

11th SOLARIS-2021 Final Program 2021.9.15

Tokyo Sep 27, PM4:30-6:30

London Sep 27, AM8:30-10:30

Colorado On Demand

**Room A**

**Opening**

**Session Chair: Koji Matsubara**

**Plenary Lectures**

**Session Chair: Noboru Yamada**

PI-11

Utilization of Hydrogen in Zero Energy Homes

Isamu Ohta (Misawa Homes Institute of Research and Development, Co., Ltd., Japan)

PI-12

Progress and Prospects of Vehicle-integrated Photovoltaics and Efforts at Toyota

Taizo Masuda (Toyota Motor Corporation, The University of Electro-Communications, Japan)

PI-13

Sustainable Transportation Fuels from H<sub>2</sub>O and CO<sub>2</sub> Using Concentrated Solar Energy

Aldo Steinfeld (ETH Zurich, Switzerland)

Tokyo Sep 28, AM8:30-10:30

London On Demand

Colorado Sep 27, PM5:30-7:30

**Room A**

**Plenary Lectures**

**Session Chair: Kent Warren**

PI-21

Two-step Solar-thermal Water Splitting - The Path Forward

Alan (Al) W. Weimer (University of Colorado Boulder, USA)

PI-22

Climate Emergency: Delivering Net Zero Carbon Buildings

Deo Prasad (University of New South Wales Sydney, Australia)

**Session Chair: Koji Matsubara**

PI-23

Control and Utilization of Surplus Electricity for the High Share of Variable Renewable Energy

Hironao Matsubara (Institute for Sustainable Energy Policies, Japan)

PI-24

Thermal Problems of Hydrogen at High Pressures

Yasuyuki Takata (Kyusyu University, Japan)

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**Room A****Plenary Lectures****Session Chair: Koji Matsubara**

PI-31

Directly Absorbing Nanofluid Enabled Solar Thermal Concentrators and Vacuum Insulation Panels for 100% Environment Friendly Horticultural Cold Storage

Harjit Singh (Brunel University London, UK)

PI-32

Solar Driven Tri-hybrid Cycle for Future Sustainable Water Supplies

Muhammad Wakil Shahzad (Northumbria University, UK)

PI-33

Renewable Energy Systems: Global Status and Prospects

Soteris Kalogirou (Cyprus University of Technology, Cyprus)

PI-34

Solar Radiation and Illuminance Models

Tariq Muneer (Edinburgh Napier University, UK)

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**Room A:****CSP****Session Chair: Ryuusuke Kawamura**

A-41

Solar Thermochemical Water Splitting Using Iron-aluminate Spinel

○ Kent J Warren, Justin T Tran, Scott C Rowe, Alan W Weimer (University of Colorado Boulder)

A-42

Conjugate Radiation-convection-conduction Simulation for Solar Volumetric Receiver with Cubic Lattice as Fundamental Structure

○ Hikaru Maruyama, Mitsuho Nakakura, Selvan Bellan, Hyun-Seok Cho, Koji Matsubara (Niigata University)

A-43

Experimental Study of Ceria Particle Fluidized Bed Solar Reactor for the Thermochemical Two-step Water-splitting Cycle Using a 30-kWth Sun-simulator

○ Takuma Kazui, Hyun-Seok Cho, Tatsuya Kodama, Selvan Bellan (Niigata University), Jin-soo Kim (CSIRO Energy)

A-44

Comparison Study on Magnesioferrite with Ceria for a Two-step Thermochemical Water Splitting Cycle

○ Maho Nagata, Hyun-Seok Cho, Tatsuya Kodama, Selvan Bellan (Niigata University), James F. Klausner (United Arab Emirates University), Kelvin Randhir (Michigan State University)

A-45

Hydrogen Production by Solar Fluidized Bed Reactor Using Ceria: Euler-lagrange Modeling of Gas-solid Flow to Optimize the Internally Circulating Fluidized Bed

○ Selvan Bellan, Tatsuya Kodama, Hyun-Seok Cho (Niigata University), Jin-Soo Kim (CSIRO Energy)

A-46

Experimental Study on Reactivity  $M\text{-CeO}_2$  ( $M\text{:Fe, Mn}$ ) in Two-step Thermochemical Water Splitting Cycle

