from 65 universities and institutions in 18 countries and 5 continents. The program consisted of two full days and one half day of oral presentations and discussion, with a poster session spanning the duration of the conference. The oral presentations were made up of 3 keynote speakers (Prof. Michael Grätzel, Prof. Karl Leo and Prof. Sir Richard Friend), 11 invited speakers and 29 submitted talks. A total of 63 posters were presented. The conference schedule and poster list are attached at the end of this document.

The feedback from the conference was overwhelmingly positive, both in terms of scientific content and organisation. Positive comments were received both on the exceptionally high quality of the keynote and invited speakers the conference organisers attracted, but also on the strength in depth of the submitted talks and posters. The general consensus is a definite need for smaller conferences such as this which are focussed on the exciting and rapidly progressing area of excitonic photovoltaics to complement the larger, less focussed meetings. The University of Warwick received praise as an excellent venue for such a conference, particularly as it provided good catering and accommodation facilities on the same site as the conference area.

Whilst it is not possible to review all the excellent presentations given throughout the conference, a small selection are discussed below. Firstly, some of the highlights of the oral presentations were:

Karl Leo from TU Dresden highlighted possible approaches to bring small molecule solar cells nearer to a commercial market. For the purpose of roll to roll processing at room temperature, a low cost substrate is requiring and the energy loss at electrodes should be avoided to increase the open circuit voltage.

Dr. David Ginley, from the National Renewable Energy Laboratory (NREL), USA, emphasized the interfacial optimization in hybrid inorganic polymer cells. In terms of building a cell structure as a whole with maximum power conversion efficiency (PCE), he suggested a method of interfacial modification through depositing a very thin film on top of ITO/glass electrodes. Devices with NiO thin films deposited by pulsed laser deposition, to replace PEDOT:PSS as a hole transporting layer, were shown to have 4% PCE compared to 3.5% for devices with a PEDOT:PSS layer. Self assembled monolayers could also be used as a stability layer and a work function modification layer.

Neal Armstrong of the University of Arizona addressed the importance of pre-treatments of ITO surfaces to increase the electro-active surface area and then increase the rates of electron transfer to solution probe molecules. Due to poor heterogeneous surface composition, topology coupled with atmospheric contaminants, as little as 10 -50 % of the geometric area of the ITO surface was reported to support electron transfer for a chemisorbed redox active molecule. Brief etching of the ITO surface with 12 M HCL, 0.2 M FeCl₃ followed by chemisorption of alkyl-carboxylic acid derivatives of EDOT and the selective electrochemical deposition of copolymer films of PEDOT and PEDOTCA resulted in an ITO surface with optimized electro-activity toward a solution probe molecule such as DMFc, with electron transfer rates approaching those seen on clean metal surfaces. The apparent fraction of the electro-active geometry was increased from less than 1 % for the as-received electrodes to over 50% for the post-treated electrodes.

Jenny Nelson from Imperial College London presented her group's work on understanding the microstructuring of P3HT:PCBM blends and how this relates to device efficiency. She highlighted the group's work using in-situ ellipsometry measurements to monitor the temporal evolution of a P3HT:PCBM blend upon solvent annealing. DSC measurements revealed a eutectic form for varying ratios of P3HT:PCBM blends. However, blends with an

excess of PCBM yielded more efficient devices than the eutectic mixture, which could be attributed to the fact that these formed a more interconnected PCBM structure.

Still on the theme of bulk heterojunction film morphology, Mike McGehee from Stanford University gave a talk on the optimisation of blend ratios. The polymer pBTTT, which is highly crystalline with a high hole mobility, was used in blends with PC_[71]BM. The optimum blend ratio was found to be 1:4, whereas 1:1 blends gave very poor devices. This behaviour was attributed to the structure of pBTTT, which has long well separated side-chains, which allow the PC_[71]BM to intercalate between them. Extra PCBM is therefore required to form an electron transporting phase, which results in the 1:4 ratio. This shows how a blend can potentially be optimised for exciton splitting or charge transport by the packing of the polymer side chains.

Rene Janssen from the Eindhoven University of Technology gave an interesting talk on the formation of a charge transfer state between MDMO-PPV and PCBM. Using a dual-chamber cuvette the absorption of MDMO-PPV and PCBM solutions were measured before and after mixing. This revealed the formation of charge transfer complexes involving most of the PCBM, which could explain the efficient charge generation for this blend.

Jao van de Lagemaat from NREL showed how to incorporate plasmonically active nanostructures in excitonic solar cells. Thin layers of nano-sized transition metal particles are known to cause surface plasmon absorption (scattering effects) and lead to optical field enhancements in their vicinity. Firstly, an evaporated layer of silver nanoparticles with thickness of around 2 nm between the ITO and a PEDOT:PSS layer resulted in a strong increase in J_{sc} (8 mA/cm²) and PCE (2.2%) due to the increased absorbance in the red spectrum around the silver particles. Also the transmission and plasmonic activity of nanohole arrays of Ag were addressed. Nanoholes deposited on a substrate with thickness of around 92 nm, with which the frequency of the Plasmon that occurs on the nanoholes is shifted into the visible wavelength region, strongly enhanced photocurrents. 5 mM of NaCl in DI water was used to redistribute nanoholes. Their plasmonic effects showed dependency on hole density, hole size, angle and light polarization. This nanohole structure can be used to replace ITO.

