

# Opening

Opening

**Monday, November 13**

**Opening Ceremony**

**13:30-15:35**

Master of Ceremony:  
Yuzuru Ueda (Tokyo University of Science)

Monday, November 13

**13:30-13:35**

**Opening Address**

T. Wada (Ryukoku University)

**13:35-13:40**

**Welcome Address**

T. Mikazuki (Governor of Shiga Prefecture)

**[Opening lecture]**

Room 1+2+3

**13:40-14:10      OL1**

**RENEWABLE ENERGY POLICY IN JAPAN**

T. Yamazaki (Agency for Natural Resources and Energy)

**14:10-14:25      OL2**

**SHIGA ENERGY VISION ~FOR THE REALIZATION OF A NEW ENERGY SOCIETY~**

Y. Nakajima (Energy Policy Division, Shiga Prefecture)

**14:25-14:40      OL3**

**THE FIRST PRACTICAL REVERSE FLOW PV SYSTEM IN A JAPANESE HOUSE HAS BEEN RUNNING STEADILY FOR 25 YEARS**

Y. Kuwano (PVTEC)

**[Award Presentation]**

**14:40-14:45**

**PVSEC Award**

**Introduction:**

M. Yamaguchi (Toyota Technological Institute)

**Presenter:**

T. Wada (Ryukoku University)

**14:45-15:05**

**Memorial Lecture**

Y. Hishikawa (AIST)

**15:05-15:15**

**PVSEC Special Award**

**Introduction:**

M. Yamaguchi (Toyota Technological Institute)

**Presenter:**

T. Wada (Ryukoku University)

**15:15-15:20**

**Hamakawa Award**

**Introduction:**

M. Yamaguchi (Toyota Technological Institute)

**Presenter:**

M. Konagai (Tokyo City University)

**15:20-15:35**

**Memorial Lecture**

T. Miyasaka (Toin University of Yokohama)

## Keynote, Plenary, Special Talks

16:00-19:00

### [Keynote & Plenary talks]

Chair persons:

T. Wada (Ryukoku University)

I. Kaizuka (RTS Corporation)

16:00-16:30 KN.1

[Keynote]

**HIGH EFFICIENCY HETEROJUNCTION CRYSTALLINE SI SOLAR CELLS**

K. Yamamoto (Kaneka Corporation)

16:30-17:00 KN.2

[Keynote]

**From powering satellites to powering humanity : what role for international R&D on Photovoltaics?**

D. Lincot (CNRS and IPVF)

17:00-17:30 10MoPl.1

[Plenary]

**The arising Role of PV and Wind Energy in the Power Sector and beyond**

C. Breyer (Lappeenranta University of Technology)

### [Special talks]

Chair person:

A. Yamada (Tokyo Institute of Technology)

17:45-18:15 4MoOS.1

[Invited]

**DESIGN OF POLYMERS WITH STRONG TEMPERATURE-DEPENDENT AGGREGATION FOR HIGH PERFORMANCE ORGANIC PHOTOVOLTAICS**

H. H. Yan (Hong Kong University of Science and Technology)

18:15-18:30 1MoOS.2

<Late News>

**Multicrystalline silicon solar cells exceeding 22%**

S. W. Glunz (Fraunhofer Institute for Solar Energy Systems)

18:30-18:45 1MoOS.3

<Late News>

**Four-Terminal Perovskite-silicon Multijunction Solar modules**

P. Pieters (imec)

18:45-19:00 10MoOS.4

<Late News>

**Developing High Scale PV in the New FIT Act Era in Japan**

J. Buford (First Solar Japan)

**Withdrawn**

# Program Oral

Program Oral

Monday, November 13

Room 1+2+3 / Room 5

Monday, November 13  
8:30 - 10:00 Room 1+2+3

Area 1

## 1MoO1 Cell Technology(1)

Chairpersons:

Thorsten Dullweber (*ISFH*)

Yoshio Ohshita (*Toyota Technological Institute*)

8:30 - 8:45 1MoO1.1

**[Area Leading invited]**

### DEVELOPMENT OF MASS-PRODUCTION TECHNOLOGY FOR BACK-CONTACT TYPE SOLAR CELLS AND MODULES

Naoki Koide<sup>1)</sup>, Chikao Okamoto<sup>1)</sup>, Shuichiro Sugiyama<sup>1)</sup>, Yoshihisa Dotta<sup>1)</sup>, Hajime Horinaka<sup>1)</sup>

<sup>1)</sup> Energy Solutions BU, Sharp Corporation

8:45 - 9:00 1MoO1.2

### INDUSTRY RELATED APPROACHES FOR BI-FACIAL P-TYPE PERX SOLAR CELLS

Tobias Fellmeth<sup>1)</sup>, Sebastian Meier<sup>1)</sup>, Elmar Lohmüller<sup>1)</sup>, Nico Wöhrle<sup>1)</sup>, Alma Spribille<sup>1)</sup>, Sabrina Werner<sup>1)</sup>, Holger Knauss<sup>2)</sup>, Helge Haverkamp<sup>2)</sup>, Nakahara Masahiro<sup>3)</sup>, Marwan Dhamrin<sup>3)</sup>, Pierre Saint-Cast<sup>1)</sup>, Andreas Wolf<sup>1)</sup>, Florian Clement<sup>1)</sup>, Stefan Rein<sup>1)</sup>, Ralf Preu<sup>1)</sup>

<sup>1)</sup> Fraunhofer ISE, Germany, <sup>2)</sup> Schmid Group, Germany, <sup>3)</sup> Toyo Aluminium K. K., Japan

9:00 - 9:15 1MoO1.3

### 22.8% LOW COST BIFACIAL n-PERT CELL WITH Ni/Ag CO-PLATED CONTACTS AND MORE THAN 95% BIFACIALITY

Philip Pieters<sup>1)</sup>, Richard Russell<sup>1)</sup>, Loic Tous<sup>1)</sup>, Emanuele Cornagliotti<sup>1)</sup>, Filip Duerinckx<sup>1)</sup>, Dirk Hendrickx<sup>1)</sup>, Jozef Szlufcik<sup>1)</sup>, Jef Poortmans<sup>1)</sup>

<sup>1)</sup> imec, Belgium

9:15 - 9:30 1MoO1.4

### FORMATION OF BLACK SILICON USING THE SIGE SELF-ASSEMBLED ISLANDS AS A MASK FOR SELECTIVE ETCHING

Yushi Ota<sup>2)</sup>, Atsushi Hombe<sup>2)</sup>, Yasuyoshi Kurokawa<sup>2)</sup>, Noritaka Usami<sup>2)</sup>, Alexey Novikov<sup>1)</sup>, Mikhail Shaleev<sup>1)</sup>, Dmitry Yurasov<sup>1)</sup>, Natalie Baidakova<sup>1)</sup>, Elena Morozova<sup>1)</sup>, Eugene Skorokhodov<sup>1)</sup>, Valery Verbus<sup>2)</sup>

<sup>1)</sup> Institute for Physics of Microstructures RAS, <sup>2)</sup> Nagoya University

9:30 - 9:45 1MoO1.5

### HIGH-EFFICIENCY C-SI SOLAR CELLS WITH DIFFERENT THERMAL BUDGETS

Miro Zeman<sup>1)</sup>, Guangtao Yang<sup>1)</sup>, Gianluca Limodio<sup>1)</sup>, Paul Procel<sup>1)</sup>, Hao Ge<sup>1)</sup>, Yue Zhang<sup>1)</sup>, Jiali Zhou<sup>1)</sup>, Arthur Weeber<sup>1)</sup>,

Olindo Isabella<sup>1)</sup>

<sup>1)</sup> Delft University of Technology, Photovoltaic Materials and Devices group

9:45 - 10:00 1MoO1.6

### INTERDIGITATED BACK-CONTACT SILICON HETEROJUNCTION SOLAR CELL FOR LIQUID PHASE CRYSTALLIZED SILICON ON GLASS WITH 14.2% EFFICIENCY

Cham Thi Trinh<sup>1)</sup>, Natalie Preissler<sup>1,2)</sup>, Paul Sonntag<sup>1)</sup>, Martin Muske<sup>1)</sup>, Martina Trahms<sup>1)</sup>, Bernd Rech<sup>1)</sup>, Daniel Amkreutz<sup>1)</sup>

<sup>1)</sup> Institute of Silicon Photovoltaics, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, <sup>2)</sup> PVcomB / Helmholtz-Zentrum Berlin für Materialien und Energie GmbH

Monday, November 13  
8:30 - 10:00 Room 5

Area 5

## 5MoO3 High Performance Cells

Chairpersons:

Masato Maitani (*The University of Tokyo*)

Shengzhong Frank Liu (*Dalian Institute of Chemical Physics, Chinese Academy of Sciences*)

8:30 - 8:45 5MoO3.1

### HIGH PERFORMANCE PEROVSKITE MODULES FOR BUILDING INTEGRATED PHOTOVOLTAICS

Lucija Rakocevic<sup>1)</sup>, Robert Gehlhaar<sup>1)</sup>, Tamara Merckx<sup>1)</sup>, Weiming Qiu<sup>1)</sup>, Tom Aernouts<sup>1)</sup>, Henri Fledderus<sup>4)</sup>, Jef Poortmans<sup>1,2,3)</sup>

<sup>1)</sup> Thin film PV, Imec, Belgium, <sup>2)</sup> ESAT, KUL, Belgium, <sup>3)</sup> University of Hasselt, Belgium, <sup>4)</sup> TNO-partner in Solliance, Netherlands

8:45 - 9:00 5MoO3.2

### 203mm×203mm largest sized highly efficient MAPbI<sub>3</sub> solar module

Hiroshi Higuchi<sup>1)</sup>, Takayuki Negami<sup>1)</sup>

<sup>1)</sup> Advanced Research Division, Panasonic corporation

9:00 - 9:15 5MoO3.3

### Monolithic perovskite/silicon-heterojunction tandem solar cells

Xin Yao<sup>1,2,3,4)</sup>, Lin Fan<sup>1,2,3,4)</sup>, Shijie Zhu<sup>1,2,3,4)</sup>, Qianshang Ren<sup>1,2,3,4)</sup>, Cuicui Zheng<sup>1,2,3,4)</sup>, Yi Ding<sup>1,2,3)</sup>, Yuelong Li<sup>1,2)</sup>, Guofu Hou<sup>1,2)</sup>, Ying Zhao<sup>1,2,3,4)</sup>, Xiaodan Zhang<sup>1,2,3,4)</sup>, Shengzhe Li<sup>1,2,3,4)</sup>, Yupeng Tong<sup>1,2,3,4)</sup>, Biao Shi<sup>1,2,3,4)</sup>, Huizhi Ren<sup>1,2,3)</sup>, Qian Huang<sup>1,2,3)</sup>, Changchun Wei<sup>1,2)</sup>, Baozhang Li<sup>1,2)</sup>, Guofu Hou<sup>1,2)</sup>, Shengzhi Xu<sup>1,2)</sup>, Dekun Zhang<sup>1,2)</sup>, Guangcai Wang<sup>1,2)</sup>

<sup>1)</sup> Institute of Photoelectronic Thin Film Devices and Technology of Nankai University, <sup>2)</sup> Key Laboratory of Photoelectronic Thin Film Devices and Technology of Tianjin, <sup>3)</sup> Key Laboratory of Optical Information Science and Technology of Ministry of Education, <sup>4)</sup> Collaborative Innovation Center of Chemical Science and

Engineering (Tianjin)

<sup>1)</sup> Toyota Technological Institute, <sup>2)</sup> University of Miyazaki

9:15 - 9:30 5MoO3.4

**OPTIMUM PEROVSKITE CELL FOR HIGHLY EFFICIENT PEROVSKITE/SILICON TANDEM SOLAR CELL**

Wayesh Qarony<sup>1)</sup>, Mohammad I. Hossain<sup>1)</sup>, Yuen Hong Tsang<sup>1)</sup>

<sup>1)</sup> Department of Applied Physics, The Hong Kong Polytechnic University

9:30 - 9:45 5MoO3.5

**OPTICAL DEVICE DESIGN OF HIGHLY EFFICIENT CH<sub>3</sub>NH<sub>3</sub>Pb(I,Br)<sub>3</sub>/Cu(In,Ga)Se<sub>2</sub>-BASED DOUBLE AND TRIPLE TANDEM SOLAR CELLS**

Hiroyuki Fujiwara<sup>1)</sup>, Masato Tamakoshi<sup>1)</sup>, Shohei Fujimoto<sup>1)</sup>, Takemasa Fujiseki<sup>1)</sup>

<sup>1)</sup> Department of Electrical, Electronic and Computer Engineering, Gifu University

9:45 - 10:00 5MoO3.6

**PEROVSKITE / TEXTURED SILICON HETEROJUNCTION FOR MECHANICALLY STACKED TANDEM SOLAR CELL**

Hiroyuki Kanda<sup>1)</sup>, Naoyuki Shibayama<sup>1)</sup>, Koji Ibi<sup>2)</sup>, Mohammad Khaja Nazeeruddin<sup>3)</sup>, Seigo Ito<sup>1)</sup>

<sup>1)</sup> University of Hyogo, <sup>2)</sup> Choshu Industry Co., Ltd., <sup>3)</sup> École Polytechnique Fédérale de Lausanne

9:15 - 9:30 7MoO5.3

**TEMPERATURE DEPENDENCE OF THE SHORT CIRCUIT CURRENT AND SPECTRAL RESPONSE OF VARIOUS KINDS OF CRYSTALLINE SILICON PV DEVICES**

Yoshihiro HISHIKAWA<sup>1)</sup>, Masahiro YOSHITA<sup>1)</sup>, Hironori OHSHIMA<sup>1)</sup>, Kengo YAMAGOE<sup>1)</sup>, Haruya SHIMURA<sup>1)</sup>, Ayumi SASAKI<sup>1)</sup>, Takashi UEDA<sup>1)</sup>

<sup>1)</sup> National Institute of Advanced Industrial Science and Technology (AIST)

9:30 - 9:45 7MoO5.4

**OPTIMISED FITTING OF INDOOR (E.G. IEC 61853 MATRIX) AND OUTDOOR PV MEASUREMENTS FOR DIAGNOSTICS AND ENERGY YIELD PREDICTIONS**

Steve J. Ransome<sup>1)</sup>, Juergen Sutterlueti<sup>2)</sup>

<sup>1)</sup> Steve Ransome Consulting Limited, <sup>2)</sup> Gantner Instruments Environment Solutions GmbH

9:45 - 10:00 7MoO5.5

**PV MODULE IRRADIANCE SENSOR FOR PRECISE OUTDOOR MEASUREMENT - STRUCTURE, RESPONSE SIMILARITY AND ANGULAR DEPENDENCE COMPARISON WITH THE MODULE UNDER TEST -**

Takuya DOI<sup>1)</sup>, Yoshihiro HISHIKAWA<sup>1)</sup>, Michiya HIGA<sup>1)</sup>, Takakazu TAKENOUCHI<sup>1)</sup>, Hironori OHSHIMA<sup>1)</sup>, Kengo YAMAGOE<sup>1)</sup>

<sup>1)</sup> RCPV, National Institute of Advanced Industrial Science and Technology (AIST)

**Monday, November 13**

8:30 - 10:00 Room 6

**Area7**

**7MoO5 PV Performance Characterization (1)**

Chairpersons:

Koji Masuda (*Japan Electrical Safety & Environment Technology Laboratories*)

Juan Lopez-Garcia (*European Commission, Joint Research Centre (JRC)*)

8:30 - 9:00 7MoO5.1

**[Invited]**

**LASER-DSR: COMPREHENSIVE REFERENCE CELL CALIBRATION IN LABORATORY AND ITS IMPACT ON OUTDOOR MEASUREMENTS**

Stefan Winter<sup>1)</sup>

<sup>1)</sup> Physikalisch-Technische Bundesanstalt (PTB), Germany

9:00 - 9:15 7MoO5.2

**INHERENT UNCERTAINTY OF ENERGY RATINGS OF MULTI-JUNCTION CELLS BY FLUCTUATION OF ATMOSPHERIC PARAMETERS**

Kenji Araki<sup>1)</sup>, Yasuyuki Ota<sup>2)</sup>, Takumi Sakai<sup>2)</sup>, Kan-Hua Lee<sup>1)</sup>, Masafumi Yamaguchi<sup>1)</sup>

**Monday, November 13**

10:30 - 12:00 Room 1+2+3

**Area1**

**1MoO2 Cell Technology(2)(Device)**

Chairpersons:

Miroslav Zeman (*Delft University of Technology*)

Kyotaro Nakamura (*Meiji University*)

10:30 - 11:00 1MoO2.1

**[Invited]**

**Present status and future perspectives of bifacial PERC+ solar cells and modules**

Thorsten Dullweber<sup>1)</sup>

<sup>1)</sup> Photovoltaics Department, Institute for Solar Energy Research Hamelin (ISFH)

11:00 - 11:15 1MoO2.2

**22.0% EFFICIENCY BIPERC WITH 17.5% BACK BASED ON INDUSTRIAL PROCESS**

Meng Xiajie<sup>1)</sup>, Yu Bin<sup>1)</sup>, Cai Yongmei<sup>1)</sup>, Xu Xinxing<sup>1)</sup>, Fan Jianbin<sup>1)</sup>, Tong Hongbo<sup>1)</sup>, Li Hua<sup>1)</sup>

<sup>1)</sup> Solar Cell Research Center, LONGi Solar Technology Co., LTD

11:15 - 11:30 1MoO2.3

### INVESTIGATION OF THE ALUMINUM PASTE COMPOSITION AND LASER CONTACT OPENING GEOMETRY FOR PERC SOLAR CELLS

Masahiro Nakahara<sup>1,2)</sup>, Marwan Dhamrin<sup>1)</sup>, Jayaprasad Arumughan<sup>2)</sup>, Stefan Schmitt<sup>2)</sup>, Valentin Mihailetchi<sup>2)</sup>, Jens Theobald<sup>2)</sup>

<sup>1)</sup> Toyo Aluminum, <sup>2)</sup> ISC Konstanz

11:30 - 11:45 1MoO2.4

### DEVELOPMENT OF PASSIVATION FILMS FOR N-TYPE CRYSTALLINE SILICON SOLAR CELLS

Kunihiko Nishimura<sup>1)</sup>, Yasutoshi Yashiki<sup>1)</sup>, Takayuki Morioka<sup>1)</sup>, Yumiko Kobayashi<sup>1)</sup>, Tatsuro Watahiki<sup>1)</sup>, Hidetada Tokioka<sup>1)</sup>, Mikio Yamamuka<sup>1)</sup>

<sup>1)</sup> Advanced Technology R&D Center, Mitsubishi Electric Corporation

11:45 - 12:00 1MoO2.5

### DEVELOPMENT OF HIGH EFFICIENT AND LONG-TERM RELIABLE CRYSTALLINE SILICON SOLAR CELLS AND MODULES BY LOW COST MASS PRODUCTION PROCESS

