

# **9th International SOLARIS Conference 2018**

IOP Conference Series: Materials Science and Engineering  
Volume 556

Chengdu, China  
30 – 31 August 2018

ISBN: 978-1-5108-9387-0  
ISSN: 1757-8981

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

This work is licensed under a Creative Commons Attribution 3.0 International Licence. Licence details:  
<http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact the Institute of Physics at the address below.

Institute of Physics  
Dirac House, Temple Back  
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481  
Fax: 44 1 17 920 0979

[techtracking@iop.org](mailto:techtracking@iop.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Table of contents

## Volume 556

**9th Edition of the International SOLARIS Conference**

**30–31 August 2018, Chengdu, China**

**Accepted papers received: 17 May 2019**

**Published online: 19 August 2019**

### **Preface**

[9th edition of the international SOLARIS conference](#)

[Peer review statement](#)

### **Papers**

[Analysis of a rotary passive heat recovery device for natural ventilation windcatcher](#)

D O' Connor, J K Calautit, K Calautit, S Shazad, B R Hughes and C Pantua.....1

[An economic analysis of the solar photovoltaic/thermal \(PV/T\) technologies in Sweden: a case study](#)

Xingxing Zhang, Jinshun Wu, Song Pan and Mengjie Han.....9

[Comprehensive assessment of advanced solar facade: thermal, optical and economic assessment](#)

R Liang, Y Sun, Y Wu and R Wilson.....15

[Experimental study on the thermal performance of ethylene-tetrafluoroethylene \(ETFE\) foil cushions](#)

J-F Flor, Y Sun, P Beccarelli, C Rowell, J Chilton and Y Wu.....21

[Photovoltaic Characteristics of Low Concentration CdTe Solar Cells](#)

Shuai Wang, LiLi Wu, Xia Hao, Jingquan Zhang, lianghuan Feng, Tapas Mallick and Lingzhi Xie.....26

[Annealing temperature dependence of properties of CdSe thin films by RF-sputtering](#)

Ailing Wang, Chunxiu Li, Jingquan Zhang, Lili Wu, Wenwu Wang and Lianghuan Feng.....31

[LCOE analysis of tower CSP plants using different molten salts for TES in China](#)

X R Zhuang, X H Xu, W R Liu, T L Liu and W F Xu.....37

[Study on Lighting -Heating-Electricity Coupled Energy Saving Potential for STPV Window in Southwest China](#)

Hao Tian, Wei Zhang, Lingzhi Xie, Yupeng Wu, Yanyi Sun, Wei Wang and Mo Chen.....43

[Preliminary Simulation Investigation of Building Energy Consumption of Solar PV Windows in Hot Summer and Cold Winter climate zone in China](#)

M Chen, W Zhang, L Xie, Y Wu, Z Ni, Q Wei, W Wang and H Tian.....49

[Study on the flow and heat transfer in a thermal shielding radiator](#)

Feiyang Sun, Yiqiang Wu, Fubo Xie, Peng Qian and Minghou Liu.....55

[The research of post-treatment on Cd<sub>1-x</sub>MgxTe thin films and CdTe solar cells](#)

Ye Feng, Mingzhe Yu, Jian Huang, Xia Hao, Wei Li, Jingquan Zhang and Lili Wu.....61

[Feasibility study of MgSO<sub>4</sub> + zeolite based composite thermochemical energy stores integrated with vacuum flat plate solar thermal collectors for seasonal thermal energy storage](#)

D Mahon, P Henshall, G Claudio and P Eames.....66

[Numerical study of a thermal storage tank enclosed PCM capsules](#)

Wei Lu, Shuqian Bi, Huakeer Wang, Jan-Frederik Flor, Yupeng Wu and Leyi Zhang.....72

[Numerical model of applying PCM boards for energy saving in lightweight buildings in Shanghai](#)

Huakeer Wang, Wei Lu and Zhigen Wu.....78

[A study of overcast, partly cloudy and clear skies by global illuminance and its variation features](#)

Siwei Lou, Danny H W Li and Wenqiang Chen.....84

[Holistic Optimisation of Solar-assisted Multiple Effect Evaporators \(MEE\)](#)

Soundaram Ramanathan and Dibakar Rakshit.....91

[Calibrating Perez Model Coefficients Using Subset Simulation](#)

M Meshkinkiya, R.C.G.M. Loonen, R Paolini and J.L.M Hensen.....97

[A climate zone approach to global solar radiation modelling using artificial neural networks](#)

Liu Yang, Xujie Huo, Danny H W Li and Joseph C Lam.....103

[Optical design and experiment evaluation of a novel asymmetric compound parabolic concentrator \(ACPC\) integration with PV for building south wall application](#)