T. Aernouts from IMEC showed prominent large scale production technologies for organic solar cells. In particular, an Ag grid with PEDOT was spray coated as an electrode to show 2.5% PCE. Screen printing and ink jet printing has also been introduced recently to make different contacting electrodes and to realize monolithic modules on a flexible foil.

Ross Hatton of the University of Warwick discussed efficient hole-extraction in bulk-heterojunction organic solar cells using chemically derivatized carbon nanotubes. Electrode (ITO) treatments with 20 nm of partially oxidized multi-walled carbon nanotubes by acid-oxidation with H_2SO_4 and HNO_3 enhanced electric field intensity without depositing a PEDOT:PSS layer. This brings into question the role of a hole transporting layer, which is normally spin-coated with PEDOT:PSS.

From the Eindhoven University of Technology, Jan Gilot gave a good talk on fully solution processed tandem solar cells, using a ZnO film spin-coated from an acetone solution as the active layer. This method allows for multiple junction solar cells to be created. Using optical modelling the optimum thickness of each active layer was determined, thus maximising the open circuit voltage.

The poster presentations were also of very high quality, with some of the highlights including:

Stefan Plogmaker of Uppsala University presented the properties of a TiO_2 /dye/solid hole-conductor interface. Solid state dye sensitized solar cells were made by infiltrating a melted hole conductor into the pores of a nanoporous dye sensitized TiO_2 electrodes (3 – 12 μm). Characterization with SEM showed the hole trapping at the interface between hole conductor and TiO_2 . IPCE was around 7%

Sungsoo Kim from Imperial College London showed solution processing method for making single walled carbon nanotube anodes with optical transmittance of over 85%, a surface resistivity of 200 ohm/sq and a work function of 4.86 eV. P3HT:PCBM bulk hetero-junction solar cells were fabricated. Efficiency for devices with carbon nanotube electrodes was 0.5%

compared to 1% for devices with ITO anodes. External quantum efficiency for devices with carbon nanotube films was 30% compared to 47% for devices with ITO. Device optimization together with enhancing wetting property of CNTs films is on-going.

Electrodeposition of porous ZnO on textile substrates was presented by Thomas Loewenstein from Justus Liebig University, Gießen. Thin porous films of ZnO were deposited on polyamide threads coated with 1 µm silver, filaments and knitted fabrics. Due to the textile's thermal instability, electrodeposition of porous ZnO films from aqueous zinc salt solutions with a structure directing agent (Eosin Y) was used. Fast deposition rates due to the fibre's microelectrode characteristics were obtained but hydrodynamic processes are yet to be fully understood, and increasing contact between the sensitizer and the redox electrolyte is required. Improvement of efficiency (< 0.1%) and fill factor (< 25%) on textiles are on-going

Peter Holliman from Bangor University presented a low temperature sintering method for TiO₂ electrodes toward large scale manufacturing of dye sensitized solar cells. By using commercially available TiO₂ paste and a thermal catalyst, the fabricated DSSCs sintered at 290°C had a PCE of 4% for 1 cm² cells at 1 sun. However, due to binder degradation, poorer surface conditions lead to decreased dye-uptake and increased series resistance.

Peter Levermore from Imperial College London showed the fabrication method for vapour phase polymerised (VPP) PEDOT on glass or polyester in terms of producing all-flexible optoelectronic devices without ITO. The fabricated VPP-PEDOT films on glass had thicknesses of 40 nm, surface roughness of 2 nm, transmittance of 90% at 550 nm, work function of 4.6 eV and conductivity of 1,000 S-cm. The optimal annealing temperature of 140°C was found and 1.54% PCE for devices with VPP-PEDOT on PET was achieved compared to 2.17% for devices made with ITO on glass.

Thilini Ishwara from Imperial College London presented interface modification and organic layer infiltration methods to facilitate polymer spin coating by tuning hydrophilic surface into hydrophobic. Molecular monolayers or inorganic overlayers were used.

João Benedetti from UNICAMP, Brazil, showed the preparation and application of different core-shell working electrodes in DSSCs assembled with a gel polymer electrolyte. Lengthened electron lifetime under open circuit voltage and enhanced power conversion efficiency were achieved by employing core-shell electrodes such as $\text{TiO}_2/\text{Al}_2\text{O}_3$ (4.59%), TiO_2/MGO (4.94%), $\text{TiO}_2/\text{Nb}_2\text{O}_5$ (4.78%), $\text{TiO}_2/\text{SrTiO}_3$ (4.55%) compared to 4.59% for TiO_2 only devices. Additional thin layers with thickness of around 5 nm had a role of a resistive electron transporting layer.

Sandy Sanchez from Universidad de Lahabana, Spain presented the production and characterization methods for Nanocrystallised CuO-TiO_2 films deposited on a conductive glass substrate. Photo-deposition methods using a UV Vapour mercury lamp and photo catalyst to avoid the use of toxic chemicals were used. Low temperature and low cost processes are also advantageous.