Yuta Irie<sup>1)</sup>, Junichi Atobe<sup>1)</sup>, Hiroaki Takahashi<sup>1)</sup>, Kouichirou Niira<sup>1)</sup>, Manabu Komoda<sup>1)</sup>, Kenji Fukui<sup>1)</sup>

<sup>1)</sup> Solar Energy Development Division, Kyocera Corporation

Monday, November 13

10:30 - 12:00 Room 5

Area5

### 5MoO4 High Performance (Efficiency)

Chairpersons:

Atsushi Wakamiya (*Kyoto University*)

Sergei Manzhos (*National University of Singapore*)

10:30 - 11:00 5MoO4.1

**[Invited]**

### HYSTERESIS-FREE PEROVSKITE SOLAR CELLS MADE OF POTASSIUM-DOPED ORGANOMETAL HALIDE PEROVSKITE

Hiroshi Segawa<sup>1)</sup>

<sup>1)</sup> Graduate School of Arts and Sciences, The University of Tokyo

11:00 - 11:15 5MoO4.2

### LOW-TEMPERATURE PREPARED NIOBIUM-DOPED AMORPHOUS TITANIUM OXIDE COMPACT LAYER IN HIGHLY EFFICIENT AND DURABLE PEROVSKITE SOLAR CELLS

Youhei Numata<sup>1)</sup>, Yoshitaka Sanehira<sup>1)</sup>, Atsushi Kogo<sup>1)</sup>, Ryo Ishikawa<sup>2)</sup>, Hajime Shirai<sup>2)</sup>, Tsutomu Miyasaka<sup>1)</sup>

<sup>1)</sup> Toin University of Yokohama, <sup>2)</sup> Saitama University

11:15 - 11:30 5MoO4.3

### HIGH EFFICIENT AND STABLE MAPBI3 BASED PEROVSKITE SOLAR CELLS

Liyuan Han<sup>1)</sup>

<sup>1)</sup> National Institute for Materials Science

11:30 - 11:45 5MoO4.4

### 18.3% RECORD-EFFICIENCY FLEXIBLE PEROVSKITE SOLAR CELLS

Shengzhong Frank Liu<sup>1,2)</sup>, Dong Yang<sup>2)</sup>

<sup>1)</sup> Shaanxi Normal University, China, <sup>2)</sup> Dalian Institute of Chemical Physics, China

11:45 - 12:00 5MoO4.5

### TOWARDS ACCURATE SPECTRAL RESPONSE MEASUREMENTS OF PEROVSKITE SOLAR CELLS

Martin Bliss<sup>1)</sup>, Alex Smith<sup>1)</sup>, Thomas Richard Betts<sup>1)</sup>, Ralph Gottschalg<sup>1)</sup>

<sup>1)</sup> Centre for Renewable Energy Systems Technology (CREST), Loughborough University

Monday, November 13

10:30 - 12:00 Room 6

Area7

### 7MoO6 PV Performance Characterization (II)

Chairpersons:

Masahiro Yoshita (*National Institute of Advanced Industrial Science and Technology*)

Stefan Winter (*Physikalisch-Technische Bundesanstalt (PTB)*)

10:30 - 10:45 7MoO6.1

### FACTORS FOR IMPROVING THE PRECISION OF OUTDOOR PHOTOVOLTAIC PERFORMANCE MEASUREMENT

Yoshihiro HISHIKAWA<sup>1)</sup>, Takuya DOI<sup>1)</sup>, Michiya HIGA<sup>1)</sup>, Takakazu TAKENOUCHI<sup>1)</sup>, Hironori OHSHIMA<sup>1)</sup>, Kengo YAMAGOE<sup>1)</sup>

<sup>1)</sup> National Institute of Advanced Industrial Science and Technology (AIST)

10:45 - 11:00 7MoO6.2

### ACCURATE MEASUREMENT AND ESTIMATION OF SOLAR CELL TEMPERATURE IN PHOTOVOLTAIC MODULE OPERATING IN REAL ENVIRONMENTAL CONDITIONS

Kensuke Nishioka<sup>1)</sup>, Kazuyuki Miyamura<sup>1)</sup>, Yasuyuki Ota<sup>1)</sup>, Minoru Akitomi<sup>2)</sup>, Yasuo Chiba<sup>2)</sup>, Atsushi Masuda<sup>2)</sup>

<sup>1)</sup> Research Center for Sustainable Energy & Environmental Engineering, University of Miyazaki, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology

**11:00 - 11:15      7MoO6.3**

**LONGTERM PERFORMANCE AND DEGRADATION RATE ANALYSIS OF PV MODULE EXPOSED IN FIELD OF THE GOBI DESERT, MONGOLIA**

Bat-Erdene Bayandelger<sup>1)</sup>, Yuzuru Ueda<sup>1)</sup>, Battulga Batbayar<sup>2)</sup>, Amarbayar Adiyabat<sup>2)</sup>, Kenji Otani<sup>3)</sup>

<sup>1)</sup> Department of Electrical Engineering, Tokyo University of Science, <sup>2)</sup> National University of Mongolia, <sup>3)</sup> National Institute of Advanced Industrial Science and Technology

**11:15 - 11:30      7MoO6.4**

**FILTERING METHOD OF DETECTING SOLAR IRRADIANCE CONDITIONS FOR PV MODULE PERFORMANCE CHARACTERIZATION UNDER UNSTABLE IRRADIANCE**

Zhang Junfang<sup>1)</sup>, Kota Watanabe<sup>1)</sup>, Jun Yoshino<sup>1)</sup>, Tomonao Kobayashi<sup>1)</sup>, Yoshihiro Hishikawa<sup>2)</sup>, Takuya Doi<sup>2)</sup>

<sup>1)</sup> Gifu University, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology

**11:30 - 11:45      7MoO6.5**

**ELECTRICAL PERFORMANCE OF BIFACIAL SILICON PV MODULES UNDER DIFFERENT INDOOR SETTINGS AFFECTING THE REAR REFLECTED IRRADIANCE**

Juan Lopez-Garcia<sup>1)</sup>, Alberto Casado<sup>1)</sup>, Tony Sample<sup>1)</sup>

<sup>1)</sup> European Commission, DG JRC, Directorate C - Energy, Transport and Climate, Energy efficiency and Renewables Unit, Italy

**11:45 - 12:00      7MoO6.6**

**ANALYSIS OF CHANGE IN POWER GENERATION BY OUTDOOR EXPOSURE OF PHOTOVOLTAIC MODULES INSTALLED AT AIST KYUSHU CENTER FROM 2010 TO 2016**

Yasuo Chiba<sup>1)</sup>, Ritsuko Sato<sup>1)</sup>, Sungwoo Choi<sup>1)</sup>, Tetsuyuki Ishii<sup>2)</sup>, Atsushi Masuda<sup>1)</sup>

<sup>1)</sup> National Institute of Advanced Industrial Science and Technology, Japan, <sup>2)</sup> Central Research Institute of Electric Power Industry, Japan

**Tuesday, November 14**  
**8:30 - 10:00 Room 1+2**

Chairpersons:

Area 1, Yoshio Ohshita (*Toyota Technological Institute*)

Area 3, Tatsuya Takamoto (*Sharp*)

Area 9, Kazuhiko Ogimoto (*The University of Tokyo*)

**8:30 - 9:00**      **1TuPl.1**      **Area1**

**[Plenary]**

**RECORD EFFICIENCY INDUSTRIAL SCREEN-PRINTED  
 MULTICRYSTALLINE SILICON SOLAR CELL**

Hao Jin<sup>1)</sup>

<sup>1)</sup> Jinko Solar Holdings Co., Ltd

**9:00 - 9:30**      **3TuPl.2**      **Area3**

**[Plenary]**

**HIGH EFFICIENCY PHOTOVOLTAICS ENABLED BY III-V  
 MATERIALS**

Frank Dimroth<sup>1)</sup>

<sup>1)</sup> Fraunhofer Institute for Solar Energy Systems ISE

**9:30 - 10:00**      **9TuPl.3**      **Area9**

**[Plenary]**

**THE VALUE OF RENEWABLE INTEGRATION STUDIES**

Carlo Brancucci<sup>1)</sup>

<sup>1)</sup> National Renewable Energy Laboratory, United States

**Tuesday, November 14**  
**10:30 - 12:00 Room 1+2**      **Area1**

**1TuO1 Characterization 1**

Chairpersons:

Noritaka Usami (*Nagoya University*)

Jan Schmidt (*Institute for Solar Energy Research Hamelin (ISFH)*)

**10:30 - 10:45**      **1TuO1.1**

**PHOTOLUMINESCENCE IMAGING AT UNIFORM EXCESS  
 CARRIER DENSITY USING NON-UNIFORM ILLUMINATION**

Yan Zhu<sup>1)</sup>, Mattias K. Juhl<sup>1)</sup>, Friedemann D. Heinz<sup>2)</sup>,  
 Martin C. Schubert<sup>2)</sup>, Thorsten Trupke<sup>1)</sup>, Ziv Hameiri<sup>1)</sup>

<sup>1)</sup> School of Photovoltaic and Renewable Energy Engineering,  
 University of New South Wales, <sup>2)</sup> Fraunhofer ISE

**10:45 - 11:00**      **1TuO1.2**

**DETAILED ANALYSIS OF CONTACT RESISTANCE  
 INVESTIGATION USING PHOTOLUMINESCENCE TECHNIQUE**

**IN A SOLAR CELL**

Amit Singh Rajput<sup>1,2)</sup>, Samuel Raj<sup>1)</sup>, Johnson KC Wong<sup>1)</sup>,  
 Armin G. Aberle<sup>1,2)</sup>

<sup>1)</sup> Solar Energy Research Institute of Singapore (SERIS), Singapore,

<sup>2)</sup> Department of Electrical and Computer Engineering, National  
 University of Singapore, Singapore

**11:00 - 11:15**      **1TuO1.3**

**UNCERTAINTY IN THE DETERMINATION OF LOCAL  
 RECOMBINATION CURRENT DENSITIES**

Hannes Höffler<sup>1)</sup>, Sabrina Werner<sup>1)</sup>, Andreas Brand<sup>1)</sup>

<sup>1)</sup> Fraunhofer Institute for Solar Energy Systems ISE

**11:15 - 11:30**      **1TuO1.4**

**TRACKING AND VISUALIZATION OF DISLOCATION  
 GENERATION IN MULTICRYSTALLINE SILICON BY  
 PHOTOLUMINESCENCE IMAGE PROCESSING**

Yusuke Hayama<sup>1)</sup>, Tetsuya Matsumoto<sup>2)</sup>, Kentaro Kutsukake<sup>3)</sup>,  
 Isao Takahashi<sup>1)</sup>, Hiroaki Kudo<sup>2)</sup>, Noritaka Usami<sup>1)</sup>

<sup>1)</sup> Graduate School of Engineering, Nagoya University, Japan, <sup>2)</sup>

Graduate School of Informatics, Nagoya University, Japan, <sup>3)</sup> Institute  
 for Materials Research, Tohoku University, Japan

**11:30 - 11:45**      **1TuO1.5**

**RELATIONSHIP BETWEEN LOCAL OXYGEN PRECIPITATION  
 AND MINORITY CARRIER LIFETIME IN CZOCHRALSKI  
 SILICON**

Rabin Basnet<sup>1)</sup>, Fiacre E. Rougieux<sup>1)</sup>, Daniel Macdonald<sup>1)</sup>

<sup>1)</sup> Research School of Engineering, The Australian National University

**11:45 - 12:00**      **1TuO1.6**

**DETERMINATION OF CARBON CONCENTRATION IN  
 PHOSPHORUS-DOPED N-TYPE CZOCHRALSKI-GROWN  
 Si CRYSTALS BY LIQUID-NITROGEN-TEMPERATURE  
 PHOTOLUMINESCENCE AFTER ELECTRON IRRADIATION**

Yoichiro Ishikawa<sup>1)</sup>, Michio Tajima<sup>1)</sup>, Hirotatsu Kiuchi<sup>1)</sup>,  
 Atsushi Ogura<sup>1)</sup>, Keiji Miyamura<sup>2)</sup>, Hirofumi Harada<sup>2)</sup>,  
 Koichi Kakimoto<sup>2)</sup>

<sup>1)</sup> Meiji University, <sup>2)</sup> Kyushu University

**Tuesday, November 14**  
**10:30 - 12:00 Room 3**      **Area2**

**2TuO4 Industry and Related Technologies**

Chairpersons:

Takayuki Negami (*Panasonic Corporation*)

Roland Scheer (*Martin-Luther-Universität*)



10:30 - 11:00 2TuO4.1

**[Invited]****PROGRESS IN HIGH EFFICIENCY CIGS SOLAR CELL AND MODULE RESEARCH AT SOLAR FRONTIER**Takuya Kato<sup>1)</sup><sup>1)</sup> Atsugi Research Center, Solar Frontier K.K.

11:00 - 11:15 2TuO4.2

**CIGS<sub>Se</sub> MODULES OVER 18% EFFICIENCY WITH TUNABLE WIDE BAND GAP BUFFER LAYERS**Thomas Dalibor<sup>1)</sup>, Maik Sode<sup>1)</sup>, Rajneesh Verma<sup>1)</sup>, Robert Lechner<sup>1)</sup>, Michael Algasinger<sup>1)</sup>, Thomas Niesen<sup>1)</sup>, Patrick Eraerds<sup>1)</sup>, Christian Schubbert<sup>1)</sup>, Jörg Palm<sup>1)</sup>, Alfons Weber<sup>1)</sup>, Martin Furfänger<sup>1)</sup>, Matej Hála<sup>1)</sup>, Marko Stölzel<sup>1)</sup><sup>1)</sup> AVANCIS GmbH

11:15 - 11:30 2TuO4.3

**FLEXIBLE CU(IN,GA)SE<sub>2</sub> BASED SOLAR CELLS USING MOLYBDENUM SUBSTRATE**Negar Naghavi<sup>1,3)</sup>, Mishael Stanley<sup>2,3)</sup>, Marie Jubault<sup>2,3)</sup>, Frédérique Donsanti<sup>2,3)</sup>, Daniel Lincot<sup>1,3)</sup><sup>1)</sup> CNRS, Institut R&D sur l'Energie Photovoltaïque (IRDEP), <sup>2)</sup> EDF – R&D, Institut R&D sur l'Energie Photovoltaïque (IRDEP), <sup>3)</sup> Institut Photovoltaïque d'Ile de France (IPVF)

11:30 - 11:45 2TuO4.4

**NEW APPROACH FOR AN INDUSTRIAL LOW-TEMPERATURE ROLL-TO-ROLL CI(G)S DEPOSITION PROCESS**Nikolaus Weinberger<sup>1)</sup>, David Stock<sup>1)</sup>, Tim Kodalle<sup>2)</sup>, Marc D. Heinemann<sup>2)</sup>, Daniel Huber<sup>3)</sup>, Martina Harnisch<sup>3)</sup>, Maurizio Acciarri<sup>4)</sup>, Christian A. Kaufmann<sup>2)</sup>, Andreas Zimmermann<sup>3)</sup>, Georg N. Strauss<sup>1)</sup>, Slimane Ghodbane<sup>3)</sup><sup>1)</sup> University of Innsbruck, <sup>2)</sup> Helmholtz-Zentrum Berlin, <sup>3)</sup> Sunplugged GmbH, <sup>4)</sup> University Milano-Bicocca

11:45 - 12:00 2TuO4.5

**NUMERICAL MODELING OF SHADING-INDUCED BREAKDOWN IN CIGS PHOTOVOLTAIC DEVICES**Marco Nardone<sup>1)</sup><sup>1)</sup> Department of Physics and Astronomy, Bowling Green State UniversityTsutomu Miyasaka (*Faculty of Biomedical Engineering, Toin University of Yokohama*)

10:30 - 10:45 5TuO7.1

**DISSOCIATION OF GEMINATE CHARGE PAIRS IN ORGANO LEAD TRIHALIDE PEROVSKITES**Vidmantas Gulbinas<sup>1)</sup>, Ramūnas Augulis<sup>1)</sup>, Marius Franckevičius<sup>1)</sup>, Vytautas Abramavičius<sup>2)</sup>, Darius Abramavičius<sup>2)</sup>, Shaik Mohammed Zakeeruddin<sup>3)</sup>, Michael Grätzel<sup>3)</sup><sup>1)</sup> Center for Physical Sciences and Technology, Vilnius, Lithuania, <sup>2)</sup> Vilnius University, Faculty of Physics, Department of Theoretical Physics, Vilnius, Lithuania, <sup>3)</sup> Laboratory of Photonics and Interfaces, ISIC, Swiss Federal Institute of Technology (EPFL), Switzerland

10:45 - 11:00 5TuO7.2

**TOWARDS HOT CARRIER PEROVSKITE SOLAR CELLS**Tze Chien Sum<sup>1)</sup>, Mingjie Li<sup>1)</sup>, Saikat Bhaumik<sup>2)</sup>, Nripan Mathews<sup>2,3)</sup>, Subodh Mhaisalkar<sup>2,3)</sup><sup>1)</sup> School of Physical and Mathematical Sciences, Nanyang Technological University, <sup>2)</sup> Energy Research Institute, NTU, <sup>3)</sup> School of Materials Science and Engineering, Nanyang Technological University

11:00 - 11:15 5TuO7.3

**INTERFACE ENGINEERING, PHOTOEXCITED CARRIER DYNAMICS AND MECHANISM FOR IMPROVING PHOTOVOLTAIC PERFORMANCE OF PEROVSKITE SOLAR CELLS**Qing Shen<sup>1,5)</sup>, Chao Ding<sup>1)</sup>, Yuhei Ogomi<sup>2,5)</sup>, Taro Toyoda<sup>1,5)</sup>, Kenji Yoshino<sup>3,5)</sup>, Takashi Minemoto<sup>4,5)</sup>, Shuzi Hayase<sup>2,5)</sup><sup>1)</sup> Faculty of Informatics and Engineering, The University of Electro-Communications, <sup>2)</sup> Kyushu Institute of Technology, <sup>3)</sup> Miyazaki University, <sup>4)</sup> Ritsumeikan University, <sup>5)</sup> CREST, Japan Science and Technology Agency (JST)

11:15 - 11:30 5TuO7.4

**Perovskite Solar Cells: Morphological Crystal Structure and Interface Architecture**Satoshi Uchida<sup>1)</sup>, Ludmila Cojocar<sup>1)</sup>, V.V. Jayaweera<sup>2)</sup>, Shoji Kaneko<sup>2)</sup>, Jotaro Nakazaki<sup>1)</sup>, Takaya Kubo<sup>1)</sup>, Hiroshi Segawa<sup>1)</sup><sup>1)</sup> Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, <sup>2)</sup> SPD Laboratory, Inc.