○ Yu Sakai, Hyun-Seok Cho, Tatsuya Kodama, Selvan Bellan (Niigata University), Jong-Kyu Kim (Korea Institute of Energy Research)

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**Room B**

**Energy Storage**

**Session Chair: Takayuki Yamagata**

B-41

Synthesis of Metal Nitrides for Solar Thermochemical Ammonia Production

○ Xiang Gao, Nathaniel Anbar, Ivan Ermanoski (Arizona State University), Andrea Ambrosini (Sandia National Laboratories), Ellen B. Stechel (Arizona State University)

B-42

Fluidization Behavior of Redox Metal Oxide and Spinel Particles to Develop High-energy-density Thermal Energy Storage System for Concentrated Solar Power Applications

○ Genta Tsurumaki, Selvan Bellan, Koji Matsubara, Tatsuya Kodama, Mitsuho Nakakura, Nobuyuki Gokon, Hyun-Seok Cho (Niigata University), Mani Karthik, Shanmugasundaram Sakthivel (International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI))

B-43

Numerical Study on the Transient Heat Transfer Behaviour of Packed Bed Thermal Energy Storage System for Concentrated Solar Power Plant

○ Nobuhiro Okodo, Selvan Bellan, Koji Matsubara, Tatsuya Kodama, Nobuyuki Gokon, Hyun-Seok Cho (Niigata University)

B-44

Capacity Factor of Thermal Energy Storage System with Multiple Passages

Anil Kumar Patil, ○ Ravi Kumar, Manoj Kumar (DIT University)

B-45

Cost-effective, Scalable and High Temperature Stable Spinel Structured Solid Particles for High Temperature Solar Thermal Energy Storage Applications

M Shiva Prasad (International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI)), Selvan Bellan (Niigata University), Mani Karthik,

○ Shanmugasundaram Sakthivel (International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI))

B-46

Loop Heat Pipe for Cooling a Hot Vehicle Cabin Heated by Solar Radiation

○ Yuuya Watabe, Tomohiro Nakazawa, Kenya Takenouchi, Atsushi Tsujimori (Kanto-gakuin University)

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**Room A**

**CSP & Others**

**Session Chair: Atsushi Sakurai**

A-51

Investigation of Unsteady-state Solar Receiver Performance by Conjugate Heat Transfer Simulation

○ Mitsuho Nakakura, Teppei Maruyama, Hotaka Ojima, Koji Matsubara (Niigata University)

A-52

Study the Impacts of External Shading Devices at Top Floors of High-rise Buildings Facing Unobstructed Skies

Danny H. W. Li, ○ Shuyang Li, Emmanuel I. Aghimien (City University of Hong Kong)

A-53

A Simulation Study of Daylight-linked Lighting Control under Heavily Obstructed Skies

○ Ernest Kw Tsang (The Open University of Hong Kong), Danny Hw Li (City University of Hong Kong), Patrick X Chen (The Open University of Hong Kong)

A-54

Tsukuba Holonism Town-Building a Carbon Neutral Community

○ Kenji Morita, Hiroyuki Mitsuishi (Japan Automobile Research Institute), Ichiro Sugimoto (Laboratory of Energy & Human Life Science Inc.), Masayoshi Ishida (University of Tsukuba)

A-55

A Study of Regional Solar Radiation Forecast by Support Vector Quantile Regression with Laplacian Kernel

○ Takahiro Takamatsu, Hideaki Ohtake, Takashi Oozeki (National Institute of Advanced Industrial Science and Technology)

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**Room B**

**Solar Radiation**

**Session Chair: Hideaki Ohtake**

B-51

Estimation of Vertical Global Solar Irradiance Using Artificial Neural Networks  
 Danny H.W Li, ○ Emmanuel I. Aghimien, Shuyang Li, Ernest K.W Tsang (The Open University of Hong Kong)

B-52

Study on Two Phase Flow Microchannel Heat Sink Applied to Solar-tracking High-concentration Photovoltaic Thermal Hybrid System  
 ○ Shaobo Yang (The University of Tokyo), Sihui Hong (Sun Yat-sen University), Bohan Zhang (The University of Tokyo), Chaobin Dang (Fukui University), Yu Chen (The University of Tokyo)