Excitonic Solar Cell Conference 2008

University of Warwick, UK

9-12th September 2008

Tuesday 9th September 2008

Today's Reception Sponsored by:  bp solar

Time	
3-11pm	Registration and key collection desks open, <i>Rootes Building Ground Floor</i>
6pm	Welcome drinks reception sponsored by BP Solar, <i>the Bar, Rootes Building 1st Floor</i>
7.30pm	Dinner, <i>Rootes Restaurant, Rootes Building 1st Floor</i>

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Wednesday 10th September 2008

Today's Reception Sponsored by:



Time	
7-12am	Registration and key collection desks open, <i>Rootes Building Ground Floor</i>
7.30-9.30am	Breakfast served, <i>Rootes Restaurant</i>
9am	Oral Session 1.1, LT3 Science Concourse Chair: James Durrant
9.00am	Welcome by Prof. Tim Jones and Prof. James Durrant , Conference Organisers
9.10am	Keynote Talk: Michael Grätzel (EPFL, Switzerland) <i>Nanocrystalline Junctions and Molecular Photovoltaic Cells</i>
9.50am	Invited Talk: Sean Shaheen (University of Denver, USA) <i>Examining low band gap materials for OPV</i>
10.20am	Invited Talk: David Ginley (NREL, USA) <i>Interfacial Optimization in Hybrid Inorganic – Polymer Solar Cells</i>
10.50am	Tea & Coffee, <i>Science Concourse</i>
11.20am	Oral Session 1.2, LT3 Science Concourse Chair: René Janssen
11.20am	Invited Talk: Jenny Nelson (Imperial College London, UK) <i>Microstructure of polythiophene:fullerene blend films and its influence on photovoltaic device behaviour</i>
11.50am	Invited Talk: Mike McGehee (Stanford University, USA) <i>An experimental and theoretical study of charge transport in carbon nanotube networks for transparent electrodes</i>
12.20pm	Neil Greenham (University of Cambridge, UK) <i>Loss Mechanisms in Polymer Blend Photovoltaic Devices</i>
12.40pm	Amy Ballantyne (Imperial College London, UK) <i>Optimisation of morphology and energy level structure of bulk heterojunction polymer/fullerene solar cells</i>
1.00pm	Lunch, <i>Rootes Restaurant</i>
2.10pm	Oral Session 1.3, LT3 Science Concourse Chair: Tim Jones
2.10pm	Keynote Talk: Karl Leo (TU Dresden, Germany) <i>Small molecule organic solar cells: Challenges and Opportunities</i>
2.50pm	Invited Talk: Neal Armstrong (University of Arizona, USA) <i>Two New Approaches to Organic Solar Cell Materials: Electrodeposited poly(Thiophenes) and Solvent-Annealed Titanyl Phthalocyanines</i>
3.20pm	Jao van de Lagemaat (NREL, USA) <i>Plasmonic effects in excitonic solar cells</i>
3.40pm	Tea & Coffee, <i>Science Concourse</i>
4.00pm	Oral Session 1.4, LT3 Science Concourse Chair: Laurie Peter
4.00pm	Invited Talk: Gerald Meyer (John Hopkins University, USA) <i>Photodriven Electron and Cation Transfer in Dye Sensitized Solar Cells</i>
4.30pm	Gerrit Boschloo (Uppsala University, Sweden) <i>Dye-sensitized solar cells: dye regeneration and hole transport by iodide / triiodide electrolytes or molecular hole conductors</i>
4.50pm	Francisco Fabregat-Santiago (Universitat Jaume I, Spain) <i>Electrical properties of solid state Dye solar cell with spiro-OMeTAD as hole conductor</i>
5.10pm	Johann Bouclé (University of Limoges, France) <i>Solution-processed ZnO-polymer hybrid bulk heterojunctions</i>
5.30-7pm	Poster Session & Wine Reception sponsored by Asylum Research UK, <i>Science Concourse</i>
7.30pm	Conference Dinner, <i>Panorama Suite, Rootes Building 2nd Floor</i>

Thursday 11th September 2008

Today's Reception Sponsored by: **Kurt J. Lesker**
Company

Time

7.30-9.30am Breakfast served, *Rootes Restaurant*

9am **Oral Session 2.1, LT3 Science Concourse** **Chair: Garry Rumbles**

9.00am **Keynote Talk: Richard Friend (University of Cambridge, UK)**
Charge photogeneration from polymer semiconductor heterojunctions

9.40am **Invited Talk: René Janssen (Eindhoven Uni. of Technology, NL)**
The Role Of Ground And Excited Charge Transfer States In Polymer:Fullerene Solar Cells

10.10am **Gerhard Gobsch (Ilmenau University of Technology, Germany)**
Sub-bandgap absorption in polymer solar cells

10.30am Tea & Coffee, *Science Concourse*

11.00am **Oral Session 2.2, LT3 Science Concourse** **Chair: Neil Robertson**

11.00am **Invited Talk: Laurie Peter (University of Bath, UK)**
Characterization and Modelling of dye-sensitized solar cells

11.30am **Invited Talk: Juan Bisquert (Universitat Jaume I, Spain)**
Connection between photovoltaic performance and impedance spectroscopy parameters in all-solid nanostructured and organic solar cells

12.00am **Brian O'Regan (Imperial College London, UK)**
Injection and Recombination in Dye Sensitized Solar Cells; The Effects of Dye Structure and Band Edge Position

12.20pm **Henry Snaith (University of Oxford, UK)**
Diblock copolymers as sacrificial templates in mesostructured excitonic solar cells

12.40pm Lunch, *Rootes Restaurant*

Continues Overleaf.....