11:30 - 11:45 5TuO7.5

**STUDY ON THE THERMAL STABILITY OF THE CH<sub>3</sub>NH<sub>3</sub>PBX<sub>2</sub> (X= BR, I) MIXED PEROVSKITE SOLAR CELLS**Zubair Ahmad<sup>1)</sup>, Mansoor Ani Najeeb<sup>1)</sup>, R. A. Shakoor<sup>1)</sup><sup>1)</sup> Center for Advanced Materials (CAM) Qatar University

Tuesday, November 14

10:30 - 12:00 Room 5

Area5

5TuO7 Mechanism and dynamics

Chairpersons:  
Shengzhong Frank Liu (*Dollan Institute of Chemical Physics, Chinese Academy of Science*)



11:45 - 12:00 5TuO7.6

**A SPATIALLY SMOOTHED DEVICE MODEL FOR MESO-STRUCTURED PEROVSKITE SOLAR CELLS**Hansong Xue<sup>1,2)</sup>, Erik Birgersson<sup>1)</sup>, Rolf Stangl<sup>1,2)</sup><sup>1)</sup> National University of Singapore, <sup>2)</sup> Solar Energy Institute of Singapore**Tuesday, November 14**  
**13:30 - 15:30 Room 1+2****Area1****1TuO2 Noble Technologies, Hybrid**

Chairpersons:

Shinsuke Miyajima (*Tokyo Institute of Technology*)Kwanyong Seo (*Ulsan National Institute of Science and Technology (UNIST)*)

13:30 - 13:45 1TuO2.1

**PROGRESS WITH POLYMER/SILICON HETEROJUNCTION SOLAR CELLS**Jan Schmidt<sup>1,2)</sup>, Dimitri Zielke<sup>1)</sup>, Ralf Gogolin<sup>1)</sup>, Marc-Uwe Halbach<sup>1)</sup>, Rüdiger Sauer<sup>3)</sup>, Wilfried Lövenich<sup>3)</sup><sup>1)</sup> Department of Photovoltaics, Institute for Solar Energy Research Hamelin (ISFH), <sup>2)</sup> Leibniz University Hanover, <sup>3)</sup> Heraeus

13:45 - 14:00 1TuO2.2

**CRYSTALLINE-SI HETEROJUNCTION WITH ORGANIC THIN-LAYER (HOT) SOLAR CELLS**Hajime Shirai<sup>1)</sup>, Koji Kasahara<sup>1)</sup>, Daisuke Harada<sup>1)</sup>, Tsutomu Hayashi<sup>2)</sup>, Jaker Hossain<sup>1)</sup>, Ryo Ishikawa<sup>1)</sup><sup>1)</sup> Graduate School of Science and Engineering, Saitama University, <sup>2)</sup> K-I-S Co.Ltd.

14:00 - 14:15 1TuO2.3

**TOWARDS THE INDUSTRIALISATION OF PEROVSKITE-SILICON TANDEM CELLS**Daniel Kirk<sup>1)</sup><sup>1)</sup> Oxford PV (UK) Ltd.

14:15 - 14:30 1TuO2.4

**COLORLED SOLAR MODULE USING AUTOMOTIVE PAINTINGS**Yuki Kudo<sup>1)</sup>, Debasish Banerjee<sup>2)</sup>, Taizo Masuda<sup>1)</sup><sup>1)</sup> Toyota Motor Corporation, <sup>2)</sup> Toyota Motor Engineering & Manufacturing North America

14:30 - 14:45 1TuO2.5

**<1G/W SOLAR CELLS ON FLEXIBLE SILICON SUBSTRATES**André Augusto<sup>1)</sup>, Pradeep Balaji<sup>1)</sup>, William Dauksher<sup>1)</sup>, Stuart G. Bowden<sup>1)</sup><sup>1)</sup> Electrical Engineering, Arizona State University

14:45 - 15:00 1TuO2.6

**DEVELOPMENT OF 65 μm THIN FREE-STANDING Cz SILICON HETEROJUNCTION CELLS WITH Voc UP TO 749 mV**Shruti Jambaldinni<sup>1)</sup>, Twan Bearda<sup>1)</sup>, Joachim John<sup>1)</sup>, Michael Haslinger<sup>1)</sup>, Miha Filipic<sup>1)</sup>, Jinyoun Cho<sup>1,2)</sup>, Maarten Debucquoy<sup>1)</sup>, Ivan Gordon<sup>1)</sup>, Jozef Szlufcik<sup>1)</sup>, Jef Poortmans<sup>1,2,3)</sup><sup>1)</sup> imec, Belgium, <sup>2)</sup> KU Leuven, Belgium, <sup>3)</sup> U Hasselt, Belgium

15:00 - 15:15 1TuO2.7

**NOVEL SILVER PASTE FOR N-TYPE BI-FACIAL PERT CELL**Kyotaro Nakamura<sup>1)</sup>, Kazuo Muramatsu<sup>2)</sup>, Noboru Yamaguchi<sup>3)</sup>, Yoshio Ohshita<sup>4)</sup><sup>1)</sup> Organization for the Strategic Coordination of Research and Intellectual Properties, Meiji University, <sup>2)</sup> NAMICS CORPORATION, <sup>3)</sup> ULVAC, Inc., <sup>4)</sup> Toyota Technological Institute

15:15 - 15:30 1TuO2.8

**EFFECTS OF CHEMICAL ROUNDING ON THE PERFORMANCE OF PYRAMID-TEXTURED P-TYPE EMITTERS PASSIVATED BY ALOX IN N-TYPE SI SOLAR CELLS**Hyunju Lee<sup>1)</sup>, Inseol Song<sup>2)</sup>, Sang-Won Lee<sup>2)</sup>, Sungeun Park<sup>2)</sup>, Soohyun Bae<sup>2)</sup>, Yoonmook Kang<sup>2)</sup>, Haeseok Lee<sup>2)</sup>, Donghwan Kim<sup>2)</sup>, Atsushi Ogura<sup>3)</sup>, Yoshio Ohshita<sup>1)</sup><sup>1)</sup> Toyota Technological Institute, <sup>2)</sup> Korea University, <sup>3)</sup> Meiji University**Tuesday, November 14****13:30 - 15:30 Room 3****Area3****3TuO5 High Efficiency multijunction**

Chairpersons:

Angele Reinders (*University of Twente*)Mitsuru Imaizumi (*Japan Aerospace Exploration Agency*)

13:30 - 14:00 3TuO5.1

**[Invited]****HERITAGE TRIPLE JUNCTION III-V SOLAR CELLS EXCEEDING 31% EFFICIENCY**James H. Ermer<sup>1)</sup>, Chris M. Fetzer<sup>1)</sup>, Philip T. Chiu<sup>1)</sup>, Xingquan Liu<sup>1)</sup>, Moran Haddad<sup>1)</sup>, Jeffrey P. Kroger<sup>1)</sup><sup>1)</sup> Spectrolab, Inc., A Boeing Company

14:00 - 14:15 3TuO5.2

**[Area Leading invited]**

### III-V THIN-FILM SOLAR CELL MODULES DEVELOPED FOR SPACE AND TERRESTRIAL ENVIRONMENT

Hiroshi Yamaguchi<sup>1)</sup>, Hiroyuki Juso<sup>1)</sup>, Kohsuke Ueda<sup>1)</sup>, Hidetoshi Washio<sup>1)</sup>, Tatsuya Takamoto<sup>1)</sup>, Taishi Sumita<sup>2)</sup>, Tetsuya Nakamura<sup>2)</sup>, Mitsuru Imaizumi<sup>2)</sup>

<sup>1)</sup> Energy Solutions BU, Sharp corporation, <sup>2)</sup> Japan Aerospace Exploration Agency

14:15 - 14:30 3TuO5.3

### STEP-TUNNEL InGaAs/GaAsP QUANTUM WELL SUPERLATTICE FOR 1.15-eV MIDDLE CELL IN 4-JUNCTION SOLAR CELL

Masakazu Sugiyama<sup>1)</sup>, Takanori Usuki<sup>2)</sup>, Kasidit Toprasertpong<sup>2)</sup>, Kentaroh Watanabe<sup>1)</sup>, Yoshiaki Nakano<sup>1)</sup>

<sup>1)</sup> Research Center for Advanced Science and Technology, The University of Tokyo, <sup>2)</sup> Department of Electrical Engineering and Information Systems, School of Engineering, The University of Tokyo

14:30 - 14:45 3TuO5.4

### FABRICATION OF GAAS SOLAR CELLS GROWN WITH INGAP WINDOW LAYERS BY HYDRIDE VAPOR PHASE EPITAXY

Ryuji Oshima<sup>1)</sup>, Kikuo Makita<sup>1)</sup>, Akinori Ubukata<sup>2)</sup>, Takeyoshi Sugaya<sup>1)</sup>

<sup>1)</sup> National Institute of Advanced Industrial Science and Technology, <sup>2)</sup> Taiyo Nippon Sanso Corporation

14:45 - 15:00 3TuO5.5

### CHARACTERIZATION OF INVERTED GROWN LATTICE-MATCHING MULTIJUNCTION SOLAR CELLS WITH 1.0 EV DILUTE NITRIDE SUBCELL

Naoya Miyashita<sup>1)</sup>, Takaaki Agui<sup>2)</sup>, Hiroyuki Juso<sup>2)</sup>, Tatsuya Takamoto<sup>2)</sup>, Yoshitaka Okada<sup>1)</sup>

<sup>1)</sup> The University of Tokyo, <sup>2)</sup> Sharp Corporation

15:00 - 15:15 3TuO5.6

### OUTPUT EVALUATION OF A WORLD'S HIGHEST EFFICIENCY FLAT SUB-MODULE WITH InGaP/GaAs/InGaAs INVERTED TRIPLE-JUNCTION SOLAR CELL UNDER OUTDOOR OPERATION

Yasuyuki Ota<sup>1)</sup>, Kohsuke Ueda<sup>2)</sup>, Tatsuya Takamoto<sup>2)</sup>, Kensuke Nishioka<sup>1)</sup>

<sup>1)</sup> University of Miyazaki, <sup>2)</sup> Sharp Corporation

15:15 - 15:30 3TuO5.7

### FLIGHT DEMONSTRATION OF IMM3J SPACE SOLAR CELL FILM IN SPACE

Taishi Sumita<sup>1)</sup>, Yuichi Shibata<sup>1)</sup>, Tetsuya Nakamura<sup>1)</sup>, Kazunori Shimazaki<sup>1)</sup>, Akio Kukita<sup>1)</sup>, Mitsuru Imaizumi<sup>1)</sup>, Takeshi Ohshima<sup>2)</sup>, Shin-ichiro Sato<sup>2)</sup>, Tatsuya Takamoto<sup>3)</sup>

<sup>1)</sup> Japan Aerospace Exploration Agency, <sup>2)</sup> National Institutes for Quantum and Radiological Science and Technoroly, <sup>3)</sup> Sharp corporation

Tuesday, November 14  
13:30 - 15:30 Room 5

Area9

### 9TuO8 PV System Integration Including Smart Grid

Chairpersons:

Kazuhiko Ogimoto (*The University of Tokyo*)

Carlo Brancucci (*National Renewable Energy Laboratory*)

13:30 - 14:00 9TuO8.1

**[Invited]**

### LESSONS LEARNED FROM RECENT DEMONSTRATIONS COMBINING PHOTOVOLTAIC GENERATION AND BATTERY STORAGE

Ben York<sup>1)</sup>, Steven Coley<sup>1)</sup>, Alex Magerko<sup>1)</sup>, Cameron Riley<sup>1)</sup>, Aminul Huque<sup>1)</sup>

<sup>1)</sup> Electric Power Research Institute (EPRI)

14:00 - 14:15 9TuO8.2

### IMPACT ASSESSMENT OF SHORT-TERM FLUCTUATION OF HIGH PENETRATION PV POWER GENERATION ON POWER SYSTEM FREQUENCY CONTROL

Zhiping Tan<sup>1)</sup>, Muneaki Kurimoto<sup>1)</sup>, Yusuke Manabe<sup>2)</sup>, Toshihisa Funabashi<sup>2)</sup>, Takeyoshi Kato<sup>2)</sup>

<sup>1)</sup> Department of Electrical Engineering, Nagoya University, <sup>2)</sup> Institute of Materials and Systems for Sustainability, Nagoya University

14:15 - 14:30 9TuO8.3

### REGIONAL PHOTOVOLTAICS POWER ESTIMATION USING A GEO-STATIONARY SATELLITE HIMAWARI-8

Hideaki Ohtake<sup>1,2)</sup>, Fumichika Uno<sup>1,2)</sup>, Takashi Oozeki<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST), JAPAN, <sup>2)</sup> Meteorological Research Institute, Japan Meteorological Agency (MRI-JMA), Japan

14:30 - 14:45 9TuO8.4

### INFLUENCE OF WRF RADIATION SCHEME ON PRECISION OF IRRADIANCE FORECASTING

Naoto Kai<sup>1)</sup>, Muneaki Kurimoto<sup>1)</sup>, Yusuke Manabe<sup>1)</sup>, Toshihisa Funabashi<sup>1)</sup>, Takeyoshi Kato<sup>1)</sup>, Fumichika Uno<sup>2)</sup>

<sup>1)</sup> Nagoya University, Japan, <sup>2)</sup> National Institute of Advanced Science and Technology, Japan

14:45 - 15:00 9TuO8.5

### ENERGY MANAGEMENT CONTROLLER FOR PHOTOVOLTAIC CHARGING STATION (PV-CS) IN ELECTRIC VEHICLE APPLICATION

Ayda Esfandiyari<sup>1)</sup>, Brian Norton<sup>1)</sup>, Michael F. Conlon<sup>1)</sup>, Sarah J. McCormack<sup>2)</sup>

<sup>1)</sup> Dublin Energy Lab, School of Electrical Engineering, Dublin Institute of Technology (DIT), <sup>2)</sup> Dept of Civil, Structural and Environmental Engineering, Trinity College Dublin (TCD)

15:00 - 15:15 9TuO8.6

### DAY AHEAD PLANNING OF PV POWER GENERATION TO MINIMIZE IMBALANCE COST CONSIDERING SOLAR RADIATION FORECAST ERROR

Ayumu Iio<sup>1)</sup>, Yuzuru Ueda<sup>1)</sup>

<sup>1)</sup> Department of Electrical Engineering, Tokyo University of Science

15:15 - 15:30 9TuO8.7

### LINEAR COMBINATION OF DAY-AHEAD CHARGE/DISCHARGE SCHEDULING TOWARD MULTI-OBJECTIVE ANALYSIS OF EMS

Takahiro Sasaki<sup>1)</sup>, Jindan Cui<sup>1)</sup>, Yuzuru Ueda<sup>1)</sup>, Masakazu Koike<sup>2)</sup>, Takayuki Ishizaki<sup>3)</sup>, Jun-ichi Imura<sup>3)</sup>

<sup>1)</sup> Tokyo University of Science, Japan, <sup>2)</sup> Tokyo University of Marine Science and Technology, Japan, <sup>3)</sup> Tokyo Institute of Technology, Japan

Tuesday, November 14

18:30 - 20:00 Room 1+2

Area8

8TuO3 Emerging Technologies

Chairpersons:

Takashi Oozeki (*National Institute of Advanced Industrial Science and Technology (AIST)*)

John Ogawa Borland (*J.O.B. Technologies*)

18:30 - 18:45 8TuO3.1

**[Area Leading invited]**

Photovoltaic power systems deployment for half a century and our technical contribution in Asia

Yousuke Nozaki<sup>1)</sup>, Kazuhiko Oda<sup>1)</sup>, Kensuke Murai<sup>1)</sup>, Keiichiro Hakuta<sup>1)</sup>, Yuji Kawagoe<sup>1)</sup>

<sup>1)</sup> Smart Energy Business Headquarters, NTT FACILITIES, Inc

18:45 - 19:00 8TuO3.2

**[Area Leading invited]**

PV MODULE REUSE & RECYCLING BUSINESS AND MODULE DEFECTS IN THE FIELD

Masafumi Ito<sup>1)</sup>, Taisuke Doi<sup>1)</sup>

<sup>1)</sup> NPC Incorporated

19:00 - 19:15 8TuO3.3

### DEVELOPMENT OF HIGH PRECISION FAULT DETECTION METHOD OF LARGE-SCALE PV USING PV STRING MEASUREMENT DATA

Takuro Kida<sup>1)</sup>, Yuzuru Ueda<sup>1)</sup>, Yoshinori Inoue<sup>2)</sup>, Tatsuhiko Konuma<sup>3)</sup>

<sup>1)</sup> Tokyo University of Science, <sup>2)</sup> Fuji Electric Co., Ltd, <sup>3)</sup> BroadBand Tower, Inc.

19:15 - 19:30 8TuO3.4

### FIELD EXPERIENCE AND PERFORMANCE ANALYSIS OF FLOATING PV TECHNOLOGIES IN THE TROPICS

Haohui Liu<sup>1)</sup>, Lu Zhao<sup>1)</sup>, Jason Lun Leung<sup>1)</sup>, Vijay Anand Krishna<sup>1)</sup>, Thomas Reindl<sup>1)</sup>

<sup>1)</sup> Solar Energy Research Institute of Singapore (SERIS)

19:30 - 19:45 8TuO3.5

### ALL-BLACK FRONT SURFACES FOR BUILDING-INTEGRATED PHOTOVOLTAICS

Beniamino Iandolo<sup>1)</sup>, Io Mizushima<sup>2)</sup>, Rasmus S. Davidsen<sup>1)</sup>, Peter T. Tang<sup>2)</sup>, Ole Hansen<sup>1)</sup>

<sup>1)</sup> DTU nanotech, Technical University of Denmark, <sup>2)</sup> IPU, Denmark

19:45 - 20:00 8TuO3.6

### ELECTROSTATIC CLEANING EQUIPMENT FOR REMOVAL OF DUST FROM SOLAR PANELS

Hiroyuki Kawamoto<sup>1)</sup>

<sup>1)</sup> Department of Applied Mechanics and Aerospace Engineering, Waseda University

Tuesday, November 14

18:30 - 20:00 Room 3

Area2

2TuO6 Device Characterization and TCO

Chairpersons:

Shogo Ishizuka (*AIST*)

Thomas Dalibor (*R&D, AVANCIS GmbH*)

18:30 - 18:45 2TuO6.1

### CRITICAL ROLE OF LIGHT EXPOSURE ON CO-EVAPORATED Cu(In,Ga)Se<sub>2</sub> SOLAR CELLS

Roland Scheer<sup>1)</sup>, Torsten Hoelscher<sup>1)</sup>, Matthias Maiberg<sup>1)</sup>

<sup>1)</sup> Institute of Physics, Martin-Luther-Universität, Germany

18:45 - 19:00 2TuO6.2

### THE ORIGIN AND PROPAGATION OF REVERSE BIAS INDUCED DEFECTS IN CIGS PHOTOVOLTAIC DEVICES

Harvey L. Guthrey<sup>1)</sup>, Steve Johnston<sup>1)</sup>, Elizabeth Palmiotti<sup>2)</sup>,  
Andreas Gerber<sup>3)</sup>, Mowafak Al-Jassim<sup>1)</sup>

<sup>1)</sup> Analytical Microscopy Group, National Renewable Energy  
Laboratory, <sup>2)</sup> Colorado School of Mines, <sup>3)</sup> IEK5-Forschungszentrum  
Jülich GMBH

**19:00 - 19:15**      **2TuO6.3**

**ANALYSIS OF RECOMBINATION RATES IN CU(IN,GA)(S,SE)2-  
BASED SOLAR CELLS WITH CDS, ZNS(O,OH), AND (CD,ZN)  
BUFFER LAYERS**

Jakapan Chantana<sup>1)</sup>, Takuya Kato<sup>2)</sup>, Hiroki Sugimoto<sup>2)</sup>,  
Takashi Minemoto<sup>1)</sup>

<sup>1)</sup> Department of Electrical and Electronic Engineering, Ritsumeikan  
University, <sup>2)</sup> Solar Frontier K. K.

