

Event organised by



Supported by



CHEETAH

Cost-reduction through material optimisation and Higher EnErgy output of solar photovoltaic modules joining Europe's Research and Development efforts in support of its PV industry

European Solar Technology Forum – From Research to Industrial Application // CHEETAH final event



A European Project supported through the Seventh Framework Programme for Research and Technological Development



European Solar Technology Forum - From Research to Industrial Application // CHEETAH's Final Event

30 November 2017

Helmholtz-Zentrum Berlin für Materialien und Energie (HZB), Berlin, Germany

This event is a unique networking opportunity to get to know leading experts from research and also industry. It summarises 4 years' research results, how to implement and continue the innovations in the years to come. Key innovations include:

- Water based Crystalline Silicon - « Getting below a 100 microns »
- Thin Film PV - « Thinner and more efficient through smart cells »
- Organic PV & Perovskite - « Intrinsic long term stability without special encapsulation »

One of the core objectives of the CHEETAH project is to accelerate the implementation of innovative technologies in the PV industry. SolarPower Europe and EIT-InnoEnergy support the project consortium in establishing the link between research and industry by the organisation of public conferences and the publication of reports demonstrating the commercial value of technologies developed in the CHEETAH project. CHEETAH research institutes are keen to discuss and launch partnerships with companies to commercialise new solutions developed in the CHEETAH project.

CHEETAH is a combined collaborative project (CP) and coordination and support action (CSA) funded under the European Commission's 7th Framework Programme (2014 – 2017). CHEETAH aims to solve specific R&D issues in the EERA-PV Joint Program and to overcome fragmentation of European PV R&D in Europe and intensify the collaboration between R&D providers

and industry to accelerate the industrialization of innovations.

With 16 nationalities represented in the consortium, CHEETAH's ambition is to develop technology and foster innovative manufacturing capabilities and photovoltaic products so that Europe can develop its technological and industrial capacity in all parts of the value chain.

CHEETAH's objectives for the 4 years of the program were threefold:

- Developing new concepts and technologies for wafer-based crystalline silicon PV (modules with ultrathin cells), thin film PV (advanced light management) and organic PV (very low-cost barriers), resulting in (strongly) reduced cost of environmentally benign/abundant/non-toxic materials and increased module performance.
- Fostering long-term European cooperation in the PV R&D sector, by sharing knowledge, organizing workshops, exchange and training researchers inside and outside Europe, efficient use of infrastructures, promoting best practices and standards.
- Accelerating the implementation of innovative technologies in the PV industry, by a strong involvement of SolarPower Europe and EIT-InnoEnergy in this program.

Speaker's biographies

Dr. Anna Battaglia has a Master's and a PhD in the field of materials modification induced by ion implantation from the University of Catania. Having worked for several manufacturers in technology management support, she has more than 20 years of experience in the semiconductor industry. In 2012 she joined 3SUN to oversee industrial research on thin film silicon PV and coordinates two EUP7 projects (Fast-Track, Agatha). She is author of several articles and patents.



Michael Bauer has a degree in Process and Mechanical Engineering from Martin-Luther-University of Halle and Technical University Braunschweig with a dissertation on the theoretics of scale up of heat transfer mechanisms in tubular fixed bed reactors. After being in charge of process development at various organisations such as Bayer CorpScience and later McKinsey Inc, he joined Calyxo GmbH, a former subsidiary of Q-Cells SE, in 2008 as CTO/COO. In 2017 he became Managing Director of Calyxo GmbH.



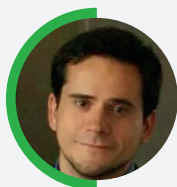
Christopher Case is the Chief Technology Officer at Oxford PV, a spin-out of Oxford University that is commercialising perovskites for PV applications. Most recently, he was the Chief Technology Officer for Linde Electronics and the former Chief Scientific Officer of The BOC Group. Earlier, he was engineering professor at Brown University and spent 10 years at AT&T Bell Labs.



Adrien Danel holds a master's degree in physics and a Ph.D. degree in microelectronics from INPG Grenoble. From 2004 to 2008 he was leading the team in charge of metrology and trace analysis in CEA-LETI's cleanrooms. In 2009, he joined INES focusing on heterojunction crystalline cells and contributing to technology transfer and industrialization as process integration leader in the CEA-INES heterojunction pilot line.