2.00pm **Parallel Oral Sessions 2.3a/b, LT3/LT4 Science Concourse**

Session 2.3a: Materials and Devices, LT3 Science Concourse

Chair: Paul Burn

2.00pm	Neil Robertson (University of Edinburgh, UK) <i>Ru-Complex Dyes with Dithiolene ligands for DSSC</i>
2.20pm	Michael Walter (Portland State University, USA) <i>Nanostructured Aminophenylporphyrin Films for Use in Bulk Heterojunction and Inverse Dye-sensitized TiO₂ Solar Cells</i>
2.40pm	Hongxia Wang (University of Bath, UK) <i>Characterization of dye-sensitized solar cells by light-induced infrared absorption measurements</i>
3.00pm	Emilio Palomares (ICIQ Catalonia, Spain) <i>Photo-induced Charge Recombination Kinetics on CdSe/P3HT Photovoltaic Devices</i>
3.20pm	Hari Upadhyaya (Loughborough University, UK) <i>Band gap tunability in (CdPb)S based quantum dots for photovoltaic application</i>

Session 2.3b: Characterisation and Modelling, LT4 Science Concourse

Chair: Alison Walker

2.00pm	Chris Groves (University of Cambridge, UK) <i>Bimolecular Recombination in organic photovoltaics</i>
2.20pm	Gytis Juška (Vilnius University, Lithuania) <i>Charge Carrier Recombination in PCBM/RR-P3HT Solar Cells</i>
2.40pm	Christopher Shuttle (Imperial College London, UK) <i>Recombination Dynamics In Organic Solar Cells</i>
3.00pm	James Kirkpatrick (Imperial College London, UK) <i>Molecular modeling of charge transport</i>
3.20pm	Joseph Norton (Georgia Institute of Technology, USA) <i>Polarization Effects In Oligoacene Crystals And Charge Separation At Oligoacene/C60 Interfaces</i>

3.40pm Tea & Coffee, Science Concourse

4.00pm **Parallel Oral Sessions 2.4a/b, LT3/LT4 Science Concourse**

Session 2.4a: Materials and Devices, LT3 Science Concourse

Chair: Jan Kroon

4.00pm	Simon King (Imperial College London, UK) <i>Controlling Charge Transfer in Polymer Photovoltaics Using Donor-Acceptor Block Copolymers</i>
4.20pm	Jörg Ackermann (CNRS Marseille, France) <i>New hybrid P-N junction nanorods as building blocks for bulk heterojunction solar cells</i>
4.40pm	Oral Presentations from Selected Poster Presenters (4x5mins + questions)

Session 2.4b: Characterisation and Modelling, LT4 Science Concourse

Chair: Brian O'Regan

4.00pm	Andrew Evans (Aberystwyth University) <i>Measurement of energy band alignment and thin film morphology in an organic photovoltaic cell structure using photoelectron spectroscopy</i>
4.20pm	Priti Tiwana (University of Oxford, UK) <i>Charge Carrier Dynamics in Dye-sensitized Nanostructured TiO₂, studied using Time-Resolved THz Spectroscopy</i>
4.40pm	Oral Presentations from Selected Poster Presenters (4x5mins + questions)

5.30-7pm Poster Session & Wine Reception sponsored by Kurt J. Lesker Company, Science Concourse

7.30pm Dinner, Rootes Restaurant

Friday 12th September 2008

Time

7.30-9.30am Breakfast served, *Rootes Restaurant*

9am **Oral Session 3.1, LT3 Science Concourse** **Chair: Neil Greenham**

9.00am **Invited Talk: Olle Inganäs (Linköping University, Sweden)**

Tandem solar cells in alternative geometries

9.30am **Rico Schueppel (Technische Universität Dresden, Germany)**

Small molecule tandem solar cells

9.50am **Jan Gilot (Eindhoven University of Technology, NL)**

Tandem Polymer Solar Cells Processed from Solution

10.10am **Tom Aernouts (IMEC, Belgium)**

Processing technologies for organic solar cells

10.30am Tea & Coffee, *Science Concourse*

11.00am **Oral Session 3.2, LT3 Science Concourse** **Chair: Sean Shaheen**

11.00am **Paul Burn (University of Queensland, Australia)**

Ruthenium dendrimers: influence of molecular volume on the efficiency of Dye-Sensitized Solar Cells (DSSCs)

11.20am **Philippe Leriche (Université d'Angers, France)**

Star-shaped Conjugated Systems Derived from Triphenylamine as Active Materials for Organic Solar Cells

11.40am **Ross Hatton (University of Warwick, UK)**

Efficient hole-extraction in bulk-heterojunction organic photovoltaics using chemically derivatized carbon nanotubes

12.00am **Invited Talk: Darin Laird (Plextronix, USA)**

Advances in Plexcore™ active layer technology systems for Organic Solar Cells

12.30pm Student Prize Presentations, *LT3 Science Concourse*, followed by.....