**19:15 - 19:30**      **2TuO6.4**

**EFFECT OF CESIUM FLUORIDE POST-DEPOSITION  
TREATMENT ON THIN FILM CU(IN,GA)SE<sub>2</sub> SOLAR CELLS:  
SELF-ADJUSTMENT AND INTERFACIAL ENGINEERING AT  
CIGS/CDS INTERFACE**

Tzu-Ying Lin<sup>1,2)</sup>, Ishwor Khatri<sup>2)</sup>, Kosuke Shudo<sup>2)</sup>, Wei-Chih Huang<sup>1)</sup>,  
Mutsumi Sugiyama<sup>2)</sup>, Chih-Huang Lai<sup>1)</sup>, Tokio Nakada<sup>2)</sup>

<sup>1)</sup> Department of Materials Science and Engineering, National Tsing  
Hua University, <sup>2)</sup> Research Institute of Science and Technology,  
Tokyo University of Science

**19:30 - 19:45**      **2TuO6.5**

**CHALLENGES OF AN HYDROGEN DOPED INDIUM OXIDE  
WINDOW LAYER IN CIGS MODULES**

Darja Erfurt<sup>1)</sup>, Marc Daniel Heinemann<sup>1)</sup>, Stefan Körner<sup>2)</sup>,  
Bernd Szyszka<sup>2)</sup>, Reiner Klenk<sup>1)</sup>, Rutger Schlatmann<sup>1)</sup>

<sup>1)</sup> PVcomB Helmholtz-Zentrum Berlin, Germany, <sup>2)</sup> Technical  
University of Berlin, Germany

**19:45 - 20:00**      **2TuO6.6**

**SURFACE MODIFICATION OF FTO BY PLASMA ION  
IMPLANTATION FOR THE APPLICATION ON CDTE SOLAR  
CELLS**

Cai Liu<sup>1)</sup>, Peng Tang<sup>1)</sup>, Jingquan Zhang<sup>1)</sup>, Lili Wu<sup>1)</sup>, Wei Li<sup>1)</sup>,  
Lianghuan Feng<sup>1)</sup>

<sup>1)</sup> College of Materials Science and Engineering, Sichuan University

**Tuesday, November 14**  
**18:30 - 20:00 Room 5**

**Area6**

**6TuO9 Quantum Well Solar Cells and Up/down Conversion**

Chairpersons:

Nowshad Amin (*The National University of Malaysia*)

Shuhei Yagi (*Saitama University*)

**18:30 - 18:45**      **6TuO9.1**

**[Area Leading invited]**

**NOVEL MICRO CPV MODULE INTEGRATED WITH  
PLASTIC LENS, CIRCUIT BOARD AND III-V COMPOUND  
SEMICONDUCTOR UTILIZING INJECTION MOLDING AND  
SURFACE MOUNTING**

Michihiko Takase<sup>1)</sup>, Youichirou Aya<sup>1)</sup>, Nobuhiko Hayashi<sup>1)</sup>,  
Shutetsu Kanayama<sup>1)</sup>, Hikaru Nishitani<sup>1)</sup>, Bunji Mizuno<sup>1)</sup>

<sup>1)</sup> Special Project Office, Production Engineering Center Connected  
Solutions Company, Panasonic Corporation

**18:45 - 19:00**      **6TuO9.2**

**BROADBAND-SENSITIVE UPCONVERSION OF Er<sup>3+</sup>, Ni<sup>2+</sup>-CO-  
DOPED GARNETS**

Yasuhiko Takeda<sup>1)</sup>, Hom Nayh Luitel<sup>1)</sup>, Shintaro Mizuno<sup>1)</sup>

<sup>1)</sup> Toyota Central Research and Development Laboratories, Inc.

**19:00 - 19:15**      **6TuO9.3**

**ECO-FRIENDLY CUGAS<sub>2</sub>/ZNS QUANTUM DOTS  
HARVESTING UV-LIGHT AND EMITTING A WIDE RANGE  
OF VISIBLE LIGHT WITH HIGHLY PHOTOLUMINESCENCE  
QUANTUM YIELD FOR ENHANCING THE PERFORMANCE OF  
SOLAR CELLS**

Mohammed Jalalah<sup>1,2)</sup>, Yun-Hyuk Ko<sup>1)</sup>, Seung-Jae Lee<sup>1)</sup>,  
Ji-Eun Lee<sup>1)</sup>, Jea-Gun Park<sup>1)</sup>

<sup>1)</sup> Hanyang University, <sup>2)</sup> Najran University

**19:15 - 19:30**      **6TuO9.4**

**INVESTIGATION OF CARRIER TRANSPORT MECHANISM IN  
SUPERLATTICE SOLAR CELLS WITH STRAIN RELAXATION  
LAYER**

Hideaki Takeda<sup>1)</sup>, Tsubasa Nakamura<sup>1)</sup>, Jianan Lu<sup>1)</sup>,  
Hidetoshi Suzuki<sup>1)</sup>, Kasidit Toprasertpong<sup>2)</sup>, Masakazu Sugiyama<sup>2)</sup>,  
Tetsuo Ikari<sup>1)</sup>, Atsuhiko Fukuyama<sup>1)</sup>

<sup>1)</sup> Faculty of Engineering, University of Miyazaki, <sup>2)</sup> The University of  
Tokyo

**19:30 - 19:45**      **6TuO9.5**

**THIN-FILM MULTIPLE QUANTUM WELLS SOLAR CELLS  
FABRICATED BY EPITAXIAL LIFT OFF PROCESS**

Tatsuya Nakata<sup>1)</sup>, Kentaroh Watanabe<sup>2)</sup>, Naoya Miyashita<sup>2)</sup>,  
Hassanet Sodabanlu<sup>2)</sup>, Yoshiaki Nakano<sup>1,2)</sup>, Yoshitaka Okada<sup>1,2)</sup>,  
Masakazu Sugiyama<sup>1,2)</sup>

<sup>1)</sup> School of Engineering, University of Tokyo, <sup>2)</sup> Research Center for  
Advanced Science and Technology, University of Tokyo

**19:45 - 20:00**      **6TuO9.6**

**ELECTROLUMINESCENCE AND RECIPROCALITY RELATION IN  
MULTIPLE QUANTUM WELL SOLAR CELLS**

Kasidit Toprasertpong<sup>1)</sup>, Amaury Delamarre<sup>1)</sup>,  
Kentaroh Watanabe<sup>1)</sup>, Yoshiaki Nakano<sup>1)</sup>,  
Jean-François Guillemoles<sup>2)</sup>, Masakazu Sugiyama<sup>1)</sup>

<sup>1)</sup> The University of Tokyo, <sup>2)</sup> Institute for Research and Development  
on Photovoltaic Energy

---

**Wednesday, November 15**  
**8:30 - 10:00 Room 1+2**

Chairpersons:

Area 4. Masahiro Hiramoto (*Institute for Molecular Science*)

Area 5. Shuzi Hayase (*Kyushu Institute of Technology*)

Area 8. Yuzuru Ueda (*Tokyo University of Science*)

---

**8:30 - 9:00**      **4WePl.1**

**[Plenary]**

**REDUCTION OF PHOTON ENERGY LOSS IN POLYMER  
SOLAR CELLS**

Itaru Osaka<sup>1)</sup>

<sup>1)</sup> Department of Applied Chemistry, Hiroshima University

**9:00 - 9:30**      **5WePl.2**

**[Plenary]**

**21 Century Disruptive Photovoltaics: Perovskite Solar Cell**

Nam-Gyu Park<sup>1)</sup>

<sup>1)</sup> School of Chemical Engineering, Sungkyunkwan University

**9:30 - 10:00**      **8WePl.3**

**[Plenary]**

**TOWARDS NEW MOBILITY SOCIETY BY USING SOLAR  
ENERGY**

Masaki Nakaoka<sup>1)</sup>, Taizo Masuda<sup>1)</sup>, Kazutaka Kimura<sup>1)</sup>,  
Akinori Sato<sup>1)</sup>

<sup>1)</sup> Future Project Div., Frontier Research Center, TOYOTA MOTOR  
CORPORATION

---

**Wednesday, November 15**  
**10:30 - 12:00 Room 1+2**

**Area8**

**8WeO1 Smart Systems**

Chairpersons:

Robert Höller (*University of Applied Science Upper Austria*)

Masakazu Ito (*Waseda University*)

---

**10:30 - 11:00**      **8WeO1.1**

**[Invited]**

**REALIZATION OF NEXT GENERATION ENERGY SOCIAL  
SYSTEM THROUGH COLLABORATION, CASE STUDY OF  
FUJISAWA SST**

Ryuzo Hagihara<sup>1)</sup>

<sup>1)</sup> Eco solutions company of Panasonic Group, Panasonic

11:00 - 11:15 8WeO1.2

**A CASE STUDY FOR ACHIEVING 100% RESIDENTIAL HAWAII HOME ENERGY NEEDS WITH RENEWABLES BY OPTIMIZING ROOFTOP SOLAR PV AND HOT WATER WITH ELECTRICAL AND THERMAL (HOT&COLD) BATTERY STORAGE INTEGRATION**

John O. Borland<sup>1)</sup>, Takahiro Tanaka<sup>2)</sup>, Harumi McClure<sup>2)</sup>, Jay Moore<sup>3)</sup>, Corpuz Poncho<sup>3)</sup>

<sup>1)</sup> J.O.B. Technologies, <sup>2)</sup> Tabuchi Electric, <sup>3)</sup> Poncho's Solar

11:15 - 11:30 8WeO1.3

**EV SOLAR STATION, A KEY INFRASTRUCTURE FOR ABSORBING SURPRASS ENERGY GENERATION OF PV ON THE CAR-ROOF**

Kenji Araki<sup>1)</sup>, Kan-Hua Lee<sup>1)</sup>, Masafumi Yamaguchi<sup>1)</sup>

<sup>1)</sup> Toyota Technological Institute

11:30 - 11:45 8WeO1.4

**ADVANCED MODELLING OF ENVIRONMENT INTEGRATED PV SYSTEMS: FROM LOCATION TO LOAD**

Rudi Santbergen<sup>1)</sup>, Olindo Isabella<sup>1)</sup>, Miro Zeman<sup>1)</sup>

<sup>1)</sup> Photovoltaic Materials and Devices Laboratory, Delft University of Technology

11:45 - 12:00 8WeO1.5

**DEVELOPMENT OF AN AUTOMATIC FAILURE DETECTION ALGORITHM FOR RESIDENTIAL PV SYSTEM BY USING OPI METHOD**

Masato Ajisaka<sup>1)</sup>, Yuzuru Ueda<sup>1)</sup>, Tomoyoshi Yokota<sup>2)</sup>, Ryuuji Yamada<sup>2)</sup>

<sup>1)</sup> Department of Electrical Engineering, Tokyo University of Science, <sup>2)</sup> Kyocera Cooperation

---

**Wednesday, November 15**

10:30 - 12:00 Room 3

Area2

2WeO3 CZTS Devices

Chairpersons:

Shigeru Ikeda (*Konan University*)Susanne Siebentritt (*University of Luxembourg*)

10:30 - 10:45 2WeO3.1

**CHARACTERIZATION OF CU<sub>2</sub>ZNSNSE<sub>4</sub> SOLAR CELL WITH CONVERSION EFFICIENCY OF 11.7%**

Hitoshi Tampo<sup>1)</sup>, Shinho Kim<sup>1)</sup>, Hajime Shibata<sup>1)</sup>, Shigeru Niki<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology

10:45 - 11:00 2WeO3.2

**Characterization of the Cu<sub>2</sub>ZnSn(SXSe<sub>1-X</sub>)<sub>4</sub>(CZTSSe) absorber thin films deposited by a sputtering process**

Myeng Gil Gang<sup>1)</sup>, Jin Hyeok Kim<sup>2)</sup>

<sup>1)</sup> Optoelectronic Convergence Research Center, Department of Materials Science and Engineering, Chonnam National University, South Korea

11:00 - 11:15 2WeO3.3

**A COMPARATIVE STUDY OF LIGANDS IN Cu<sub>2</sub>ZnSn(S,Se)<sub>4</sub> SOLAR CELLS PREPARED FROM NANOPARTICLE INKS**

Yongtao Qu<sup>1)</sup>, Neil S. Beattie<sup>1)</sup>, Guillaume Zoppi<sup>1)</sup>

<sup>1)</sup> Department of Mathematics, Physics and Electrical Engineering, Ellison Building, Northumbria University

11:15 - 11:30 2WeO3.4

**SURFACE TREATMENT EFFECT ON Cu<sub>2</sub>ZnSn(S,Se)<sub>4</sub> SOLAR CELLS**

Takuya Ebi<sup>1)</sup>, Kanta Sugimoto<sup>1)</sup>, Naoki Suyama<sup>1)</sup>, Kazuyoshi Nakada<sup>1)</sup>, Akira Yamada<sup>1)</sup>

<sup>1)</sup> Tokyo Institute of Technology

11:30 - 11:45 2WeO3.5

**CZTSE: GE SOLAR CELLS FABRICATION FROM MBE-DEPOSITED METALLIC STACK PRECURSORS**

Sergio Giraldo<sup>1)</sup>, Shino Kim<sup>2)</sup>, Hitoshi Tampo<sup>2)</sup>, Hajime Shibata<sup>2)</sup>, Alejandro Pérez-Rodríguez<sup>1)</sup>, Edgardo Saucedo<sup>1)</sup>

<sup>1)</sup> Catalonia Institute for Energy Research (IREC), <sup>2)</sup> National Institute of Advanced Industrial Science and Technology (AIST)

11:45 - 12:00 2WeO3.6

**ANNEALING EFFECT AFTER CdS LAYER DEPOSITION ON Cu<sub>2</sub>ZnSn(S,Se)<sub>4</sub> SOLAR CELLS**

Kanta Sugimoto<sup>1)</sup>, Takuya Ebi<sup>1)</sup>, Naoki Suyama<sup>1)</sup>, Kazuyoshi Nakada<sup>1)</sup>, Akira Yamada<sup>1)</sup>

<sup>1)</sup> Tokyo Institute of Technology

---

**Wednesday, November 15**

10:30 - 12:00 Room 5

Area4

4WeO5 Organic and Dye-Sensitized Solar Cells 1

Chairpersons:

Masahiro Hiramoto (*Institute for Molecular Science*)Sergei Manzhos (*National University of Singapore*)

10:30 - 11:00 4WeO5.1

**[Invited]**



**PV FOR INDOOR USE AND ITS STANDARDIZATION**Shinji Aramaki<sup>1)</sup><sup>1)</sup> Research Division, CEREBEA**11:00 - 11:15**      **4WeO5.2****Π-CONJUGATION EFFECTS OF OLIGO(THIENYLENEVINYLENE) SIDE CHAINS IN SEMICONDUCTING POLYMERS ON PHOTOVOLTAIC PERFORMANCE**Keisuke Tajima<sup>1)</sup>, Jianming Huang<sup>1)</sup><sup>1)</sup> RIKEN Center for Emergent Matter Science (CEMS)**11:15 - 11:30**      **4WeO5.3****ORGANIC SOLAR CELLS UTILIZING NON-PERIPHERAL OCTAHEXYLPHTHALOCYANINE AND ITS ANALOGUES**Akihiko Fujii<sup>1)</sup>, Quang Duy Dao<sup>1)</sup>, Makoto Yoneya<sup>2)</sup>, Yo Shimizu<sup>2)</sup>, Masanori Ozaki<sup>1)</sup><sup>1)</sup> Division of Electrical, Electronic and Information Engineering, Osaka University, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology**11:30 - 11:45**      **4WeO5.4****IMPROVED Voc IN SMALL MOLECULE ORGANIC SOLAR CELLS WITHOUT CONCOMMITANT DECREASE IN Jsc**James W. Ryan<sup>1)</sup><sup>1)</sup> International Center for Young Scientists, National Institute for Materials Science**11:45 - 12:00**      **4WeO5.5****μM-THICK VACUUM DEPOSITED PHTHALOCYANINE :C60 PHOTOVOLTAIC CELLS UTILIZING CO-EVAPORANT INDUCED CRYSTALLIZATION**Toshihiko Kaji<sup>1)</sup><sup>1)</sup> Department of Applied Physics, Tokyo University of Agriculture and Technology**Wednesday, November 15****10:30 - 12:00 Room 6****Area5****5WeO7 High Performance (Durability etc)**

Chairpersons:

Tae Woong Kim (*University of Tokyo*)Satoshi Uchida (*University of Tokyo*)**10:30 - 10:45**      **5WeO7.1****MIXED METAL PEROVSKITE CONSISTING OF TIN WITH LOW VOLTAGE LOSS**Shuzi Hayase<sup>1)</sup>, Yuhei Ogomi<sup>1)</sup>, Daiki Yamasuso<sup>1)</sup>, Kengo Hamada<sup>1)</sup>,Yuuma Hoshiba<sup>1)</sup>, Shen Qing<sup>2)</sup>, Taro Toyoda<sup>2)</sup>, Kenji Yoshino<sup>3)</sup>, Takashi Minemoto<sup>4)</sup>, Hiroshi Segawa<sup>5)</sup><sup>1)</sup> School of Life Science and Systems Engineering, Kyushu National Institute of Technology, <sup>2)</sup> University of Electro-communications, <sup>3)</sup> Miyazaki University, <sup>4)</sup> Ritsumeikan University, <sup>5)</sup> The University of Tokyo**10:45 - 11:00**      **5WeO7.2****TANDEM DYE-SENSITIZED/PEROVSKITE SOLAR CELLS**Marina Vildanova<sup>1)</sup>, Anna Nikolskaia<sup>1)</sup>, Sergey Kozlov<sup>1)</sup>, Liudmila Larina<sup>1,2)</sup>, Nikolay Tsvetkov<sup>1,2)</sup><sup>1)</sup> Solar Photovoltaic Laboratory, Institute of Biochemical Physics RAS, <sup>2)</sup> Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology**11:00 - 11:15**      **5WeO7.3****MICROWAVE IRRADIATION FOR ORGANIC-INORGANIC HYBRID LEAD HALIDE CRYSTALLIZATION APPLIED TO PEROVSKITE SOLAR CELLS**Masato Maitani<sup>1)</sup>, Vijay S. Murugesan<sup>1)</sup>, Daikichi Iso<sup>2)</sup>, Junbeom Kim<sup>2,3)</sup>, Shuntaro Tsubaki<sup>2)</sup>, Tsutomu Miyasaka<sup>4)</sup>, Hiroshi Segawa<sup>1)</sup>, Yuji Wada<sup>2)</sup><sup>1)</sup> The University of Tokyo, <sup>2)</sup> Tokyo Institute of Technology, <sup>3)</sup> Seoul National University, <sup>4)</sup> Tooin University of Yokohama**11:15 - 11:30**      **5WeO7.4****HIGH STABILITY OF SEMI-TRANSPARENT PEROVSKITE SOLAR CELLS SHOWING NO DEGRADATION OVER 1000 HOURS OF CONTINUOUS OPERATION**Yasuhiro Shirai<sup>1)</sup>, Md Bodiul Islam<sup>1)</sup>, Masatoshi Yanagida<sup>1)</sup>, Kenjiro Miyano<sup>1)</sup><sup>1)</sup> National Institute for Materials Science**11:30 - 11:45**      **5WeO7.5****Direct observation of phase coexistence and microstructural configuration of the organometal halide perovskite solar cell**Tae Woong Kim<sup>1)</sup>, Satoshi Uchida<sup>1)</sup>, Tomonori Matsushita<sup>1)</sup>, Ludmila Cojocar<sup>1)</sup>, Takashi Kondo<sup>1)</sup>, Hiroshi Segawa<sup>1)</sup><sup>1)</sup> Univ. of Tokyo, Japan**11:45 - 12:00**      **5WeO7.6****[Area Leading Invited]****METAL OXIDE AND LOW TEMPERATURE PROCESS BASED PEROVSKITE SOLAR CELLS AND HIGH EFFICIENCY DEVELOPMENT**Tsutomu Miyasaka<sup>1)</sup><sup>1)</sup> Tooin University of Yokohama



Wednesday, November 15  
13:30 - 14:45 Room 1+2

Area1

1WeO2 Crystal Growth and Wafering

Chairpersons:

Stefan W. Glunz (*Fraunhofer Institute for Solar Energy Systems*)  
Koji Arafune (*University of Hyogo*)

13:30 - 13:45 1WeO2.1

Recent Progress and Challenges of Cast Silicon for Photovoltaic Industry

Chung Wen Lan<sup>1)</sup>, A. Lan<sup>1,2)</sup>, C.F. Yang<sup>1)</sup>, H.P. Hsu<sup>1)</sup>, M. Yang<sup>2)</sup>, A. Yu<sup>2)</sup>, B. Hsu<sup>2)</sup>, C. Hsu<sup>2)</sup>, A. Yang<sup>3)</sup>

<sup>1)</sup> Department of Chemical Engineering, National Taiwan University, <sup>2)</sup> Sino-American Silicon Products Inc. (SAS), <sup>3)</sup> Solartech Energy Inc.