B-53

Intra-day Forecasting of Global Horizontal Irradiance Using Satellite Data  
 ○ Pranda MP Garniwa, Raihan Kamil, Rial Arifin, Hyunjin Lee (Kookmin University)

B-54

Short-term Prediction of Cloud Movements with Meteorological Satellite Images Processed in Spectrum Space  
 ○Yuto Hara, Rina Takada, Jun Yoshino, Tomonao Kobayashi (Gifu University)

B-55

Application of Kalman Filter to Solar Irradiance Forecasting with a Meteorological Model in Tropical Region  
 ○ Naoki Moriai, Daiki Harada (Gifu University), Perawut Chinnavornrungee (National Science and Technology Development Agency), Jun Yoshino, Tomonao Kobayashi (Gifu University)

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**Room A**

**PV**

**Session Chair: Taizo Masuda**

A-61

Balloon Flight Test of Thin-film-type Perovskite Solar Cell  
 ○ Hideyuki Fuke, Shuusaku Kanaya, Yu Miyazawa, Hiroyuki Toyota, Kazuyuki Hirose (JAXA), Ryoto Funayama (Kishu Giken Kogyo Co.,Ltd), Masashi Ikegami (Toin University of Yokohama)

A-62

Comparative Study of a Novel Heat Pump Based on Concentrated Photovoltaic & Finned-tube Structure and Traditional Heat Pumps

○ Zhiying Song, Jie Ji, Zhaomeng Li (University of Science and Technology of China)

A-63

Thermal Measurement and Modeling of Vehicle-integrated Photovoltaic Modules

○Yoshitaka Hayakawa, Daisuke Sato, Masaaki Baba, Noboru Yamada (Nagaoka University of Technology)

A-64

Static Low-concentrator Photovoltaic Combined with Luminescent Solar Concentrator

○ Ryota Tomizawa (Toyota Motor Corporation), Daisuke Sato, Noboru Yamada (Nagaoka University of Technology), Taizo Masuda (Toyota Motor Corporation)

A-65

Simultaneous Operation of Photovoltaic Power Generation and Electroluminescence of 3-Terminal Smart Stack Multi-junction Solar Cells

○ Yutaka Watanabe, Masaaki Baba (Nagaoka University of Technology), Kikuo Makita, Takeshi Tayagaki, Takeyoshi Sugaya (National Institute of Advanced Industrial Science and Technology), Noboru Yamada (Nagaoka University of Technology)

A-66

Design of Anti-reflection Structure for Silicon Solar Cells Based on Nanoholes Array with Gradient Index

○ Shude Zhang (Suzhou Talesun Solar Technologies Co., Ltd.), Yawei Kuang (Changshu Institute of Technology)

A-67

Characteristics of Electric Field Curtain with Various Electrode Widths for Sand-removing on PV Module Surface Installed in Arid Land

○ Ryota Watanabe, Rinpei Sueyoshi, Ryo Nishimura (Tottori University)

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**Room B**

**Solar Thermal**

**Session Chair: Atsushi Tsujimori**

B-61

Simulation on Performance Improvement of  $\text{CaSO}_4$  Solar Chemical Heat Pump

○ Yawen Ren, Hironao Ogura (Chiba University)

B-62

Performance Evaluation of Hybrid Active Greenhouse Solar Dryer Attached with Evacuated Tube Solar Collector

○ Pushpendra Singh, M.K. Gaur (Madhav Institute of Technology & Science), G.N. Tiwari (Jananayak Chandrashekhar University)

B-63

Experimental Study for Enhancing the Performance of Solar Still by Utilizing The Heat Energy Obtained from Condensation

○ Padmanaban M, Suresh S, K.G.N. Sameer Reddy (National Institute of Technology)

B-64

Performance Evaluation of Passive Solar Still with CuO and ZnO Nanoparticles

○ Vikas Kumar Thakur, M.K. Gaur (Madhav Institute of Technology and Science), G.N. Tiwari (Jananayak Chandrashekhar University), M.K. Sagar (Madhav Institute of Technology and Science)

B-65

Thermal Performance Evaluation of an Indoor Designed Solar Air Heater Having Racetrack-shaped Perforated V-down Baffle Blocks with Staggered Holes – An Experimental Study.