Lunch, *Rootes Restaurant*

Close of conference.

List of Posters

Characterisation & Modelling		
PC01	Zuleta, Marcelo Uppsala University, Sweden	<i>Monitoring of Adsorbed Dyes on TiO₂ surfaces by means of Scanning Tunneling Microscopy (STM)</i>
PC02	Hoppe, Harald Ilmenau University of Technology, Germany	<i>Morphology and annealing effects in P3HT/PCBM blends</i>
PC03	Barnes, Piers Imperial College London, UK	<i>Quantifying loss processes in dye sensitised solar cells</i>
PC04	Jennings, James University of Bath, UK	<i>Characterisation of dye-sensitised TiO₂ nanotube based solar cells</i>
PC05	Anta, Juan (1) Universidad Pablo de Olavide, Spain	<i>Combined effect of energetic and spatial disorder on the traplimited electron diffusion coefficient of metal-oxide nanostructures</i>
PC06	Keivanidis, Panagiotis Imperial College London, UK	<i>Interdependence of charge separation efficiency and film morphology in P3HT:PCBM photovoltaic films: donor/acceptor composition effects</i>
PC07	Shoae, Safa Imperial College London, UK	<i>Transient Absorption Spectroscopy of Polymer:Perylene Diimide Films: Charge Generation</i>
PC08	White, Matthew NREL, USA	<i>Investigations of polymer/oxide interfaces by electrical impedance Spectroscopy</i>
PC09	Dunn, Halina University of Bath, UK	<i>Studies of Electron Transport and Electron Transfer in Dye-sensitized Solar Cells</i>
PC10	Frost, Jarvist Imperial College London, UK	<i>Multi-scale Molecular Modelling of Organic Electronic Materials</i>
PC11	Beenken, Wichard Ilmenau University of Technology, Germany	<i>Formation of Spectroscopic Units in Conjugated Polymers</i>
PC12	Urbina, Antonio Universidad Politecnica de Cartagena, Spain	<i>Influence of ultraviolet radiation and ozone exposure on the nanoscale structure and transport properties of poly-3-octyl-thiophene films used as active layers in organic solar cells</i>
PC13	Hamilton, Richard Imperial College London, UK	<i>Modelling the J-V curve from Recombination Dynamics and Charge Generation</i>
PC14	Shaw, Paul St. Andrews, UK	<i>Distance-dependence of energy transfer in exciton harvesting conjugated polymer films</i>

PC17	Cappel, Ute Uppsala University, Sweden	<i>Study of electron transfer processes in solid state dye-sensitized solar cells by Photoinduced Absorption Spectroscopy (PIA)</i>
PC18	Leventis, Henry Imperial College London, UK	<i>Transient Optical Studies of Quantum Dot Solar Cells</i>
PC19	Anderson, Assaf Imperial College London, UK	<i>The Role of regeneration as a limiting step in DSSCs performance – transient optoelectronic studies</i>
PC20	Cheung, David University of Warwick, UK	<i>Simulation of poly-(3-hexylthiophene):microstructure and charge transport</i>
PC23	Kimber, Robin University of Bath, UK	<i>A Microscopic Model Of Organic Photovoltaic Cells</i>
PC24	Morfa, Anthony NREL / Colorado, USA	<i>Anisotropic Optical Modeling of P3HT, PCBM and Blended Films</i>
PC25	Jones, Daniel University of Warwick, UK	<i>Using a tightbinding approximation to compute the electronic structure of sensitizer molecules adsorbed onto TiO₂ surfaces.</i>
PC27	Dane, Justin Imperial College London, UK	<i>Charge Transport, Degradation, and Interfacial Effects in P3HT:PCBM Cells Studied via Admittance Spectroscopy</i>
PC28	Bounioux, Celine Ben-Gurion University / TU Ilmenau, Israel	<i>LESR study of photoinduced charge transfer between conjugated polymers and single wall carbon nanotubes</i>
PC29	Maurano, Andrea Imperial College London, UK	<i>Understanding device performance: charge carrier density and decay lifetime in bulk heterojunction polymer/fullerene solar cells</i>
PC30	Plogmaker, Stefan Uppsala University, Sweden	<i>Properties of TiO₂/dye/hole-conductor interface deposited using a molten organic conducting material and by vacuum deposition</i>
<i>Materials & Devices</i>		
PM01	Ratcliff, Erin University of Arizona, USA	<i>Organic Solar Cells Based on Electrodeposited poly(3-hexylthiophene)</i>
PM02	Olson, Carol ECN Solar Energy, Netherlands	<i>Transparent Titania Nanotubes Applied in Dye-Sensitized Solar Cells</i>
PM03	Watkins, Scott CSIRO, Australia	<i>Polymer Solar Cells: the design of non-conjugated polymers and studies of semiconductor energy levels</i>
PM04	Dyer-Smith, Clare Imperial College London, UK	<i>Studies of self assembling light harvesting units in organic solar cells</i>
PM05	Poize, Guillaume CINAM Marseille, France	<i>Morphology control of bulk heterojunction solar cells based on blends of P3HT and ZnO nanoparticles</i>