13:45 - 14:00 1WeO2.2

METAL PRECIPITATE DISTRIBUTIONS IN HIGH-PERFORMANCE AND CONVENTIONAL MULTICRYSTALLINE SILICON

Mallory Jensen<sup>1)</sup>, Sarah Wiegold<sup>1)</sup>, Kai E. Ekstrøm<sup>2)</sup>, Antoine Autruffe<sup>2)</sup>, Amanda Youssef<sup>1)</sup>, Erin E. Looney<sup>1)</sup>, Juan-Pablo Correa-Baena<sup>1)</sup>, Jeremy Poindexter<sup>1)</sup>, Gaute Stokkan<sup>3)</sup>, Barry Lai<sup>4)</sup>, Tonio Buonassisi<sup>1)</sup>

<sup>1)</sup> Massachusetts Institute of Technology, <sup>2)</sup> Norwegian University of Science and Technology, <sup>3)</sup> SINTEF, <sup>4)</sup> Argonne National Laboratory

14:00 - 14:15 1WeO2.3

CONTROL OF CRUCIBLE MOVEMENT ON MELTING PROCESS AND CARBON CONTAMINATION IN CZOCHRALSKI SILICON CRYSTAL GROWTH

Xin Liu<sup>1)</sup>, Xue-Feng Han<sup>1)</sup>, Satoshi Nakano<sup>1)</sup>, Koichi Kakimoto<sup>1)</sup>

<sup>1)</sup> Research Institute for Applied Mechanics, Kyushu University

14:15 - 14:30 1WeO2.4

COMBINING THE ULTRA SIMPLIFIED SOLENNIA 3 CELL CONCEPT WITH N-TYPE CRYSTALMAX SILICON

Raphaël Cabal<sup>1)</sup>, Bernadette Grange<sup>1)</sup>, Lotfi Bounaas<sup>2)</sup>, Sébastien Dubois<sup>1)</sup>

<sup>1)</sup> CEA, LITEN, INES, <sup>2)</sup> ECM Green Tech

14:30 - 14:45 1WeO2.5

PERFORMANCE OF DIAMOND SAWING MULTI-CRYSTALLINE SILICON WAFER AND CELL

Longfei Gong<sup>1,2)</sup>, Xuegong Yu<sup>1)</sup>, Shanming Jin<sup>2)</sup>, Deren Yang<sup>1,2)</sup>

<sup>1)</sup> School of Materials Science & Engineering, Zhejiang University, <sup>2)</sup> Suzhou GCL Photovoltaic Technology Co., Ltd.

Wednesday, November 15  
13:30 - 14:45 Room 3

Area2

2WeO4 New Materials and Concept

Chairpersons:

Mutsumi Sugiyama (*Tokyo University of Science*)  
Negar Naghavi (*CNRS*)

13:30 - 13:45 2WeO4.1

[Area Leading invited]

RECENT PROGRESS IN HIGH EFFICIENCY PURE SULFIDE CIGS SOLAR CELLS

Hiroki Sugimoto<sup>1)</sup>, Homare Hiroi<sup>1,2)</sup>, Yasuaki Iwata<sup>1)</sup>, Akira Yamada<sup>2)</sup>

<sup>1)</sup> Atsugi Research Center, Solar Frontier K.K., <sup>2)</sup> Tokyo Institute of Technology

13:45 - 14:00 2WeO4.2

EFFECT OF SB-DOPED N+-BASi2 SURFACE LAYER ON THE CARRIER TRANSPORT PROPERTIES AND SPECTRAL RESPONSE

Komomo Kodama<sup>1)</sup>, Ryota Takabe<sup>1)</sup>, Kaoru Toko<sup>1)</sup>, Takashi Suemasu<sup>1)</sup>

<sup>1)</sup> Institute of Applied Physics, University of Tsukuba

14:00 - 14:15 2WeO4.3

FORMATION OF A NOVEL MG-P-ZN TERNARY SEMICONDUCTOR: A KEY MATERIAL OF EFFICIENCY ENHANCEMENT IN Zn3P2-BASED SOLAR CELLS

Ryoji Katsube<sup>1)</sup>, Kenji Kazumi<sup>1)</sup>, Yoshitaro Nose<sup>1)</sup>

<sup>1)</sup> Kyoto University, Japan

14:15 - 14:30 2WeO4.4

OPTIMIZATION OF THE RECOMBINATION JUNCTION IN MONOLITHIC TWO-TERMINAL HYBRID CIGS TANDEM DEVICES

Johan Blanker<sup>1)</sup>, Yi Hsiu Liu<sup>1)</sup>, Zeger Vroon<sup>2)</sup>, Miro Zeman<sup>1)</sup>, Arno Smets<sup>1)</sup>

<sup>1)</sup> Delft University of Technology, <sup>2)</sup> TNO/Solliance

14:30 - 14:45 2WeO4.5

A CORRELATIVE MICROSCOPY APPROACH TO DELINEATE THE IMPACT OF STRUCTURAL DEFECTS ON THE LOW MINORITY CARRIER LIFETIME IN TIN SULFIDE THIN FILMS

Amanda Youssef<sup>1)</sup>, Rupak Chakraborty<sup>1)</sup>, Paul Rekemeyer<sup>1)</sup>, Austin Akey<sup>2)</sup>, Silvija Gradečak<sup>1)</sup>, Tonio Buonassisi<sup>1)</sup>

<sup>1)</sup> Massachusetts Institute of Technology, <sup>2)</sup> Harvard Center for Nanoscale Systems

Wednesday, November 15  
13:30 - 14:45 Room 5

Area4

#### 4WeO6 Organic and Dye-Sensitized Solar Cells 2

Chairpersons:

Keisuke Tajima (RIKEN)

Anna Nikolskaia (Institute of Biochemical Physics, Russian Academy of Sciences)

13:30 - 13:45 4WeO6.1

#### IMPROVED CONVERSION EFFICIENCY OF 10% FOR SOLID-STATE DYE SENSITIZED SOLAR CELLS USING P-TYPE CUI

Naohiko Kato<sup>1)</sup>, Shinya Moribe<sup>1)</sup>, Masahito Shiozawa<sup>1)</sup>, Kazuo Higuchi<sup>1)</sup>, Akira Suzuki<sup>2)</sup>, Katsuya Tsuchimoto<sup>2)</sup>, Kouji Tatematsu<sup>3)</sup>, Katsuyoshi Mizumoto<sup>3)</sup>, Shouichi Doi<sup>3)</sup>, Tatsuo Toyoda<sup>3)</sup>, Ryo Suzuki<sup>1)</sup>, Mareedu Sreenivasu<sup>2)</sup>

<sup>1)</sup> Energy Conversion Materials Lab. Toyota Central Research and Development Laboratories, <sup>2)</sup> AISIN Cosmos R&D Co., Ltd., <sup>3)</sup> AISIN SEIKI Co., Ltd.

13:45 - 14:00 4WeO6.2

#### DESIGN OF SEMICONDUCTING POLYMERS TOWARDS HIGHLY THERMALLY STABLE SOLAR CELLS

Masahiko Saito<sup>1)</sup>, Itaru Osaka<sup>1)</sup>, Yasuhiro Suzuki<sup>1)</sup>, Kazuo Takimiya<sup>2)</sup>, Takashi Okabe<sup>3)</sup>, Satoru Ikeda<sup>3)</sup>, Tsuyoshi Asano<sup>3)</sup>

<sup>1)</sup> Graduate School of Engineering, Hiroshima University, <sup>2)</sup> RIKEN Center for Emergent Matter Science, <sup>3)</sup> JX Nippon Oil & Energy Corporation

14:00 - 14:15 4WeO6.3

#### Cold Isostatic-Pressured Silver Nanowire Electrodes for Flexible Organic Solar Cells via Room-Temperature Processes

Ji Hoon Seo<sup>1)</sup>, Inchan Hwang<sup>1)</sup>, Han-Don Um<sup>1)</sup>, Sojeong Lee<sup>1)</sup>, Kangmin Lee<sup>1)</sup>, Jeonghwan Park<sup>1)</sup>, Hyeonoh Shin<sup>2)</sup>, Tae-Hyuk Kwon<sup>2)</sup>, Seok Ju Kang<sup>1)</sup>, Kwanyong Seo<sup>1)</sup>

<sup>1)</sup> Department of Energy Engineering Ulsan National Institute of Science and Technology (UNIST), <sup>2)</sup> Department of Chemistry, Ulsan National Institute of Science and Technology (UNIST),

14:15 - 14:30 4WeO6.4

#### INDUCED CRYSTALLIZATION OF ORGANIC SEMICONDUCTOR IN THIN FILM BY SURFACE SEGREGATED MONOLAYERS

Seiichiro Izawa<sup>1,2)</sup>, Kyohei Nakano<sup>3)</sup>, Kaori Suzuki<sup>3)</sup>, Yujiao Chen<sup>3)</sup>, Tomoka Kikitsu<sup>3)</sup>, Daisuke Hashizume<sup>3)</sup>, Tomoyuki Koganezawa<sup>4)</sup>, Thuc-Quyen Nguyen<sup>5)</sup>, Keisuke Tajima<sup>3)</sup>

<sup>1)</sup> Institute for Molecular Science, <sup>2)</sup> The Graduate University for Advanced Studies (SOKENDAI), <sup>3)</sup> RIKEN Center for Emergent Matter Science (CEMS), <sup>4)</sup> Japan Synchrotron Radiation Research Institute (JASRI), <sup>5)</sup> University of California, Santa Barbara

14:30 - 14:45 4WeO6.5

#### COMPARATIVE COMPUTATIONAL STUDY OF FULLERENE DERIVATIVES: EFFECTS DUE TO FULLERENE SIZE, ADDENDS, AND CRYSTALLINITY ON BANDSTRUCTURE, CHARGE TRANSPORT AND OPTICAL PROPERTIES

Sergei Manzhos<sup>1)</sup>, Amrita Pal<sup>1)</sup>, Lai Kai Wen<sup>1)</sup>, Chia Yao Jun<sup>1)</sup>, Il Jeon<sup>2)</sup>, Yutaka Matsuo<sup>2)</sup>

<sup>1)</sup> Department of Mechanical Engineering, National University of Singapore, <sup>2)</sup> University of Tokyo

Wednesday, November 15  
13:30 - 14:45 Room 6

Area7

#### 7WeO8 Module Materials

Chairpersons:

Keisuke Ohdaira (Japan Advanced Institute of Science and Technology)  
Sarah Kurtz (University of California, Merced)

13:30 - 13:45 7WeO8.1

#### [Area Leading invited]

#### IMPACT OF PERC SOLAR CELL REAR METALLIZATION ON PV MODULE RELIABILITY

Marwan Dhamrin<sup>1)</sup>, Shota Suzuki<sup>1)</sup>, Naoya Morishita<sup>1)</sup>, Masahiro Nakahara<sup>1)</sup>, Yoshiki Hashizume<sup>1)</sup>, Zenya Ashitaka<sup>1)</sup>, Tsuji Kosuke<sup>1)</sup>

<sup>1)</sup> Core Technology Center Tokyo Aluminium K.K

13:45 - 14:00 7WeO8.2

#### ELECTRICAL IDENTIFICATION OF "AGING SIGNATURE" IN CRYSTALLINE SILICON PHOTOVOLTAIC MODULES EXPOSED IN FIELD FOR LONG-TERM

Tadanori Tanahashi<sup>1)</sup>, Norihiko Sakamoto<sup>1)</sup>, Hajime Shibata<sup>1)</sup>, Atsushi Masuda<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST)

14:00 - 14:15 7WeO8.3

#### ADHESION DEGRADATION OF THE METALLIZATION-ENCAPSULANT INTERFACE

Nick S. Bosco<sup>1)</sup>, Peter Hacke<sup>1)</sup>, Sarah R. Kurtz<sup>1)</sup>, Jared Tracy<sup>2)</sup>, Reinhold H. Dauskardt<sup>2)</sup>

<sup>1)</sup> National Renewable Energy Laboratory, <sup>2)</sup> Stanford University

14:15 - 14:30 7WeO8.4

#### LOSS ANALYSIS AND DESIGN OPTIMIZATION OF SHINGLED BIFACIAL PHOTOVOLTAIC MODULES

Jai Prakash Singh<sup>1)</sup>, Yan Wang<sup>1)</sup>, Yong Sheng Khoo<sup>1)</sup>

<sup>1)</sup> Solar Energy Research Institute of Singapore, National University of Singapore

14:30 - 14:45 7WeO8.5

**CONCEPTS FOR PV MODULES OPTIMIZED FOR DIFFERENT CLIMATIC CONDITIONS: BACKSHEETS AND ENCAPSULANTS**

Gernot Oreski<sup>1)</sup>, Antonia Mihaljevic<sup>1)</sup>, Gabriele C. Eder<sup>2)</sup>, Lukas Neumaier<sup>3)</sup>, Christina Hirschl<sup>3)</sup>, Rita Ebner<sup>4)</sup>, Michael Edler<sup>5)</sup>, Werner Krumlacher<sup>5)</sup>

<sup>1)</sup> Polymer Competence Center Leoben, <sup>2)</sup> Österreichisches Forschungsinstitut für Chemie und Technik, <sup>3)</sup> Carinthian Tech Research, <sup>4)</sup> Austrian Institute of Technology, <sup>5)</sup> Isovoltaic AG

**Thursday, November 16**  
**8:30 - 10:00 Room 1+2**

Chairpersons:

Area 2. Hajima Shibata (*National Institute of Advanced Industrial Science and Technology*)

Area 6. Yoshitaka Okada (*The University of Tokyo*)

Area 7. Yoshihiro Hishikawa (*National Institute of Advanced Industrial Science and Technology*)

**8:30 - 9:00 2ThPl.1**

**Area2**

**[Plenary]**

**CIGS SOLAR CELLS WITH ABOVE 22% EFFICIENCY:CHARACTERISTICS AND HIGHLIGHTS**

Michael Powalla<sup>1)</sup>, Stefan Paetel<sup>1)</sup>, Theresa Magorian Friedlmeier<sup>1)</sup>

<sup>1)</sup> Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)

**9:00 - 9:30 6ThPl.2**

**Area6**

**[Plenary]**

**New approaches for Beyond-Silicon Photovoltaics**

Harry A. Atwater<sup>1)</sup>

<sup>1)</sup> California Institute of Technology

**9:30 - 10:00 7ThPl.3**

**Area7**

**[Plenary]**

**A PERSPECTIVE ON THE WHOLE LIFE CYCLE OF PV MODULES**

Donghwan Kim<sup>1,2)</sup>, Hae-Seok Lee<sup>2)</sup>, Yoonmook Kang<sup>2)</sup>, Soohyun Bae<sup>1)</sup>, Hyomin Park<sup>1)</sup>, Se Jin Park<sup>1)</sup>, Jeongeui Hong<sup>3)</sup>, Wonwook Oh<sup>4)</sup>, Nochang Park<sup>4)</sup>, Sung Hyun Kim<sup>4)</sup>

<sup>1)</sup> Department of Materials Science and Engineering, Korea University, <sup>2)</sup> KU-KIST GreenSchool, Graduate School of Energy and Environment, Korea University, <sup>3)</sup> Hanwha-Q Cells Korea, <sup>4)</sup> Korea Electronics Technology Institute (KETI)

**Thursday, November 16**  
**10:30 - 12:00 Room 1+2**

**Area1**

**1ThO1 Characterization II**

Chairpersons:

Atsushi Ogura (*Meiji University*)

Donghwan Kim (*Korea University*)

**10:30 - 10:45 1ThO1.1**

**[Area Leading invited]**

**CRYSTAL GROWTH AND EVALUATION OF ULTRA-LONG CARRIER LIFETIME CZOCHRALSKI SILICON**

Yuta Nagai<sup>1)</sup>, Satoko Nakagawa<sup>1)</sup>, Hiroyuki Tsubota<sup>1)</sup>,

Hisashi Matsumura<sup>1)</sup>

<sup>1)</sup> GlobalWafers Japan Co., Ltd.