Aldo Di Carlo is full professor of Optoelectronics and Nanoelectronics at the University of Rome "Tor Vergata" (Italy). Since 2006 he is director of the Centre for Hybrid and Organic Solar Energy (CHOSE) which involves more than 30 researchers for the development and industrialization of the organic and hybrid organic/inorganic photovoltaic technologies. Di Carlo is author/coauthor of more than 350 scientific publications on international journals, 13 patents and several book chapters.



Guillermo A. Farías Basulto was born in 1987 in Guadalajara, Mexico. He studied industrial engineering at the University of Guadalajara and a MSc. in Global Production Engineering-Solar at Technical University Berlin. In 2016, he joined HZB-PVcomB, where he works developing ideas and concepts for both micro-concentration of solar energy and topics related to laser patterning for thin film photovoltaics.

Dr. Erik Gabrielsson has been the Chief Technology Officer of Dyenamo since August 2014 and is responsible for the company's R&D activities in the fields of Dye-Sensitized (DSSC) and Perovskite Solar Cells (PSC). Dr. Gabrielsson holds a PhD in organic chemistry from the Royal Institute of Technology (KTH) in Stockholm.



Suren Gevorgyan is a senior scientist at the Technical University of Denmark. He received his PhD from the Technical University of Denmark in 2010. From the early years of his career Suren has been working in the field of organic photovoltaics and specializing in characterization and stability improvements of the devices. His main research interests include device engineering and optimization, encapsulation, device lifetime, standard testing procedures and electro-optical characterization.



Dr. Ivan Gordon has a PhD in the field of novel magnetic materials for sensor applications from the University of Leuven. He joined IMEC in 2003 where he leads the Silicon PV group. He is also editor of the journal Solar Energy Materials and Solar Cells and associate editor of the IEEE Journal on PV. He authored and co-authored more than 200 scientific papers. Since 2016 he is the coordinator of EERA-PV and steering committee member of ETIP-PV.



Senior Research Scientist **Dr. Jan Kroon**, studied chemistry at the University of Amsterdam and received his PhD in the field of Physical Organic Chemistry. He joined ECN in 1996 where he worked as project manager for Organic PV until 2013. Since then, he is senior project manager in the PV module technology and reliability group and program coordinator for back contact x-Si cells and modules. He is an experienced manager of national and international projects including CHEETAH.



Kristin Lüdemann did her Thesis at UNSW, Australia, about Thin Silicon PV on glass. She has spent 15 years at Roth & Rau GmbH (today, Meyer Burger Germany), latest position "Head of Strategic Product Marketing" (before positions in Technology development, Project Management and "Head of Sales AMER/EMEA"). Currently, 3 years at Von Ardenne GmbH as "Vice President Crystalline Photovoltaic".



Lars Oberbeck has 20 years of experience in Si PV and semiconductor research and development. He has a diploma in Physics from the University of Hanover and a PhD in Electrical Engineering from the University of Stuttgart in the field of c-Si PV. Following his post-doctoral research at the University of New South Wales (Australia) he worked for Infineon and later for SolarWorld and joined Total in 2012 as Head of the solar R&D department.



Prof. **Dr. Rutger Schlatmann** has a PhD from the FOM Institute Amolf in Amsterdam. He is director of the Institute for Thin-Film and Nanotechnology for PV at the Helmholtz-Zentrum Berlin and full professor at the Hochschule fuer Technik und Wirtschaft Berlin. He is also member of the ETIP-PV steering committee and vice-president of the Berlin Brandenburg Energy Network. His research focuses on thin film and nanotechnology for Si-based and compound semiconductor solar energy. He also works on the generation of integrated PV and electrolysis systems to produce 'solar fuels'.



Martina Schmid holds a PhD from Freie Universität Berlin, receiving the Carl-Ramsauer Award of the German Physical Society (DPG) and the DGM Young Researcher Award of the German Society of Material Science. After postdoctoral stays at the University of Ljubljana and the California Institute of Technology, she started a Young Investigator Group at HZB in 2012. In 2013 she became Junior Professor at Freie Universität Berlin. Since 2017 she is Professor for Experimental Physics at the University of Duisburg-Essen. Her research interests include photonics, plasmonics, PV and renewable energy devices with a focus on nano and microoptical concepts for light guiding and concentration.