PM06	Al-Khalifah, Manea University of Hull, UK	<i>Organic photovoltaics based on liquid crystal porous networks</i>
PM07	Rugen-Hankey, Sarah Bangor University, UK	<i>Unsymmetrical Phthalocyanines for Dye Sensitized Solar Cells</i>
PM08	Oosterhout, Stefan Eindhoven University, Netherlands	<i>Hybrid Polymer: Metal Oxide Solar Cells</i>
PM09	Kim, Sungsoo Imperial College London, UK	<i>Single-Walled Carbon Nanotube Electrodes for All-Plastic Solar Cells</i>
PM10	Schumann, Stefan and Berhanu, Sarah University of Warwick / Imperial College London, UK	<i>Colloidal crystals as nanostructured templates for organic solar cells</i>
PM11	Marek, Peter Karlsruhe Institute of Technology, Germany	<i>Towards Biomimetic Solar Cells</i>
PM12	Stingelin-Stutzmann, Natalie Queen Mary, UK	<i>Binary Organic Photovoltaic Blends: A Simple Rationale for Optimum Compositions</i>
PM13	Marquéz, Lourdes Universitat Jaume I, Spain	<i>Effect of TiO₂ blocking layer in the behavior of open circuit decay</i>
PM14	Tuladhar, Sachetan Imperial College London, UK	<i>Stability measurements of encapsulated P3HT:PCBM blend solar cells under continuous irradiation and various ambient conditions</i>
PM17	Loewenstein, Thomas Justus-Liebig-Universität Gießen, Germany	<i>Electrodeposition of porous ZnO on textile substrates for application in dye-sensitized solar cells</i>
PM18	Connell, Arthur Bangor University, UK	<i>Low Temperature Sintering in Dye-Sensitized Solar Cells (DSSC)</i>
PM19	Opitz, Andreas University of Augsburg, Germany	<i>Planar vs. bulk-heterojunction solar cells based on CuPc and C60</i>
PM20	Lei, Chunghong University of Hull, UK	<i>Calamatic liquid crystal blends for organic photovoltaics</i>
PM21	Hiorns, Roger Université de Bordeaux, France	<i>Main-chain fullerene polymers for photovoltaic devices</i>
PM22	Levermore, Peter Imperial College London, UK	<i>Flexible Solar Cells with Electrodes Formed by Vapour Phase Polymerization</i>
PM25	Chauhan, Virendra University of Warwick, UK	<i>Extending the Interface Gap in Phthalocyanine/C60 Hetrojunctions: Influence on Voc and Device Performance</i>
PM26	Maluta, Eric University of Bath, UK	<i>Dye Uptake Process in Dye-sensitized Photovoltaic Cells</i>

PM27	Tu, Guoli University of Cambridge, UK	<i>Progress of Organic Solar Cells Based on Polymer Brushes and New Low Bandgap Conjugated Polymers</i>
PM28	Podhájecká, Klára Academy of Sciences of Czech Rep.	<i>PV device containing combined molecularly dissolved and crystalline perylene diimide derivative</i>
PM31	Ishwara, Thilini Imperial College London, UK	<i>Studies of interface modification and organic layer infiltration in hybrid organic / metal oxide solar cell structures</i>
PM32	Placencia, Diogenes University of Arizona, USA	<i>Organic Solar Cells Based on Titanyl Phthalocyanine Donor Layers</i>
PM33	Dissanayake, Nanditha University of Surrey, UK	<i>Design and fabrication of PbS-nanocrystal:C60 photovoltaic devices</i>
PM34	Liu, Junpeng Peking University, China	<i>Hybrid Polymer Solar Cells Based on Vertically Oriented ZnO Nanowires</i>
PM35	Anta, Juan (2) Universidad Pablo de Olavide, Spain	<i>Photovoltaic performance of nanostructured zinc oxide sensitised with xanthene dyes</i>
PM36	Chen, Ming CSIRO, Australia	<i>Engineered Photoactive Polymers for Efficient Excitonic Energy Harvesting</i>
PM37	Alet, Pierre-Jean CEA Saclay, France	<i>Hybrid solar cells based on nano-structured silicon thin films and P3HT</i>
PM38	Ferenczi, Toby Imperial College London, UK	<i>Micro-structure and vertical segregation in polymer:fullerene blend solar cells</i>
PM39	Linfoot, Charlotte University of Edinburgh, UK	<i>Cu(I) Bipyridyl Dyes for use in DSSCs</i>
PM40	Unger, Eva Uppsala University, Sweden	<i>Hybrid solar cells with TiO2 acceptor and Triphenylamine-Thienylenevinylene donor</i>
PM43	Rhodes, Rhys University of Manchester, UK	<i>Relationships between photoactive layer film morphology of hybrid polymer solar cells and nanoparticle dispersion colloid stability</i>
PM44	Galagan, Yulia Holst Centre, Netherlands	<i>From lab scale to reel-to-reel production of low cost organic solar cells</i>
PM45	Freitas, Jilian UNICAMP, Brazil	<i>Photovoltaic solar cells based on new poly(fluorenylene vinylene) derivatives and CdSe quantum dots</i>
PM46	Benedetti, João UNICAMP, Brazil	<i>Preparation and characterization of core shell SrTiO3, Al2O3, and MgO-coated TiO2 electrodes and their application in Dye-Sensitized Solar Cells</i>