10:45 - 11:00 1ThO1.2

**IMPROVED UNDERSTANDING OF LIGHT-INDUCED DEGRADATION AND REGENERATION IN MULTICRYSTALLINE SILICON SOLAR CELLS**

Jan Schmidt<sup>1,2)</sup>, Dennis Bredemeier<sup>1)</sup>, Dominic C. Walter<sup>1)</sup>

<sup>1)</sup> Department of Photovoltaics, Institute for Solar Energy Research Hamelin (ISFH), <sup>2)</sup> Leibniz University Hanover

11:00 - 11:15 1ThO1.3

**EFFECTS OF CARBON CONCENTRATION ON OXYGEN PRECIPITATION THROUGH ANNEALING PROCESS IN N-TYPE CZ-SILICON EVALUATED BY IR LIGHT SCATTERING TOMOGRAPHY**

Kosuke Kinoshita<sup>1)</sup>, Takuto Kojima<sup>1)</sup>, Yoshio Ohshita<sup>2)</sup>, Atsushi Ogura<sup>1)</sup>

<sup>1)</sup> Meiji University, <sup>2)</sup> Toyota Technological Institute

11:15 - 11:30 1ThO1.4

**FAST OPTICAL DETERMINATION OF MICROVOID SIZE IN HYDROGENATED AMORPHOUS SILICON LAYERS BASED ON DATA OBTAINED FROM POSITRON ANNIHILATION SPECTROSCOPY**

Nobuyuki Matsuki<sup>1)</sup>, Nagayasu Oshima<sup>2)</sup>, Brian E. O'Rourke<sup>2)</sup>, Akira Uedono<sup>3)</sup>

<sup>1)</sup> Kanagawa University, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology, <sup>3)</sup> University of Tsukuba

11:30 - 11:45 1ThO1.5

**EVALUATION OF EFFECTIVE DIFFUSIVITIES AND THREE-DIMENSIONAL SIMULATION OF CARRIER DISTRIBUTION IN PHOSPHORUS-IMPLANTED EMITTER OF SI SOLAR CELL USING SCANNING NONLINEAR DIELECTRIC MICROSCOPY**

Yasuo cho<sup>1)</sup>, Kotaro Hirose<sup>1)</sup>, Katsuto Tanahashi<sup>2)</sup>, Hidetaka Takato<sup>2)</sup>

<sup>1)</sup> Research Institute of Electrical Communication, Tohoku University, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology

11:45 - 12:00 1ThO1.6

**XSOLAR-HETERO: CURRENT STATUS OF THE WEB-BASED SOLAR CELL SIMULATION PLATFORM DEVELOPED AT SERIS**

Rolf Stangl<sup>1)</sup>, Gautam Anand<sup>1)</sup>, Rahul Jaiswal<sup>1)</sup>, Mengjie Li<sup>1,2)</sup>, Andreas Fell<sup>3)</sup>, Cangming Ke<sup>1)</sup>, Armin Aberle<sup>1,2)</sup>

<sup>1)</sup> Solar Energy Research Institute of Singapore (SERIS), <sup>2)</sup> Department of Electrical and Computer Engineering (ECE), National University of Singapore (NUS), <sup>3)</sup> Fraunhofer Institute for Solar Energy Systems

Thursday, November 16  
10:30 - 12:00 Room 3

Area4

**4ThO3 Organic and Dye-Sensitized Solar Cells 3**

Chairpersons:

Masashi Ikegami (*Toin University of Yokohama*)

James RYAN (*National Institute for Materials Science (NIMS)*)

10:30 - 10:45 4ThO3.1

**EFFECTS OF IMPURITY DOPING AT PPM LEVEL IN PHOTOVOLTAIC ORGANIC OSEMICONDUCTORS**

Masahiro Hiramoto<sup>1)</sup>

<sup>1)</sup> Department of Materials Molecular Science, Institute for Molecular Science (IMS)

10:45 - 11:00 4ThO3.2

**HOLE RELAXATION IN POLYMER:FULLERENE SOLAR CELLS EXAMINED BY MICROWAVE SPECTROSCOPY OF A DEVICE**

Akinori Saeki<sup>1,2)</sup>

<sup>1)</sup> Department of Applied Chemistry, Osaka University, <sup>2)</sup> PRESTO, JST

11:00 - 11:15 4ThO3.3

**FABRICATION AND PERFORMANCE OF ORGANIC SOLAR CELLS USING MoO<sub>3</sub> / Mg AS CATHODE INTERLAYERS**

Hiroshi Kageyama<sup>1)</sup>, Iwamichi Ishikawa<sup>1)</sup>, Akira Higa<sup>1)</sup>

<sup>1)</sup> Faculty of Engineering, University of the Ryukyus

11:15 - 11:30 4ThO3.4

**CHANGE IN OUTPUT POWER OF ORGANIC PHOTOVOLTAIC MODULES CONNECTED TO ELECTRIC POWER GRID FOR 2 YEARS**

Ritsuko Sato<sup>1)</sup>, Yasuo Chiba<sup>1)</sup>, Masayuki Chikamatsu<sup>1)</sup>, Yuji Yoshida<sup>1)</sup>, Atsushi Masuda<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology

11:30 - 11:45 4ThO3.5

**PREFERRED ORIENTATION OF C<sub>8</sub>-BTBT MOLECULES ON INORGANIC SINGLE CRYSTAL SUBSTRATES WITH VARIOUS ORIENTATION**

Aye Myint Moh<sup>1)</sup>, Khoo Pei Loon<sup>1)</sup>, Kimihiro Sasaki<sup>1)</sup>, Seiji Watase<sup>2)</sup>, Tsutomu Shinagawa<sup>1,2)</sup>, Masanobu Izaki<sup>1)</sup>

<sup>1)</sup> Mechanical Engineering Department, Toyohashi University of Technology, <sup>2)</sup> Osaka Municipal Technical Research Institute

11:45 - 12:00 4ThO3.6

**STUDY OF DYE-SENSITIZED SOLAR CELLS PERFORMANCE**

## UNDER LOW LIGHT INTENSITIES AND INDOOR-LIGHT CONDITIONS

Anna B. Nikolskaia<sup>1)</sup>, Marina F. Vildanova<sup>1)</sup>, Olga V. Alexeeva<sup>1)</sup>, Oleg I. Shevaleevskiy<sup>1)</sup>, Sergey S. Kozlov<sup>1)</sup>

<sup>1)</sup> Institute of Biochemical Physics, Russian Academy of Sciences

**Thursday, November 16**  
**10:30 - 12:00 Room 5**

**Area6**

### 6ThO5 Intermediate Band and Hot Carrier Solar Cells

Chairpersons:

Yasuhiko Takeda (*Toyota Central Research and Development Laboratories, Inc.*)

Ned Ekins-Daukes (*University of New South Wales*)

**10:30 - 10:45**      **6ThO5.1**

#### EFFICIENT TWO-STEP PHOTOCURRENT IN INTERMEDIATE BAND SOLAR CELLS USING HIGHLY HOMOGENEOUS INAS/GAAS QUANTUM-DOT SUPERLATTICE

Kazuki Hirao<sup>1)</sup>, Shigeo Asahi<sup>1)</sup>, Toshiyuki Kaizu<sup>1)</sup>, Yukihiko Harada<sup>1)</sup>, Takashi Kita<sup>1)</sup>

<sup>1)</sup> Department of Technology, Kobe University

**10:45 - 11:00**      **6ThO5.2**

#### FULL SPECTRUM QUANTUM EFFICIENCY MAPPING ON TYPE-II QUANTUM NANOSTRUCTURE SOLAR CELLS

Ryo Tamaki<sup>1)</sup>, Yasushi Shoji<sup>1)</sup>, Yoshitaka Okada<sup>1)</sup>

<sup>1)</sup> Research Center for Advanced Science and Technology (RCAST), The University of Tokyo

**11:00 - 11:15**      **6ThO5.3**

#### TWO-STEP PHOTON UP-CONVERSION SOLAR CELLS INCORPORATING A VOLTAGE BOOSTER HETERO-INTERFACE

Shigeo Asahi<sup>1)</sup>, Kazuki Kusaki<sup>1)</sup>, Yukihiko Harada<sup>1)</sup>, Takashi Kita<sup>1)</sup>

<sup>1)</sup> Department of Electrical and Electronic Engineering, Kobe University

**11:15 - 11:30**      **6ThO5.4**

#### INFRARED ABSORPTION CHARACTERISTICS IN TWO-STEP PHOTON UP- CONVERSION SOLAR CELLS

Kazuki Kusaki<sup>1)</sup>, Shigeo Asahi<sup>1)</sup>, Toshiyuki Kaizu<sup>1)</sup>, Ryo Tamaki<sup>2)</sup>, Yoshitaka Okada<sup>2)</sup>, Takashi Kita<sup>1)</sup>

<sup>1)</sup> Graduate School of Engineering, Kobe University, <sup>2)</sup> Research Center for Advanced and Technology (RCAST), The University of Tokyo, Tokyo

**11:30 - 11:45**      **6ThO5.5**

#### In(Ga)As / Al<sub>0.2</sub>GaAs QUANTUM DOT INTERMEDIATE-

## BAND-ASSISTED HOT-CARRIER SOLAR CELL WITH FABRY-PEROT CAVITY

Benoît Behaghel<sup>1,2,3,4)</sup>, Pierre Rale<sup>1)</sup>, Hung-Ling Chen<sup>1)</sup>, Laurent Lombez<sup>2)</sup>, Yasushi Shoji<sup>3)</sup>, Ryo Tamaki<sup>3)</sup>, Stéphane Collin<sup>1)</sup>, Yoshitaka Okada<sup>3,4)</sup>, Jean-François Guillemoles<sup>2,4)</sup>

<sup>1)</sup> Centre de Nanosciences et de Nanotechnologies (C2N-CNRS), Paris-Saclay University, <sup>2)</sup> Institute for Research and Development on Photovoltaic Energy (IRDEP-CNRS), <sup>3)</sup> Research Center for Advanced Science and Technology (RCAST), The University of Tokyo, <sup>4)</sup> NextPV, RCAST-CNRS joint lab

**11:45 - 12:00**      **6ThO5.6**

#### HOT CARRIER COOLING IN BULK CESIUM LEAD HALIDE PEROVSKITE AND THE QUANTUM DOTS

Qing Shen<sup>1,5)</sup>, Teresa Ripolles<sup>2)</sup>, Feng Liu<sup>1)</sup>, Yaohong Zhang<sup>1)</sup>, Naoki Nakazawa<sup>1)</sup>, Yuhei Ogomi<sup>2,5)</sup>, Taro Toyoda<sup>1,5)</sup>, Kenji Yoshino<sup>3,5)</sup>, Takashi Minemoto<sup>4,5)</sup>, Shuzi Hayase<sup>2,5)</sup>

<sup>1)</sup> The University of Electro-Communications, <sup>2)</sup> Kyushu Institute of Technology, <sup>3)</sup> Miyazaki University, <sup>4)</sup> Ritsumeikan University, <sup>5)</sup> CREST, Japan Science and Technology Agency (JST)

**Thursday, November 16**

**13:30 - 15:30 Room 1+2**

**Area1**

### 1ThO2 Cell Technology 3 (Heterojunction)

Chairpersons:

Michio Kondo (*AIST*)

Philip Pieters (*imec*)

**13:30 - 13:45**      **1ThO2.1**

#### TOWARDS INDUSTRIALIZATION OF HETEROJUNCTION WITH THIN AND ULTRA- THIN WAFERS

Samuel HARRISON<sup>1)</sup>, Adrien Danel<sup>1)</sup>, Julien Gaume<sup>1)</sup>, Maryline Joanny<sup>1)</sup>, Charles Roux<sup>1)</sup>

<sup>1)</sup> Department of Solar Energy, CEA-LITEN

**13:45 - 14:00**      **1ThO2.2**

#### INFLUENCE OF THE THICKNESSES OF THE AMORPHOUS SILICON LAYERS ON THE EFFICIENCY OF SILICON HETEROJUNCTION SOLAR CELLS FOR VARIOUS CLIMATES

Jean Cattin<sup>1)</sup>, Jan Haschke<sup>1)</sup>, Olivier Dupré<sup>1)</sup>, Raphaël Monnard<sup>1)</sup>, Laurie-Lou Senaud<sup>2)</sup>, Matthieu Despeisse<sup>2)</sup>, Loris Barraud<sup>2)</sup>, Mathieu Boccard<sup>1)</sup>, Christophe Ballif<sup>1,2)</sup>

<sup>1)</sup> Institute of Microengineering, Photovoltaics and Thin-Film Electronics Laboratory, École Polytechnique Fédérale de Lausanne (EPFL), <sup>2)</sup> Swiss Center for Electronics and Microtechnology (CSEM), PV-center

**14:00 - 14:15**      **1ThO2.3**

#### "FLASH" FIRED HOLE SELECTIVE SILICON-BASED HETEROJUNCTION CONTACTS

Andrea Ingenito<sup>1)</sup>, Gizem Nogay<sup>1)</sup>, Christophe Allebé<sup>2)</sup>,

Jrg Horzel<sup>2)</sup>, Matthieu Despeisse<sup>2)</sup>, Franz-Josef Haug<sup>1)</sup>, Philipp Friedrich Hermann Löper<sup>1)</sup>, Christophe Ballif<sup>1,2)</sup>

<sup>1)</sup> Photovoltaics and Thin-Film Electronics Laboratory, École Polytechnique Fédérale de Lausanne (EPFL), Institute of Microengineering (IMT), <sup>2)</sup> CSEM, PV-Centre

14:15 - 14:30 1ThO2.4

### PECVD LAYERS FOR HIGH AND LOW TEMPERATURE IMPROVED INDUSTRIAL SOLAR CELL PROCESSES

Christophe Allebé<sup>1)</sup>, Antoine Descoeurdes<sup>1)</sup>, Jorg Horzel<sup>1)</sup>, Andrea Ingenito<sup>2)</sup>, Gizem Nogay<sup>2)</sup>, Philippe Wyss<sup>2)</sup>, Josua Stuckelberger<sup>2)</sup>, Franz-Josef Haug<sup>2)</sup>, Matthieu Despeisse<sup>1)</sup>, Christophe Ballif<sup>1,2)</sup>

<sup>1)</sup> CSEM SA, PV-Center, <sup>2)</sup> École Polytechnique Fédérale de Lausanne (EPFL), Institute of Microengineering (IMT), Photovoltaics and Thin-Film Electronics Laboratory

14:30 - 14:45 1ThO2.5

### REAR-EMITTER SILICON HETEROJUNCTION SOLAR CELLS: ADVANCED FRONT-CONTACT MATERIALS FOR HIGH-EFFICIENCY INDUSTRIAL CELLS

Bernd Stannowski<sup>1)</sup>, Anna Belen Morales Vilches<sup>1)</sup>, Luana Mazzarella<sup>1)</sup>, Sebastian Neubert<sup>1)</sup>, Alexandros Cruz-Bournazou<sup>1)</sup>, Matteo Werth<sup>1)</sup>, Daniel Meza<sup>2)</sup>, Max Sebastian Hendrichs<sup>1)</sup>, Lars Korte<sup>2)</sup>, Rutger Schlatmann<sup>1)</sup>

<sup>1)</sup> Helmholtz-Zentrum Berlin, PVcomB <sup>2)</sup> Helmholtz-Zentrum Berlin, Inst. for Silicon Photovoltaics

14:45 - 15:00 1ThO2.6

### IMPACT OF WAFER THICKNESS ON A-SI:H/C-SI HETEROJUNCTION SOLAR CELLS

Hitoshi Sai<sup>1,2)</sup>, Hiroshi Umishio<sup>1,3)</sup>, Takuya Matsui<sup>1,2)</sup>, Shota Nunomura<sup>1,2)</sup>, Tomoyuki Kawatsu<sup>4)</sup>, Hidetaka Takato<sup>2)</sup>, Koji Matsubara<sup>1,2)</sup>

<sup>1)</sup> Research Center for Photovoltaics (RCPV), National Institute of Advanced Industrial Science and Technology (AIST), <sup>2)</sup> Renewable Energy Research Center, Fukushima Renewable Energy Research Institute (FREA), <sup>3)</sup> Tsukuba University, <sup>4)</sup> Komatsu NTC Ltd.

15:00 - 15:15 1ThO2.7

### >23% SILICON HETEROJUNCTION SOLAR CELLS IN MEYER BURGER'S DEMO LINE: RESULTS OF PILOT PRODUCTION ON MASS PRODUCTION TOOLS

Jun Zhao<sup>1)</sup>, Marcel König<sup>1)</sup>, Yu Yao<sup>2)</sup>, Thomas Söderström<sup>2)</sup>

<sup>1)</sup> Meyer Burger (Germany) AG, <sup>2)</sup> Meyer Burger AG

15:15 - 15:30 1ThO2.8

### FABRICATION OF SILICON HETEROJUNCTION SOLAR CELLS WITH BARIUM DISILICIDE THIN FILMS PREPARED BY THERMAL EVAPORATION

Kazuma Takahashi<sup>1)</sup>, Yoshihiko Nakagawa<sup>1)</sup>, Kazuhiro Goto<sup>1)</sup>,

Kosuke O. Hara<sup>2)</sup>, Isao Takahashi<sup>1)</sup>, Yasuyoshi Kurokawa<sup>1)</sup>, Noritaka Usami<sup>1)</sup>

<sup>1)</sup> Graduate school of Engineering, Nagoya University, <sup>2)</sup> University of Yamanashi

Thursday, November 16

13:30 - 15:30 Room 3

Area2

2ThO4 CIGS Devices I

Chairpersons:

Hitoshi Tampo (*National Institute of Advanced Industrial Science and Technology*)

Michael Powalla (*ZSW (Centre for Solar Energy and Hydrogen Research)*)

13:30 - 14:00 2ThO4.1

**[Invited]**

### DEVELOPMENTS IN ALKALI TREATED CIGS SOLAR CELLS: FLEXIBLE AND TANDEM DEVICES WITH PEROVSKITE

Ayodhya N. Tiwari<sup>1)</sup>, Enrico Avancini<sup>1)</sup>, Lucas Zortea<sup>1)</sup>, Fan Fu<sup>1)</sup>, Stefano Pisoni<sup>1)</sup>, Thomas Feurer<sup>1)</sup>, Shiro Nishiwaki<sup>1)</sup>, Thomas Paul Weiss<sup>1)</sup>, Romain Carron<sup>1)</sup>, Lukas Greuter<sup>1)</sup>, Stephan Buecheler<sup>1)</sup>

<sup>1)</sup> Laboratory for Thin Films and Photovoltaics, Empa-Swiss Federal Laboratories for Materials Science and Technology

14:00 - 14:15 2ThO4.2

### IMPACTS OF LONG-TERM HEAT-LIGHT SOAKING ON CIGS SOLAR CELLS WITH KF POST-DEPOSITION TREATMENT

Jiro Nishinaga<sup>1)</sup>, Takashi Koida<sup>1)</sup>, Shogo Ishizuka<sup>1)</sup>, Yukiko Kamikawa<sup>1)</sup>, Hajime Shibata<sup>1)</sup>, Shigeru Niki<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology (AIST)