With more than 10 years' experience in solar industry, **Thomas Söderström** has been with Meyer Burger for 6 years leading the Innovation and Technology Solar module department and developing Bifacial Smart Wire Technology. His previous positions were research and academic oriented in Switzerland where he obtained his PhD from the IMT of Neuchâtel, now EPFL, and at UNSW in Australia. His scientific contributions achieving an impact factor above 20 and working with companies such as Flexcell, Bosch, Oerlikon and Suntech.



Paul Sommeling (MSc, chemistry) started working at ECN in 1996 in the unit Solar Energy. He is experienced in durability testing and module encapsulation and participated in a number of EU projects involving both technology development and fundamental research. He joined the Module Technology group since 2011, working on thin film and x-Si back contact modules.



Lars Stolt graduated in electronics at Uppsala University in 1982. After his PhD, he did research on CIGS solar cells at the Institute of Microelectronics in Stockholm and later at Uppsala University, where he was appointed as professor in 1998. In 2003 he started Solibro, a spin-out company based on the CIGS technology, which formed a joint venture with Q-Cells in 2007 with Lars Stolt as CTO. Since 2014 he is also part-time professor at the Solar Cell Group at the Ångström Laboratory.





Nigel Taylor leads the JRC's internal research project on renewables resources in Europe and beyond, and its Low Carbon Energy Observatory which tracks the progress of a broad range of technologies impacting energy transition policies. He graduated with a degree in mechanical engineering from Dublin University, Trinity College in 1982 and was awarded his Ph.D. also from Trinity in 1987. After jobs in industrial R&D in Germany and Italy, he joined the European Commission in 1997.

Kris Van Nieuwenhuysen obtained her degree in engineering in 2000. She then joined the Si solar cell group of imec, where she has been the main expert in Si epitaxial CVD processes for solar cell fabrication. She was the main responsible for the realization of the >16% efficient full epitaxial solar cell at imec. She developed several epi processes both in low-pressure and atmospheric pressure CVD systems and was involved in several European projects.



Sjoerd Veenstra, researcher at ECN/Solliance, has a passion for photovoltaics (PV). After his PhD (2002), he went to ECN in Petten (NL) to work on Organic PV. In 2011 he moved to Eindhoven where the regional (B., D., NL.) thin film PV research is clustered. The focus of his work is now on perovskite PV for application in single and tandem junctions.

Andreas Wade holds a Master of Engineering degree from the Technical University Clausthal (Germany) and is Environmental Process Engineer by Education. After working in various organisations as an expert for recycling, emissions reduction and life cycle management strategy, he joined First Solar where is currently Global Sustainability Director. He is also President of the International Thin-Film Solar Industry Association (PVthin) and elected Vice-Chair of the SolarPower Europe Strategy Committee.



James Watson is the CEO of SolarPower Europe. He joined SolarPower Europe in July 2014 after seven years of working in the energy sector in Brussels with consultancy Weber Shandwick. Earlier in his career Dr Watson worked for the European Commission and various UK government bodies and worked as a lecturer in Environmental Law at the University of Manchester.

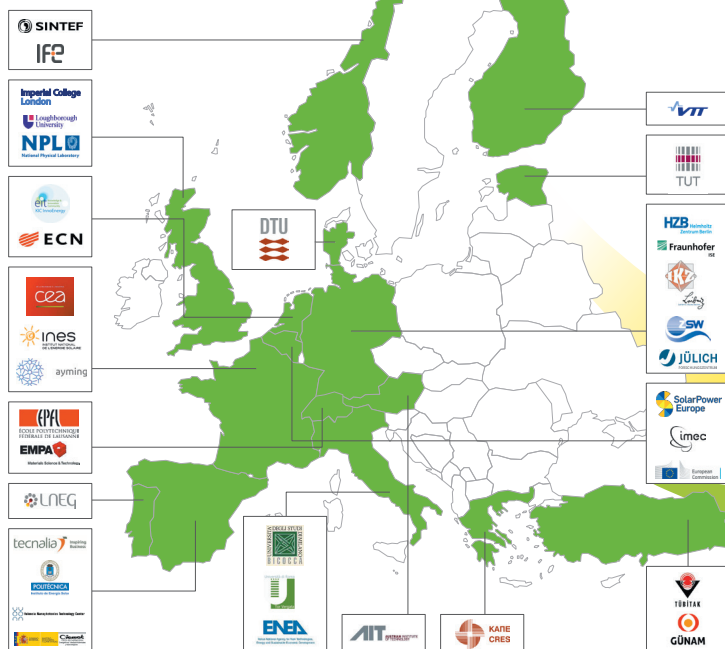
Andre Weiss holds a PhD in Chemistry from the University of Heidelberg. Between 2002 and 2008 he oversaw Research and Product Management for dyes, pigments and polymer additives at Clariant GmbH. In 2008 he joined Heliatek as Head of the Chemistry Department and in 2017 he became Vice President for R&D.