Participation List

Convenors

Prof. James Durrant, Imperial College London, UK
Prof. Tim Jones, University of Warwick, UK
Prof. Laurie Peter, University of Bath, UK (also Invited Speaker)
Dr. Garry Rumbles, NREL, USA
Dr. Paul Sullivan, University of Warwick, UK

Keynote and Invited Speakers

Prof. Sir. Richard Friend, University of Cambridge, UK
Prof. Michael Grätzel, EPFL, Switzerland
Prof. Karl Leo, Dresden Technical University, Germany

Prof. Neal Armstrong, University of Arizona, USA
Prof. Juan Bisquert, Universitat Jaume I, Spain
Dr. David Ginley, NREL, USA
Prof. Olle Inganäs, Linköping University, Sweden
Prof. René Janssen, Eindhoven University of Technology, Netherlands
Dr. Darin Laird, Plextronix, USA
Dr. Mike McGehee, Stanford University, USA
Prof. Gerald Meyer, Johns Hopkins University, USA
Prof. Jenny Nelson, Imperial College London, UK
Dr. Sean Shaheen, University of Denver, USA

Other Speakers

Dr. Jörg Ackermann, Centre Interdisciplinaire de Nanoscience de Marseille (CINAM), France
Dr. Tom Aernouts, imec, Belgium
Dr. Amy Ballantyne, Imperial College London, UK
Dr. Gerrit Boschloo, Uppsala University, Sweden
Dr. Johann Bouclé, University of Limoges, France
Prof. Paul Burn, University of Queensland, Australia
Prof. Andrew Evans, Aberystwyth University, UK
Dr. Francisco Fabregat-Santiago, Universitat Jaume I, Spain
Mr. Jan Gilot, Eindhoven University of Technology, Netherlands
Prof. Gerhard Gobsch, Ilmenau University of Technology, Germany
Dr. Neil Greenham, University of Cambridge, UK
Dr. Chris Groves, University of Cambridge, UK
Dr. Ross Hatton, University of Warwick, UK
Prof. Gytis Juška, Vilnius University, Lithuania
Mr. Simon King, Imperial College London, UK
Dr. James Kirkpatrick, Imperial College London, UK
Dr. Philippe Leriche, University of Angers, France

Dr. Joseph Norton, Georgia Tech, USA
Dr. Brian O'Regan, Imperial College London, UK
Dr. Emilio Palomares Gil, Institut Catala d'Investigacio Quimica (ICIQ), Spain
Dr. Neil Robertson, University of Edinburgh, UK
Dr. Rico Schueppel, Dresden Technical University, Germany
Mr. Christopher Shuttle, Imperial College London, UK
Dr. Henry Snaith, University of Oxford, UK
Mrs. Priti Tiwana, University of Oxford, UK
Dr. Hari Upadhyaya, Loughborough University, UK
Dr. Jao van de Lagemaat, NREL, USA
Mr. Michael Walter, Portland State University, USA
Dr. Hongxia Wang, University of Bath, UK

Poster Presentations

Mr. Pierre-Jean Alet, CEA – Saclay, France
Mr. Manea Al-Khalifah, University of Hull, UK
Mr. Assaf Anderson, Imperial College London, UK
Dr. Juan Anta, Universidad Pablo de Olavide, Spain
Dr. Piers Barnes, Imperial College London, UK
Dr. Wichard Beenken, Ilmenau University of Technology, Germany
Mr. João Benedetti, UNICAMP, Brazil
Ms. Sarah Berhanu, Imperial College London, UK
Ms. Celine Bounioux, Ben-Gurion University of the Negev / TU Ilmenau, Israel
Ms. Ute Cappel, Uppsala University, Sweden
Mr. Virendra Chauhan, University of Warwick, UK
Dr. Ming Chen, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
Dr. David Cheung, University of Warwick, UK
Dr. Arthur Connell, Bangor University, UK
Mr. Justin Dane, Imperial College London, UK
Mr. Nanditha Dissanayake, University of Surrey, UK
Ms. Halina Dunn, University of Bath, UK
Ms. Clare Dyer-Smith, Imperial College London, UK
Mr. Toby Ferenczi, Imperial College London, UK
Ms. Jilian Freitas, UNICAMP, Brazil
Mr. Jarvist Frost, Imperial College London, UK
Dr. Yulia Galagan, Holst Centre, Netherlands
Dr. Richard Hamilton, Imperial College London, UK
Dr. Roger Hiorns, Université de Bordeaux, France
Dr. Harald Hoppe, Ilmenau University of Technology, Germany
Mrs. Thilini Ishwara, Imperial College London, UK
Mr. James Jennings, University of Bath, UK
Mr. Daniel Jones, University of Warwick, UK
Dr. Panagiotis Keivanidis, Imperial College London, UK
Mr. Sungsoo Kim, Imperial College London, UK
Mr. Robin Kimber, University of Bath, UK
Dr. Chunghong Lei, University of Hull, UK
Mr. Henry Leventis, Imperial College London, UK
Dr. Peter Levermore, Imperial College London, UK
Ms. Charlotte Linfoot, University of Edinburgh, UK