14:15 - 14:30 2ThO4.3

### INVESTIGACION ON ALKALI-TREATMENT MECHANISMS FOR IMPROVING ENERGY CONVERSION EFFICIENCY OF Cu(In,Ga)(Se,S)<sub>2</sub> MODULES

Jyh-Lih Wu<sup>1)</sup>, Kong Fai Tai<sup>1)</sup>, Yasuaki Iwata<sup>1)</sup>, Takuya Kato<sup>1)</sup>, Hiroki Sugimoto<sup>1)</sup>, Veronica Bermudez<sup>1)</sup>

<sup>1)</sup> Atsugi Research Center, Solar Frontier K.K., Japan

14:30 - 14:45 2ThO4.4

### EFFECTS OF RUBIDIUM FLUORIDE POST DEPOSITION TREATMENTS ON QUATERNARY CIGS AND TERNARY CGS THIN FILM SOLAR CELLS

Shogo Ishizuka<sup>1)</sup>, Noboru Taguchi<sup>2)</sup>, Jiro Nishinaga<sup>1)</sup>, Yukiko Kamikawa<sup>1)</sup>, Shingo Tanaka<sup>2)</sup>, Hajime Shibata<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology, <sup>2)</sup> Research Institute of Electrochemical Energy, National Institute of Advanced Industrial Science and Technology



14:45 - 15:00 2ThO4.5

**INVESTIGATING THE PROPERTIES OF RbF-TREATED CIGS THIN-FILMS AND RESULTING DEVICES**

Tim Kodalle<sup>1)</sup>, Marc D. Heinemann<sup>1)</sup>, Hasan A. Yetkin<sup>1,2)</sup>, Setareh Zahedi-Azad<sup>3)</sup>, Iver Lauer<sup>1)</sup>, Rutger Schlatmann<sup>1,4)</sup>, Christian A. Kaufmann<sup>1)</sup>

<sup>1)</sup> PVcomB/Helmholtz-Zentrum Berlin für Materialien und Energie, Germany, <sup>2)</sup> Technical University Berlin, Germany, <sup>3)</sup> Martin-Luther-University Halle-Wittenberg, Germany, <sup>4)</sup> Hochschule für Technik und Wirtschaft Berlin, Germany

15:00 - 15:15 2ThO4.6

**COMPARATIVE STUDY OF HEAT LIGHT SOAKING ON MF (M= K, Cs) TREATED CIGS SOLAR CELLS WITH CDS BUFFER LAYER**

Ishwor Khatri<sup>1)</sup>, Kosuke Shudo<sup>2)</sup>, Junpei Matsuura<sup>2)</sup>, Mutsumi Sugiyama<sup>1,2)</sup>, Tokio Nakada<sup>1)</sup>

<sup>1)</sup> Research Institute for Science and Technology Tokyo University of Science, <sup>2)</sup> Faculty of Science and Technology, Tokyo University of Science

15:15 - 15:30 2ThO4.7

**EXPERIMENTAL INVESTIGATION OF Cd- AND Zn-DIFFUSION EFFECT FOR Cu(In,Ga)Se<sub>2</sub> SOLAR CELLS WITH Cu-POOR LAYER**

Hiroki Sugiura<sup>1)</sup>, Takahito Nishimura<sup>2)</sup>, Kazuyoshi Nakada<sup>1)</sup>, Akira Yamada<sup>1)</sup>

<sup>1)</sup> Department of Electrical and Electronic Engineering, Tokyo Institute of Technology, <sup>2)</sup> Department of Physical Electronics, Tokyo Institute of Technology

**Thursday, November 16****13:30 - 15:30 Room 5****Area6****6ThO6 Quantum Dot Solar Cells and Emerging Technologies**

Chairpersons:

Yoshitaka Okada (*University of Tokyo*)Qing Shen (*The University of Electro-Communications*)

13:30 - 14:00 6ThO6.1

**[Invited]****THE ROLE OF RATCHETS IN PHOTOVOLTAICS**

Ned Ekins-Daukes<sup>1)</sup>, C. Phillips<sup>2)</sup>, A. Pusch<sup>2)</sup>, A. Vaquero<sup>2)</sup>, M. Yoshida<sup>2)</sup>, T. Schmidt<sup>1)</sup>

<sup>1)</sup> University of New South Wales, <sup>2)</sup> Imperial College London

14:00 - 14:15 6ThO6.2

**Optimizing the Front Contacts of PbSe Quantum Dot Solar Cell with Additional Au Grids**

Zihan Chen<sup>1)</sup>, Zhilong Zhang<sup>1)</sup>, Robert Patterson<sup>1)</sup>,

Gavin Conibeer<sup>1)</sup>, Shujuan Huang<sup>1)</sup>

<sup>1)</sup> School of Photovoltaic and Renewable Energy Engineering, University of New South Wales

14:15 - 14:30 6ThO6.3

**PASSIVATING LEAD SELENIDE QUANTUM DOT THIN FILM SOLAR CELLS WITH INORGANIC PEROVSKITE NANOPARTICLES**

Zhilong Zhang<sup>1)</sup>, Zihan Chen<sup>1)</sup>, Lin Yuan<sup>1)</sup>, Gavin Conibeer<sup>1)</sup>, Robert Patterson<sup>1)</sup>, Shujuan Huang<sup>1)</sup>

<sup>1)</sup> Australian Centre for Advanced Photovoltaics, University of New South Wales

14:30 - 14:45 6ThO6.4

**SURFACE AND ENERGY BAND ENGINEERING OF ENVIRONMENTALLY FRIENDLY QUANTUM DOTS FOR MULTIPLE EXCITONS SOLAR CELLS**

Vladimir Švrček<sup>1)</sup>, Mickael Lozac'h<sup>1)</sup>, Marius Buerkle<sup>1)</sup>, Atta Ul Haq<sup>2)</sup>, Calum McDonald<sup>2)</sup>, Davide Mariotti<sup>2)</sup>, Koji Matsubara<sup>1)</sup>

<sup>1)</sup> National Institute of Advanced Industrial Science and Technology, <sup>2)</sup> Nanotechnology and Advanced Materials Research Institute (NAMRI), Ulster University

14:45 - 15:00 6ThO6.5

**ENHANCEMENT ON PHOTOVOLTAIC PROPERTIES OF HEAVILY PHOSPHORUS-DOPED SUPER-HIGH DENSITY SI QUANTUM DOT THIN FILM BY S PIN-ON METHOD**

Pin-Ruei Huang<sup>1)</sup>, Sung-Che Lin<sup>1)</sup>, Po-Tsung Lee<sup>1)</sup>

<sup>1)</sup> Department of Photonics, National Chiao Tung University

15:00 - 15:15 6ThO6.6

**LOOKING AT THE TUNNEL RECOMBINATION JUNCTIONS OF AN A-SI:H/NC- SI:H/SHJ SOLAR CELL FOR WATER SPLITTING APPLICATIONS**

Paula Perez-Rodriguez<sup>1)</sup>, Machiel Stam<sup>1)</sup>, Michael Falkenberg<sup>1)</sup>, Ravi Vasudevan<sup>2)</sup>, Miro Zeman<sup>1)</sup>, Arno H.M. Smets<sup>1)</sup>

<sup>1)</sup> Photovoltaic Materials and Devices (PVMD) group, Delft University of Technology, <sup>2)</sup> INES

15:15 - 15:30 6ThO6.7

**NONEQUILIBRIUM THEORY ON THE CONVERSION EFFICIENCY LIMIT OF SOLAR CELLS INCLUDING FINITE THERMALIZATION AND EXTRACTION TIME**

Kenji Kamide<sup>1)</sup>, Toshimitsu Mochizuki<sup>1)</sup>, Hidefumi Akiyama<sup>2,3)</sup>, Hidetaka Takato<sup>1)</sup>

<sup>1)</sup> AIST, <sup>2)</sup> ISSP, Univ. Tokyo, <sup>3)</sup> AIST OPERANDO-OIL



Friday, November 17  
8:30 - 10:00 Room 1+2

Area 1

1FrO1 Thin Film Technologies

Chairpersons:

Arno H. M. Smets (*Delft University of Technology*)

Akira Terakawa (*Panasonic Corporation, Eco-Solutions Company*)

8:30 - 9:00 1FrO1.1

[Invited]

WYSIPS® CRYSTAL TECHNOLOGY: AN INVISIBLE ENERGY HARVESTING SOLUTION FOR LOW POWER OLED DISPLAYS

Barthold Veenendaal<sup>1)</sup>, Badre Kerzabi<sup>1)</sup>

<sup>1)</sup> Sunpartner Technologies, France

9:00 - 9:15 1FrO1.2

Silicon-based Multi-junction Solar Cells

Xiaodan Zhang<sup>1,2,3,4)</sup>, Bofei Liu<sup>1,2,3,4)</sup>, Lisha Bai<sup>1,2,3,4)</sup>, Yi Ding<sup>1,2)</sup>, Ying Zhao<sup>1,2,3,4)</sup>, Jia Fang<sup>1,2,3,4)</sup>, Tiantian Li<sup>1,2,3,4)</sup>, Xin Yao<sup>1,2,3,4)</sup>, Shijie Zhu<sup>1,2,3,4)</sup>, Qianshang Ren<sup>1,2,3,4)</sup>, Changchun Wei<sup>1,2)</sup>, Qian Huang<sup>1,2)</sup>, Jian Ni<sup>1,2)</sup>, Dekun Zhang<sup>1,2)</sup>, Xinliang Chen<sup>1,2)</sup>, Shengzhi Xu<sup>1,2)</sup>, Huizhi Ren<sup>1,2)</sup>, Guangcai Wang<sup>1,2)</sup>, Yuelong Li<sup>1,2,3,4)</sup>, Baozhang Li<sup>1,2)</sup>

<sup>1)</sup> Institute of Photoelectronic Thin Film Devices and Technology of Nankai University, Nankai University, <sup>2)</sup> Key Laboratory of Photoelectronic Thin Film Devices and Technology of Tianjin, <sup>3)</sup> Key Laboratory of Photoelectronic Thin Film Devices and Technology of Ministry of Education, <sup>4)</sup> Collaborative Innovation Center of Chemical Science and Engineering (Tianjin)

9:15 - 9:30 1FrO1.3

MINI-MODULES BASED ON THIN LIQUID-PHASE CRYSTALLIZED SILICON ON GLASS

Sven Kühnapfel<sup>1)</sup>, Tim Frijnts<sup>2)</sup>, Holger Rhein<sup>2)</sup>, Stefan Gall<sup>1)</sup>, Rutger Schlatmann<sup>2)</sup>, Bernd Rech<sup>1)</sup>

<sup>1)</sup> Helmholtz-Zentrum Berlin für Materialien und Energie, Institut für Silizium-Photovoltaik, <sup>2)</sup> Helmholtz-Zentrum Berlin für Materialien und Energie, PVcomB

9:30 - 9:45 1FrO1.4

HYDROGEN PLASMA ETCHING OF RCA CHEMICAL OXIDE AND ITS USE IN HETEROJUNCTION SOLAR CELL APPLICATIONS

JIA GE<sup>1)</sup>, JIN LIU<sup>1)</sup>, BOON HENG TEO<sup>1)</sup>, DELIO PEREZ<sup>1)</sup>, EDWIN CARMONA<sup>1)</sup>, MARYKNOL DELOS SANTOS<sup>1)</sup>, THOMAS MUELLER<sup>1)</sup>

<sup>1)</sup> Solar Energy Research Institute of Singapore

9:45 - 10:00 1FrO1.5

INFLUENCE OF DC POWER ON THE PROPERTIES OF i-a-Si:H PASSIVATION LAYER DEPOSITED BY FACING TARGET

SPUTTERING

Yuta Shiratori<sup>1)</sup>, Faris Akira<sup>1)</sup>, Kazuyoshi Nakada<sup>1)</sup>, Shinsuke Miyajima<sup>1)</sup>

<sup>1)</sup> Tokyo Institute of Technology

Friday, November 17  
8:30 - 10:00 Room 3

Area 2

2FrO3 Materials Characterization

Chairpersons:

Jiro Nishinaga (*AIST*)

Harvey Guthrey (*National Renewable Energy Laboratory (NREL)*)

8:30 - 8:45 2FrO3.1

ELECTRONIC DEFECTS IN CIGSe: A COMPREHENSIVE MODEL

Susanne Siebentritt<sup>1)</sup>, Conrad Spindler<sup>1)</sup>, Finn Babbe<sup>1)</sup>

<sup>1)</sup> Laboratory for Photovoltaics, University of Luxembourg

8:45 - 9:00 2FrO3.2

IMPACT OF KF-POST DEPOSITION TREATMENT ON SURFACE ELECTRONIC STRUCTURE OF CIGSSe AND CIGSe ABSORBERS

Suehiro Kawamura<sup>1)</sup>, Yuya Iwamoto<sup>1)</sup>, Kohei Tanigawa<sup>1)</sup>, Takuya Kato<sup>2)</sup>, Hiroki Sugimoto<sup>2)</sup>, Shogo Ishizuka<sup>3)</sup>, Hajime Shibata<sup>3)</sup>, Koji Matsubara<sup>3)</sup>, Shigeru Niki<sup>3)</sup>, Norio Terada<sup>1)</sup>

<sup>1)</sup> Graduate School of Science and Engineering, Kagoshima University, <sup>2)</sup> Solar Frontier K. K., <sup>3)</sup> AIST

9:00 - 9:15 2FrO3.3

DEEP LEVEL EMISSION IN POLYCRYSTALLINE CUGASE2 THIN-FILMS OBSERVED BY MICRO-PHOTOLUMINESCENCE

Muhammad Monirul Islam<sup>1)</sup>, Shenghao Wang<sup>1)</sup>, Shogo Ishizuka<sup>2)</sup>, Hajime Shibata<sup>2)</sup>, Shigeru Niki<sup>2)</sup>, Katsuhiko Akimoto<sup>1)</sup>, Takeaki Sakurai<sup>1)</sup>

<sup>1)</sup> University of Tsukuba, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology (AIST)

9:15 - 9:30 2FrO3.4

FIRST PRINCIPLES STUDIES ON EFFECTS OF LIGHT AND HEAVY ALKALI ELEMENTS IN Cu(In,Ga)Se2 SOLAR CELLS

Tsuyoshi Maeda<sup>1)</sup>, Takahiro Wada<sup>1)</sup>

<sup>1)</sup> Department of Materials Chemistry, Ryukoku University

9:30 - 9:45 2FrO3.5

BAND OFFSET AT THE INTERFACE BETWEEN CDS BUFFER AND CZTGSE ABSORBER LAYER

Takehiko Nagai<sup>1)</sup>, Kenta Kawasaki<sup>2)</sup>, Suehiro Kawamura<sup>2)</sup>,

Shin'ichi Takaki<sup>2</sup>, Takuya Shimamura<sup>2</sup>, Hitoshi Tampo<sup>1</sup>,  
Shinho Kim<sup>1</sup>, Hajime Shibata<sup>1</sup>, Shigeru Niki<sup>1</sup>, Norio Terada<sup>2</sup>

<sup>1</sup> Research Center for Photovoltaics (RCPV), National Institute of  
Advanced Industrial Science and Technology (AIST), <sup>2</sup> Kagoshima  
University

9:45 - 10:00 2FrO3.6

### OPTICAL PROPERTIES OF Cu<sub>2</sub>ZnGeSe<sub>4</sub> WITH VERY LOW URBACH ENERGY: COMPARISON WITH Cu-Se-BASED MATERIALS

Shohei Fujimoto<sup>1</sup>, Hitoshi Tampo<sup>2</sup>, Shinho Kim<sup>2</sup>,  
Keisuke Nagaya<sup>1</sup>, Mitsutoshi Nishiwaki<sup>1</sup>, Kang Min Kim<sup>2</sup>,  
Hajime Shibata<sup>2</sup>, Shigeru Niki<sup>2</sup>, Hiroyuki Fujiwara<sup>1</sup>

<sup>1</sup> Department of Electrical, Electronic and Computer Engineering,  
Gifu University, <sup>2</sup> Research Center for Photovoltaics, National  
Institute of Advanced Industrial Science and Technology

Friday, November 17

8:30 - 10:00 Room 5

Area10

### 10FrO5 PV Deployment and Sustainability

Chairpersons:

Hiroyuki Yamada (*New Energy and Industrial Technology Development  
Organization*)

Andrea Wade (*Deputy Operating Agent IEA PVPS Task12*)

8:30 - 9:00 10FrO5.1

[Invited]

### CHANCES AND CHALLENGES FOR PHOTOVOLTAICS IN EUROPE AFTER THE FEED-IN-TARIF SCHEMES

Arnulf Jaeger-Waldau<sup>1</sup>, Thomas Huld<sup>1</sup>, Sandor Szabo<sup>1</sup>

<sup>1</sup> European Commission, JRC, Energy Efficiency and Renewables Unit

9:00 - 9:15 10FrO5.2

### Innovative Framework Model for Post-Subsidy PV Market Forecast

Gaëtan Masson<sup>1</sup>, Chris Werner<sup>2</sup>, Philippe Macé<sup>1</sup>,  
Alexander Gerlach<sup>3</sup>

<sup>1</sup> Becquerel Institute, <sup>2</sup> Chris Werner Energy Consulting, <sup>3</sup> Gerlach  
New Energy Consulting

9:15 - 9:30 10FrO5.3

### CHINA'S PV MARKET TILL 2020 - VIETNAM AN EMERGING UP AND DOWNSTREAM SOLAR PV MARKET

Frank Haugwitz<sup>1</sup>

<sup>1</sup> Asia Europe Clean Energy (Solar) Advisory Co. Ltd.