○ Rajeev Pandey, Manoj Kumar, J. S. Saini (DIT University)

B-66

Fundamental Study on Thermoradiative Energy Conversion for Space Applications

○ Hiroto Shibuya, Nobuhiro Nagumo, Kio Kumagai, Atsushi Sakurai (Niigata University)

B-67

A Sustainable Solar Desalination System Using Direct-contact Spray Evaporation and Condensation (DCSEC) Method

○ Qian Chen, Raid ALRowais, Kum Ja M, Muhammad Burhan, Kim choon Ng (King Abdullah University of Science and Technology)



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**Room A**

**PV**

**Session Chair: Hideyuki Fuke**

A-71

Analysis of Rear Side Irradiance Non-uniformity for Bifacial Photovoltaics Characterisation in Outdoor Conditions

○ Michelle Kitayama, Mehreen S. Gul (Heriot-Watt University)

A-72

Bifacial Solar Photovoltaic Irradiance Gain: An Investigation of Different Ground Albedo

○ Marzia Alam, Mehreen Saleem Gul (Heriot-Watt University), Tariq Muneer (Edinburgh Napier University)

A-73

Proposal of Reproduced I-V Characteristics of a Photovoltaic System Linearization Method to Suppress Vibration of FB Model

○ Kumpei Yamamoto, Ikuo Nanno, Jun Murakami (Ube College), Toshiyuki Hamada (Osaka Electro-Communication University), Masayuki Fujii, Takuya Hirata (Oshima College), Shinitirou Oke (Tsuyama College), Norio Ishikura (Yonago College)

A-74

The Best Energy Combination for an Island Micro-grid in a Rural Village of Tanzania, with an Emphasis on the Total Cost

○ Kabir Md Imtiaz , Hironobu Matsuo (Shizuoka. University)

A-75

Evaluation of an Optically Switchable Photovoltaic Window by Building Energy and Daylight Performance Simulations

○ Xiao Liu, Jan-Frederik Flor, Yupeng Wu (University of Nottingham)

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**Room B**

**Energy Systems**

**Session Chair: Selvan Bellan**

B-71

Comprehensive Performance Investigation of a Novel Double-skin Ventilated Window Integrated with CdTe Cells

○ Chuyao Wang, Yayun Tang, Tingting Yao, Jie Ji (University of Science and Technology of China)

B-72

A Study on Efficiency Enhancement of the Photovoltaic by Installing a Simple Heat Sink

○ Sorawit Sonsaree (Pibulsongkram Rajabhat University), Somchai Jiajitsawat (Naresuan University)

B-73

Numerical Analysis of Solar Hot Water Floor Heating System Aiming at ZEB Shelter Gymnasium

○ Koichi Isawa (Fukuyama University), Sung-Ki Song (Hiroshima Institute of Technology), Koki Yakushijin (Fukuyama University)

B-74

Applications of ANN in Solar Energy Themes for Built Environment

○ Rishika Shah, R K Pandit, M K Gaur (Madhav Institute of Technology), G.N. Tiwari (Jananayak Chandrashekhar University)

B-75

Solar Technology and Future of Solar

○ Vaishali Karande (Solarist Enlight Life)

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**Room A**

**Plenary Lectures**

**Session Chair: Atsushi Akisawa**

PI-81

Thermal Radiative Properties of Solid Particles for Concentrated Solar Power Using Particle Receivers

Zhuomin Zhang, Chuyang Chen, Shin Young Jeong, Chiyu Yang, Devesh Ranjan, and Peter G. Loutzenhiser (Georgia Institute of Technology, USA)

PI-82

Study on the Multi-functional Application of BIPV/T System  
Jie Ji (University of Science and Technology of China, China)

PI-83

Development of Hard-shell Micro-encapsulated Phase Change Materials  
Hiroshi Suzuki (Kobe University, Japan)

PI-84

Solar Thermochemical Water/CO<sub>2</sub> Splitting Cycles  
Tatsuya Kodama (Niigata University, Japan), Jin Soo Kim (CSIRO Energy Center,  
Australia)

**Closing**

**Session Chair: Koji Matsubara**