

28th Workshop on Crystalline Silicon Solar Cells & Modules: Materials and Processes

12 - 15 August 2018
Winter Park, Colorado

SUNDAY, 12 August	
8:00-8:45 AM	<i>Registration & Breakfast</i>
WELCOME	
8:45-9:00 AM	<i>Welcome to the 28th Workshop on Crystalline Silicon Solar Cells & Modules</i> Bhushan Sopori (Consultant)
SESSION 1	Characterization Chair: Steve Harvey
9:00-9:40 AM	<i>State-of-the-art for Silicon reference module calibrations at NREL</i> Carl Osterwald (NREL)
9:40-10:10 AM	<i>Photoluminescence based characterization techniques for photovoltaic modules in the field</i> Raghavi Bhoopathy (UNSW)
10:10-10:40 AM	<i>Data-mining big data sets</i> Rhett Evans (UNSW)
10:40-11:10 AM	<i>BREAK</i>
11:10-Noon	DISCUSSION: Characterization - Calibration Lab, Production, and in the Field Moderator: Steve Johnston
Noon-1:30 PM	<i>LUNCH BUFFET</i>
SESSION 2	Contacts, Doping, and Metalization Chair: Yoshio Ohshita
1:30-2:00 PM	<i>Advances in metal pastes enabling continued efficiency increases in recent years</i> Brian Laughlin (Dupont)
2:00-2:30 PM	<i>Issues in industrial use of screen print pastes for high-efficiency cell designs</i> Vinod Chandrasekaran (HERAEUS)
2:30-3:00 PM	<i>BREAK</i>
3:00-3:30 PM	<i>Si-based passivating contacts developments</i> Christophe Allebé (EPFL)
3:30-4:00 PM	<i>APCVD glasses and laser doping</i> Ilker Sen (Schmid)
6:00-8:00 PM	<i>WELCOME RECEPTION and BUFFET</i>

MONDAY, 13 August

7:00-8:00 AM *Breakfast*

SESSION 3 **Studies of Field Degradation**

Chair: Kaitlyn VanSant

Degradation in Silicon Heterojunction Modules

8:00-8:30 AM

Dirk Jordan (NREL)

Potential-induced degradation of n-type crystalline silicon photovoltaic modules

8:30-9:00 AM

Seira Yamaguchi (JAIST)

9:00-9:30 AM

PID mechanisms and rates in n-PERT and p-PERC+ bifacial silicon modules, including the factor of light

Peter Hacke (NREL) & Wei Luo (NUS/SERIS)

9:30-10:00 AM *BREAK*

SESSION 4 **Bifacial Technologies**

Chair: Harrison Wilterdink

Field Performance of Bifacial PV Modules and Systems

10:00-10:30 AM

Cliff Hansen (Sandia)

The latest developments in Bifacial Solar Cells at ECN

10:30-11:00 AM

Maciej Stodolny (ECN part of TNO)

DISCUSSION: Maximizing Energy Yield Over the Lifetime of an Array

11:00-Noon

Moderator: Roland Einhaus

Noon-1:30 PM *LUNCH BUFFET*

Afternoon Break for Side Meetings

7:00-9:00 PM *POSTER SESSION & RECEPTION*

TUESDAY, 14 August

7:30-8:30 AM *Breakfast*

SESSION 5 **Device Physics for Advanced Cell Designs**

Chair: Dean Levi

8:30-9:00 AM *Screening selective contact combinations for attractive crystalline Si cell structures*

Rolf Brendel (ISFH)

9:00-9:30 AM *Electrical characterization of ITO/MoO_x/SiO_x/n-cSi cell: Interface workfunction and carrier transport analysis*

Takefumi Kamioka Ph.D. (Toyota Technological Institute)

9:30-10:00 AM *Multi-scale Modeling of Transport in Heterojunction Solar Cells*

Steve Goodnick (ASU)

10:00-10:20 AM *BREAK*

SESSION 6 **Opportunities Beyond Silicon**

Chair: Ron Sinton

10:20-10:50 AM *Progress in Perovskites and Perovskite Si Tandem Cells*

Michael McGehee (University of Colorado, Boulder)

10:50-11:20 AM *Opportunities and challenges for market entry of silicon-based tandem solar cells*

Zachary Holman (ASU)

11:20-Noon **DISCUSSION: Going Beyond Simple Silicon Modules**

Moderator: Mowafak Al-Jassin

Noon-1:30 PM *LUNCH BUFFET*

SESSION 7 **Degradation, Regeneration, and Material Enhancement**

Chair: Tim Niewelt

1:30-2:10 PM *Hydrogen - the good, the bad and the ugly for silicon solar cells*

Brett Hallam (UNSW)

2:10-2:40 PM *Recent understanding and perspective for degradation of p-type crystalline Si solar cells under high-voltage stress*

Atsushi Masuda (AIST)

2:40-3:10PM *Update on degradation and regeneration mechanisms due to B:O*

Axel Herguth (Konstanz)

3:10-3:30 PM *BREAK*

3:30-4:30 PM **DISCUSSION: Mitigating defects and preventing degradation**

Moderator: Henry Hieslmair

7:00-9:00 PM *POSTER SESSION & RECEPTION*

WEDNESDAY, 15 August	
7:30-8:30 AM	<i>Breakfast</i>
SESSION 8	Device Physics of Materials Chair: Atsushi Ogura
8:30-9:00 AM	<i>The electrical properties of cast-grown high performance multicrystalline silicon and mono-like silicon: Material limitations and cell potential</i> Kelvin Sio (ANU)
9:00-9:30 AM	<i>Limiting effects in crystalline silicon for high-efficiency solar cells – Results of the German research clusters SolarLIFE and LIMES</i> Tim Niewelt (ISE)
SESSION 9	Silicon Module Manufacturing Economics Chair: Bhushan Sopori
9:30-10:10 AM	<i>Economic Factors of Production Affecting Current and Future Crystalline Silicon</i> <i>Photovoltaic Module Manufacturing Costs and Sustainable Pricing</i> Michael Woodhouse (NREL)
10:10-10:40 AM	<i>BREAK</i>
10:40-Noon	DISCUSSION: Economics for Future Silicon: Cost, Efficiency, and Business Considerations. Moderator: Qi Wang

Thank you for your participation... See you next year!!!