Dr. Junpeng Liu, Peking University, China
Mr. Thomas Loewenstein, Justus-Liebig-Universität Gießen, Germany
Mr. Eric Maluta, University of Bath, UK
Mr. Peter Marek, Karlsruhe Institute of Technology, Germany
Ms. Lourdes Marquéz, Universitat Jaume I, Spain
Mr. Andrea Maurano, Imperial College London, UK
Mr. Anthony Morfa, NREL / Colorado, USA
Dr. Carol Olson, ECN Solar Energy, Netherlands
Mr. Stefan Oosterhout, Eindhoven University, Netherlands
Dr. Andreas Opitz, University of Augsburg, Germany
Mr. Diogenes Placencia, University of Arizona, USA
Mr. Stefan Plogmaker, Uppsala University, Sweden
Ms. Klára Podhájecká, Academy of Sciences of Czech Rep., Czech Rep.
Mr. Guillaume Poize, Centre Interdisciplinaire de Nanoscience de Marseille (CINAM), France
Mrs. Erin Ratcliff, University of Arizona, USA
Mr. Rhys Rhodes, University of Manchester, UK
Ms. Sarah Rugen-Hankey, Bangor University, UK
Mr. Stefan Schumann, University of Warwick, UK
Mr. Paul Shaw, St. Andrews, UK
Ms. Safa Shoae, Imperial College London, UK
Dr. Natalie Stingelin-Stutzmann, Queen Mary University of London, UK
Dr. Guoli Tu, University of Cambridge, UK
Dr. Sachetan Tuladhar, Imperial College London, UK
Ms. Eva Unger, Uppsala University, Sweden
Dr. Antonio Urbina, Universidad Politecnica de Cartagena, Spain
Dr. Scott Watkins, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
Mr. Matthew White, NREL, USA
Dr. Marcelo Zuleta, Uppsala University, Sweden

Other Attendees

Dr. Eva M. Barea, Universitat Jaume I, Spain
Ms. Nicola Beaumont, University of Warwick, UK
Mr. Thomas Brenner, University of Cambridge, UK
Dr. Miguel Carrasco, Merck, UK
Ms. Silvia Colella, CNR Lecce, Italy
Dr. Gavin Collis, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
Dr. Raffaello Da Campo, University of Warwick, UK
Ms. Tracy Dos Santos, Imperial College London, UK
Dr. Alan Dunbar, University of Sheffield, UK
Ms. Anne Finger, Clausthal University of Technology, Germany
Ms. Irene Gonzalez-Valls, Centre d'Investigacions en Nanociència i Nanotecnologia, Spain
Mr. Ian Hancox, University of Warwick, UK
Dr. Saif Haque, Imperial College London, UK
Mr. Thomas Howells, University of Warwick, UK
Ms. Fabiola Iacono, Universitat Jaume I, Spain
Dr. Benoit Illy, Imperial College London, UK
Mr. Martin Karlsson, BASF / Uppsala University, Germany
Dr. James Kingsley, University of Sheffield, UK
Dr. Stuart Kitney, University of Hull, UK

Dr. Jan M. Kroon, ECN Solar Energy, Netherlands
Mrs. Xiaoe Li, Imperial College London, UK
Dr. Monica Lira-Cantu, Centre d'Investigacions en Nanociència i Nanotecnologia, Spain
Dr. Emyr MacDonald, Cardiff University, UK
Dr. Leanne Marle, Royal Society of Chemistry, UK
Dr. Martyn McLachlan, Imperial College London, UK
Ms. Giovanna Melcarne, CNR Lecce, Italy
Dr. Antoni Munar, Universitat Jaume I, Spain
Mr. Edward New, University of Warwick, UK
Dr. Patrick Nicholson, National Physical Laboratory, UK
Prof. Mary O'Neill, University of Hull, UK
Ms. Annamaria Petrozza, Sharp Laboratories of Europe, UK
Dr. Håkan Rensmo, Uppsala University, Sweden
Dr. Jason Riley, Imperial College London, UK
Mr. Sandy Sanchez, Instituto superior politécnico José Antonio Echevarría, Cuba
Dr. Stefan Schaefer, Robert Bosch GmbH, Germany
Mr. Michele Sessolo, University of Valencia, Spain
Prof. Mike Shipman, University of Warwick, UK
Dr. Paul Staniec, University of Sheffield, UK
Dr. Peter Taylor, Sharp Laboratories of Europe, UK
Dr. Alessandro Troisi, University of Warwick, UK
Prof. Alison Walker, University of Bath, UK
Ms. Claire Walker, University of Bath, UK
Dr. Martijn Wienk, Eindhoven University, Netherlands
Dr. Gerry Wilson, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
Dr. Stefano Zambelli, Silcart Srl, Italy