9:30 - 9:45 10FrO5.4

### PROSPECTS OF PV DEPLOYMENT IN JAPAN TOWARDS 2030

Koichi SUGIBUCHI<sup>1</sup>, Risa KURIHARA<sup>1</sup>, Haruki YAMAYA<sup>1</sup>,  
Takashi OHIGASHI<sup>1</sup>, Izumi KAIZUKA<sup>1</sup>, Osamu IKKI<sup>1</sup>

<sup>1</sup> RTS Corporation

9:45 - 10:00 10FrO5.5

### PV RECYCLING SIMPLY WITH LIGHT: NEW, INNOVATIVE AND ECONOMIC

Wolfram J. Palitzsch<sup>1</sup>, Ulrich M. Loser<sup>1</sup>

<sup>1</sup> Loser Chemie GmbH

Friday, November 17

8:30 - 10:00 Room 6

Area7

### 7FrO7 Potential-Induced Degradation

Chairpersons:

Yasuaki Ishikawa (*Nara Institute of Science and Technology*)

Hung-Sen Wu (*Industrial Technology Research Institute*)

8:30 - 8:45 7FrO7.1

### J<sub>sc</sub> AND V<sub>oc</sub> REDUCTIONS IN SILICON HETEROJUNCTION PHOTOVOLTAIC MODULES BY POTENTIAL-INDUCED DEGRADATION TESTS

Keisuke Ohdaira<sup>1</sup>, Seira Yamaguchi<sup>1</sup>, Chizuko Yamamoto<sup>2</sup>,  
Atsushi Masuda<sup>2</sup>

<sup>1</sup> Graduate School of Advanced Science and Technology, Japan  
Advanced Institute of Science and Technology, <sup>2</sup> National Institute of  
Advanced Industrial Science and Technology

8:45 - 9:00 7FrO7.2

### SODIUM DISTRIBUTIONS AT THE SURFACE OF SILICON NITRIDE FILM AFTER POTENTIAL INDUCED DEGRADATION TEST AND RECOVERY TEST OF PV MODULES

Fumitaka Ohashi<sup>1</sup>, Yoshiki Mizuno<sup>1</sup>, Hiroki Yoshida<sup>1</sup>,  
Hiroya Kosuga<sup>1</sup>, Taishi Furuya<sup>1</sup>, Ruben Jerónimo Freitas<sup>1</sup>,  
Yukiko Hara<sup>2</sup>, Atsushi Masuda<sup>2</sup>, Shuichi Nonomura<sup>1</sup>

<sup>1</sup> Faculty of Engineering, Gifu University, <sup>2</sup> National Institute of  
Advanced Industrial Science and Technology

9:00 - 9:15 7FrO7.3

### INFLUENCE OF BIAS APPLICATION ON POTENTIAL INDUCED DEGRADATION FOR CRYSTALLINE SILICON PHOTOVOLTAIC MODULES

Sachiko Jonai<sup>1</sup>, Tadanori Tanahashi<sup>1</sup>, Hajime Shibata<sup>1</sup>,  
Atsushi Masuda<sup>1</sup>

<sup>1</sup> Research Center for Photovoltaics (RCPV), National Institute of  
Advanced Industrial Science and Technology (AIST)

9:15 - 9:30 7FrO7.4

### ESTIMATING THE PERFORMANCE OF PID-INFLUENCED PV MODULES FROM QUANTITATIVE ELECTROLUMINESCENCE

**MEASUREMENTS**

Karl G. Bedrich<sup>1)</sup>, Wei Luo<sup>1)</sup>, Yifeng Chen<sup>2)</sup>, Pierre J. Verlinden<sup>2)</sup>, Sarah Kurtz<sup>3)</sup>, Peter Hacke<sup>3)</sup>, Zhiqiang Feng<sup>2)</sup>, Yan Wang<sup>1)</sup>, Armin G. Aberle<sup>1)</sup>, Yong Sheng Khoo<sup>1)</sup>

<sup>1)</sup> SERIS, NUS, Singapore, <sup>2)</sup> TRINA Solar, China, <sup>3)</sup> NREL, USA

9:30 - 9:45 7FrO7.5

**Carrier Dynamics in the Potentially Induce Degraded Photovoltaic Modules**

Mohammad Aminul Islam<sup>1)</sup>, Hiroyuki Matsuzaki<sup>2)</sup>, Hidenari Nakahama<sup>3)</sup>, Yasuaki Ishikawa<sup>1)</sup>

<sup>1)</sup> Graduate School of Material Science, Nara Institute of Science and Technology, <sup>2)</sup> National Institute of Advanced Industrial Science and Technology, <sup>3)</sup> Nisshinbo Mechatronics Inc.

9:45 - 10:00 7FrO7.6

**EFFECTS OF LIGHT IRRADIATION DURING POTENTIAL-INDUCED DEGRADATION TESTS FOR P-TYPE CRYSTALLINE SILICON PHOTOVOLTAIC MODULES**

Yukiko Hara<sup>1)</sup>, Atsushi Masuda<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology

Friday, November 17  
10:30 - 12:00 Room 1+2

Area 1

**1FrO2 Carrier Selective Contact**

Chairpersons:

Tomihisa Tachibana (*AIST*)

Hyunju Lee (*Toyota Technological Institute*)

10:30 - 10:45 1FrO2.1

**ANALYSIS OF WORKFUNCTION OF MOOX AT MOOX/SIO2 INTERFACE BY CAPACITANCE-VOLTAGE MEASUREMENT**

Takefumi Kamioka<sup>1)</sup>, Yutaka Hayashi<sup>1)</sup>, Yuki Isogai<sup>1)</sup>, Kyotaro Nakamura<sup>2)</sup>, Yoshio Ohshita<sup>1)</sup>

<sup>1)</sup> Toyota Technological Institute, <sup>2)</sup> Meiji University

10:45 - 11:00 1FrO2.2

**TUNABLE ELECTRON AND HOLE SELECTIVITY OF TITANIUM OXIDE BASED CONTACTS FOR CRYSTALLINE SILICON SOLAR CELLS**

Takuya Matsui<sup>1,2)</sup>, Martin Bivour<sup>1)</sup>, Paul Ndione<sup>1,3)</sup>, Paul Hettich<sup>1)</sup>, Martin Hermle<sup>1)</sup>

<sup>1)</sup> Fraunhofer ISE, <sup>2)</sup> AIST, <sup>3)</sup> NREL

11:00 - 11:15 1FrO2.3

**POLY-SI(O)X PASSIVATING CONTACTS FOR MINIMIZING PARASITIC ABSORPTION IN IBC C-SI CELLS**

Guangtao Yang<sup>1)</sup>, Paul Procel<sup>1)</sup>, Yue Zhang<sup>1)</sup>, Arthur Weeber<sup>1)</sup>, Olindo Isabella<sup>1)</sup>, Miro Zeman<sup>1)</sup>

<sup>1)</sup> Photovoltaic Materials and Devices group, Delft University of Technology

11:15 - 11:30 1FrO2.4

**PASSIVATING CONTACTS BASED ON LAYERS OF SILICON-OXIDE AND CARBIDE FOR CRYSTALLINE SILICON SOLAR CELLS**

Franz-Josef Haug<sup>1)</sup>, Philippe Wyss<sup>1)</sup>, Gizem Nogay<sup>1)</sup>, Josua Stückelberger<sup>1)</sup>, Andrea Ingenito<sup>1)</sup>, Iris Mack<sup>1)</sup>, Christophe Allebé<sup>2)</sup>, Jrg Horzel<sup>2)</sup>, Philipp Löper<sup>1)</sup>, Christophe Ballif<sup>1,2)</sup>

<sup>1)</sup> PV-Lab, Ecole Polytechnique Fdrale de Lausanne, <sup>2)</sup> CSEM, PV-Center

11:30 - 11:45 1FrO2.5

**INDUSTRIALLY FEASIBLE, DOPANT-FREE, CARRIER-SELECTIVE PASSIVATING CONTACTS FOR HIGH-EFFICIENCY CRYSTALLINE SILICON SOLAR CELLS**

Xinbo Yang<sup>1,2)</sup>, Klaus Weber<sup>1)</sup>, Stefaan De Wolf<sup>2)</sup>

<sup>1)</sup> Research School of Engineering, Australian National University, <sup>2)</sup> King Abdullah University of Science and Technology (KAUST)

11:45 - 12:00 1FrO2.6

**EMBEDDED METAL ELECTRODE FOR HIGH-EFFICIENCY PEDOT:PSS/SI NANOWIRE HYBRID SOLAR CELLS**

Deokjae Choi<sup>1)</sup>, Han-Don Um<sup>1)</sup>, Inchan Hwang<sup>1)</sup>, Namwoo Kim<sup>1)</sup>, Kangmin Lee<sup>1)</sup>, Ji Hoon Seo<sup>1)</sup>, Jeonghwan Park<sup>1)</sup>, Kwanyong Seo<sup>1)</sup>

<sup>1)</sup> Department of Energy Engineering, Ulsan National Institute of Science and Technology (UNIST)

Friday, November 17  
10:30 - 12:00 Room 3

Area 2

**2FrO4 CIGS Devices II**

Chairpersons:

Takeaki Sakurai (*University of Tsukuba*)

Ayodhya N. Tiwari (*Empa-Swiss Federal Laboratories for Materials Science and Technology*)

10:30 - 10:45 2FrO4.1

**[Area Leading invited]**

**DEVICE STRUCTURE AND PROCESS CONTROL FOR CIGS SOLAR CELLS ON FLEXIBLE SUBSTRATE**

Jae Ho Yun<sup>1)</sup>, Kihwan Kim<sup>1)</sup>, Seung Kyu Ahn<sup>1)</sup>, Young-Joo Eo<sup>1)</sup>, Jihye Gwak<sup>1)</sup>, Jun-Sik Cho<sup>1)</sup>, Ara Cho<sup>1)</sup>

<sup>1)</sup> Photovoltaic Laboratory, Korea Institute of Energy Research, Korea

10:45 - 11:00 2FrO4.2

**AMORPHOUS IN<sub>2</sub>O<sub>3</sub>-BASED FRONT CONTACT LAYERS FOR CU(IN,Ga)SE<sub>2</sub> SOLAR CELLS**

Takashi Koida<sup>1)</sup>, Yuko Ueno<sup>1)</sup>, Jiro Nishinaga<sup>1)</sup>, Hirohumi Higuchi<sup>1)</sup>, Hideki Takahashi<sup>1)</sup>, Masayuki Iioka<sup>1)</sup>, Hajime Shibata<sup>1)</sup>, Shigeru Niki<sup>1)</sup>

<sup>1)</sup> Research Center for Photovoltaics, National Institute of Advanced Industrial Science and Technology

11:00 - 11:15 2FrO4.3

**DOPING MANIPULATED AZO AS FRONT TCO BY USING SERIAL CO-SPUTTERING FOR CIGS SOLAR CELLS**

Stefan Körner<sup>1)</sup>, Rulsan Muydinov<sup>1)</sup>, Darja Erfurt<sup>2)</sup>, Manuel Hartig<sup>1)</sup>, Bernd Szyszka<sup>1,3)</sup>, Reiner Klenk<sup>2)</sup>

<sup>1)</sup> Technical University, Germany, <sup>2)</sup> PVcomB - Helmholtz-Zentrum Berlin für Materialien und Energie, Germany, <sup>3)</sup> Fraunhofer IST, Germany

11:15 - 11:30 2FrO4.4

**EFFECTS OF SUBSTRATE TEMPERATURE ON CONTROLLING INTERFACIAL QUALITY OF Cu(In,Ga)Se<sub>2</sub> SOLAR CELLS BY Se ANNEALING**

Akihide Kaneko<sup>1)</sup>, Adiyudha Sadono<sup>1)</sup>, Kazuyoshi Nakada<sup>1)</sup>, Akira Yamada<sup>1)</sup>

<sup>1)</sup> Department of Physical Electronics, Tokyo Institute of Technology

11:30 - 11:45 2FrO4.5

**OPTICAL AND RECOMBINATION LOSSES IN CIGSe, CZTSSe AND CdTe SOLAR CELLS DETERMINED BY GLOBAL EQE ANALYSIS METHOD**

Hiroyuki Fujiwara<sup>1)</sup>, Akihiro Nakane<sup>1)</sup>, Hitoshi Tampo<sup>2)</sup>, Shohei Fujimoto<sup>1)</sup>, Kang Min Kim<sup>2)</sup>, Shinho Kim<sup>2)</sup>, Hajime Shibata<sup>2)</sup>, Shigeru Niki<sup>2)</sup>

<sup>1)</sup> Department of Electrical, Electronic and Computer Engineering, Gifu University, <sup>2)</sup> AIST

11:45 - 12:00 2FrO4.6

**QUASI FERMI LEVEL SPLITTING OF CU-RICH AND CU-POOR CIS ABSORBER LAYERS**

Alberto Lomuscio<sup>1)</sup>, Tobias Rödel<sup>1)</sup>, Michele Melchiorre<sup>1)</sup>, Susanne Siebentritt<sup>1)</sup>

<sup>1)</sup> Laboratory for Photovoltaics, Physics and Materials Science Research Unit, University of Luxembourg

Friday, November 17

10:30 - 12:00 Room 5

Area3

3FrO6 Concentrator PV

Chairpersons:

Frank Dimroth (*Fraunhofer ISE*)Araki Kenji (*Toyota Technological Institute*)

10:30 - 11:00 3FrO6.1

**[Invited]****LUMINESCENT SOLAR CONCENTRATOR DESIGNS**

Angèle Reinders<sup>1)</sup>, Ravi Kishore<sup>1)</sup>, Wouter Eggink<sup>1)</sup>

<sup>1)</sup> Faculty of Engineering Technology, University of Twente

11:00 - 11:15 3FrO6.2

**[Area Leading invited]****CPV and storage battery**

Takashi Iwasaki<sup>1)</sup>

<sup>1)</sup> Solar Energy Department, Power Systems R&D Center, Sumitomo Electric Industries, LTD.

11:15 - 11:30 3FrO6.3

**CHARACTERIZATION OF III-V ON SI TANDEM SOLAR CELLS UNDER LOW CONCENTRATION USING A PULSED SOLAR SIMULATOR AND COMPONENT CELLS**

Elias Veinberg-Vidal<sup>1,2)</sup>, Laura Vauche<sup>1,2)</sup>, Karim Medjoubi<sup>1,2)</sup>, Clmnt Weick<sup>1,2)</sup>, Pablo García-Linares<sup>3)</sup>, Alejandro Datas<sup>3)</sup>, Anne Kaminski-Cachopo<sup>4)</sup>, Christophe Jany<sup>1,2)</sup>, Philippe Voarino<sup>1,2)</sup>, Ccilia Dupré<sup>1,2)</sup>

<sup>1)</sup> DCOS/SCPE/LC2E CEA, LETI, <sup>2)</sup> Universit Grenoble Alpes, France, <sup>3)</sup> IES-UPM, Spain, <sup>4)</sup> IMEP-LAHC, France

11:30 - 11:45 3FrO6.4

**DEVELOPMENT OF DUAL AXIS MICROTRACKING SYSTEM FOR CONCENTRATOR PHOTOVOLTAIC**

Masakazu Nakatani<sup>1,2)</sup>, Noboru Yamada<sup>2)</sup>

<sup>1)</sup> Sun Marion Co., Ltd., <sup>2)</sup> Nagaoka University of Technology

11:45 - 12:00 3FrO6.5

**SOLAR POWERED CAR BY STATIC CONCENTRATOR PHOTOVOLTAICS**

Taizo Masuda<sup>1,2)</sup>, Kenji Araki<sup>2)</sup>, Kenichi Okumura<sup>1)</sup>, Shinichi Urabe<sup>1)</sup>, Yuki Kudo<sup>1)</sup>, Takashi Nakado<sup>1)</sup>, Akinori Sato<sup>1)</sup>, Masafumi Yamaguchi<sup>2)</sup>, Kazutaka Kimura<sup>1)</sup>

<sup>1)</sup> Future project division, Toyota Motor Corporation, <sup>2)</sup> Toyota Technological Institute

Friday, November 17  
10:30 - 12:00 Room 6

Area7

### 7FrO8 Module Reliability and Characterization

Chairpersons:

Atsushi Masuda (*National Institute of Advanced Industrial Science and Technology*)

Nick S. Bosco (*National Renewable Energy Laboratory*)

10:30 - 10:45 7FrO8.1

**[Area Leading invited]**

#### NEW CHALLENGE ON MECHANICAL LOAD TEST FOR MODULE CERTIFICATION

Hung-Sen Wu<sup>1)</sup>

<sup>1)</sup> Center for Measurement Standards/ Photovoltaic Metrology Laboratory, Industrial Technology Research Institute

10:45 - 11:00 7FrO8.2

#### ACCELERATION TEST OF COMBINED STRESSES FOR FLEXIBLE SOLAR MODULES

Akihiro Takano<sup>1)</sup>, Tetsuro Nakamura<sup>1)</sup>, Tetsuya Fukuda<sup>1)</sup>, Ayumi Hamada<sup>1)</sup>, Hiroki Sato<sup>1)</sup>, Masaaki Toda<sup>1)</sup>

<sup>1)</sup> F-WAVE Company Limited

11:00 - 11:15 7FrO8.3

#### DOES CURRENT INJECTION DURING ENVIRONMENTAL STRESS TESTING ACCELERATE THE TARGET DEGRADATION MECHANISMS?

Jiang Zhu<sup>1)</sup>, Daniel Montiel-Chicharro<sup>1)</sup>, Michael Owen-Bellini<sup>1)</sup>, Karl Bedrich<sup>1)</sup>, Thomas R. Betts<sup>1)</sup>, Ralph Gottschalg<sup>1)</sup>

<sup>1)</sup> Centre for Renewable Energy Systems Technology, Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University

11:15 - 11:30 7FrO8.4

#### DETECTION OF PREMONITORY SYMPTOM IN DEFECTIVE MODULES BY DARK I-V CHARACTERISTICS WITH EL DIAGNOSIS

Takashi Fuyuki<sup>1)</sup>, Tadashi Obayashi<sup>2)</sup>, Kohji Masuda<sup>2)</sup>, Yasunori Uchida<sup>2)</sup>, Hiroshi Taniguchi<sup>2)</sup>, Yoshiteru Nitta<sup>2)</sup>

<sup>1)</sup> Active Solar Innovation, Inc., <sup>2)</sup> Japan Electrical Safety & Environmental Technology Laboratories (JET)

11:30 - 11:45 7FrO8.5

#### IMPROVEMENT ON THE VERIFICATION METHOD OF ELECTROLUMINESCENCE IMAGING OF THE DEGRADED PV MODULE

Panom Parinya<sup>1)</sup>, Manit Seapan<sup>1)</sup>, Chamnan Limsakul<sup>1)</sup>, Krissanapong Kirtikara<sup>1)</sup>, Dhirayut Chenvidhya<sup>1)</sup>, Tanokkorn Chenvidhya<sup>1)</sup>, Ballang Muenpinij<sup>1)</sup>,

Yaowanee Sangpongsonon<sup>1)</sup>

<sup>1)</sup> CES Solar Cells Testing Center, King Mongkut's University of Technology Thonburi

11:45 - 12:00 7FrO8.6

#### OUTDOOR PHOTOLUMINESCENCE MEASUREMENTS OF PHOTOVOLTAIC MODULES UNDER FULL SUNLIGHT ILLUMINATION

Raghavi Bhoopathy<sup>1)</sup>, Oliver Kunz<sup>1)</sup>, Mattias Juhl<sup>1)</sup>, Thorsten Trupke<sup>1)</sup>, Ziv Hameiri<sup>1)</sup>

<sup>1)</sup> School of Photovoltaics and Renewable Energy Engineering, University of New South Wales, Sydney, Australia

# Closing

Closing

**Friday, November 17**

## **Closing Ceremony**

**12:00 - 13:00 Room1+2**

Chairperson:

---

**12:00 - 12:20**

### **Overall Conference Summary**

Akira Yamada (Tokyo Institute of Technology)

**12:20-12:40**

### **Award Ceremony**

Best Paper Award

Young Researcher Paper Award

Student Paper Award

**12:40-13:00**

### **Greetings from the Future Conference Representatives**

WCPEC-7 (45th IEEE PVSC, 34th EU PVSEC, 28th PVSEC)

35th EU PVSEC

PVSEC-29

Friday, November 17