Agenda

11:00-11:30	Registration				
Opening Plenary Session: CHEETAH – Four Years of PV Research Innovations <i>Moderator: Jan Kroon, ECN and CHEETAH Project Coordinator</i>					
11:30-12:00	Welcome notes			James Watson, CEO, SolarPower Europe	
12:00-12:30	The CHEETAH project – Four years of PV research innovations			Jan Kroon, ECN and Project Coordinator	
12:30-14:00	Lunch break				
Parallel Round Table Debates					
	Crystalline Silicon based PV “Getting below a 100 microns” <i>Moderator: Ivan Gordon (imec)</i>		Thin Film PV “Thinner and more efficient through smart cells” <i>Moderator: Rutger Schlatmann (HZB)</i>		Organic PV + Perovskite “Intrinsic long term stability without special encapsulation” <i>Moderator: Sjoerd Veenstra (ECN/Solliance)</i>
14:00-14:30	Input presentations <i>Kris Van Nieuwenhuysen (imec), Adrien Danel (CEA), Paul Sommeling (ECN)</i>		Input presentations <i>Martina Schmid (University of Duisburg-Essen), Guillermo Farias Basulto (HZB)</i>		Input presentations <i>Suren Gevorgyan (DTU) – OPV Aldo di Carlo (UTV) – Perovskites</i>
14:30-15:00	Reactions from the industry Confirmed speakers: - Kristin Lüdemann, VP cSi PV, Von Ardenne - Lars Oberbeck, Head of Solar R&D, Total - Thomas Söderström, Head of Technology Solar Modules, Meyer Burger - Anna Battaglia, Engineering Manager, 3SUN		Reactions from the industry Confirmed speakers: - Andreas Wade, President, PVthin - Michael Bauer, Managing Director, Calyxo - Lars Stolt, CTO, Solibro		Reactions from the industry Confirmed speakers: - Andre Weiß, VP R&D, Heliatek - Erik Gabrielsson, CTO, Dyenamo - Chris Case, CTO, Oxford PV
15:00-16:00	Open discussion	<i>All participants</i>	Open discussion	<i>All participants</i>	Open discussion <i>All participants</i>
16:00-16:30	Coffee break				
Closing Plenary Session: CHEETAH – The Way Forward <i>Moderator: Jan Kroon, ECN and CHEETAH Project Coordinator</i>					
16:30-16:45	Insights from the round table debates			<i>Moderators</i>	
16:45-17:00	After CHEETAH – The Way Forward			<i>Ivan Gordon, imec, Coordinator of the Joint Program on Photovoltaics, EERA</i>	
17:00-17:15	Priorities for new and improved PV Standards			<i>Nigel Taylor, Joint Research Centre, European Commission</i>	
17:15-17:30	Q&A			<i>All participants</i>	
Networking Session					
17:30-18:45	Networking Reception				

Consortium



The CHEETAH consortium is composed of 34 partners from 16 European countries (The Netherlands, France, Estonia, Spain, Germany, Italy, Switzerland, Greece, Portugal, Turkey, Belgium, Austria, Denmark, Finland, UK and Norway). The partnership gathers partners having scientific excellence and complementarity in all important domains of the PV field (silicon, thin film, organic PV, novel technologies).

Acknowledgment

The CHEETAH project is supported by the European Commission through the Seventh Framework Programme for Research and Technological Development with up to 9.7 M€, out of a total budget of 13.3 M€. This 4 years project will run from 1st January 2014 to 31st December 2017.



Project coordinator
ECN – Stichting Energieonderzoek Centrum
The Netherlands
Jan Kroon, j.kroon@ecn.nl

www.cheetah-project.eu