Q Xuan, G Li, G Pei, Y Lu, Y Su and J Ji.....109

[Experimental study on thermal performance improvement of solar air heater using piezoelectric fan](#)

Hu Jiayu and Jin Chengjun.....115

[Solar-air hybrid source heat pump water heater: Performance characterization and comparison analysis](#)

Jingyong Cai and Jie Ji.....121

[Synthesis of a carbazole-substituted diphenylethylene hole transporting material and application in perovskite solar cells](#)

Juncong Li, Hongwei Zhu, Xianggao Li, Shirong Wang and Yin Xiao.....127

[Thermo-economic analysis of integrated linear Fresnel reflector gas turbine trigeneration power plants](#)

Yousef N. Dabwan and Pei Gang.....135

[Airflow Organization in a Transformable Shelter](#)

Liang Guo and Hong Ye.....141

[Design of a small size PTC: computational model for the receiver tube and validation with heat loss test](#)

M Salvestroni, G Pierucci, F Fagioli, A Pourreza, M Messeri, F Taddei, S Hosouli, H Rashidi and M De Lucia.....147

[Design of a seasonal storage for a solar district heating in Florence](#)

M Salvestroni, G Pierucci, F Fagioli, A Pourreza, M Messeri, F Taddei, S Hosouli, H Rashidi and M De Lucia.....153

[Investigation on steady aerodynamic performance of a S-CO<sub>2</sub> compressor with different diffusers in solar power system](#)

Qiuwan Du, Di Zhang and Yonghui Xie.....159

[Research on Operation Strategy of Solar Assisted Air Source Heat Pump System](#)

Z Yuhan, W Jinshun, L Mu, Z Xingxing, Z Lining, Z Weiya, Z Weijie, W Jun, X Liang, Z Weihong, W Xinru and W Yixuan.....165

[Experimental Study on Heat Storage and Release Processes of Composite Phase Change Wall under Short Intermittent Heating Conditions](#)

Yanru Li, Jin Li, Luting Xu, Yang Ming and Enshen Long.....173

[Photocatalytic activity enhanced by photo-thermal conversion with recyclable hollow Fe<sub>3</sub>O<sub>4</sub>@TiO<sub>2</sub> nanoparticles](#)

Lei Shi and Yurong He.....179

[Preliminary analysis of supercritical CO<sub>2</sub> Brayton cycle applied to the solar thermal plant](#)

L Sun, YH Xie and D Zhang.....185

[Study of Residential Thermal Transfer Values \(RTTV\) and Vertical Daylight Factor \(VDF\) for Hong Kong](#)

Ernest K. W. Tsang and Danny H. W Li.....191

[The Study On Anti-PID Performance Of High Efficiency Bifacial Cell Module](#)

Xia Cai, Zhichun Ni, Chengjin Chen, Po Ke, Henglei Chen, Haibo Cao and Qiangming Zhang.....197

[Performance analysis of a high concentrating photovoltaic/thermal system with a water spray cooling device](#)

Haifei Chen, Jie Yang, Nianyong Zhou, Jianfang Chen and Yang Zhang.....203

[Solar photocatalytic degradation of methyl orange using PbS-ZnS/electrospun fiber composites](#)

Jie Yang, Haiqun Chen and Haifei Chen.....210

[Study on aluminum honeycomb plate solar air collector and its building heating potential in western Sichuan](#)

T Meng, X Meng, Y Zhao and C Jing.....216

[Graphene oxide stabilized carbon nanotube-water nanofluids for direct absorption solar collectors](#)

Xinzhi Wang, Dan Liu, Xing Liu and Yurong He.....222

[Optimization Investigation on Wavy Channel Printed Circuit Heat Exchanger for Solar Energy Powered Brayton Cycle](#)

Y Z Li, Y H Xie and D Zhang.....228

[Study on the comprehensive energy performance of different shading systems in China](#)

X Li, JQ Peng and C Curcija.....234

[The Assembly of Embedded Systems for Integrated Photovoltaic windows in Rural Buildings \(E-IPB\)](#)

K Shanks, Hasan Baig, Ashley Knowles, Adam Brierley, Henry Orr, Jayesh Patel, Neil Foster, Stephen Ball, Yanyi Sun, Yupeng Wu, Sundaram Senthilarasu and Tapas Mallick.....240

[Thermal Performance Analysis of Concrete Small Hollow Block](#)

YE Bi-chao and Hao Zhou.....246

[Dynamic performance analysis of façade-integrated tri-functional photovoltaic/thermal solar collector](#)

Jinwei Ma, Xue Kou, Shuang Liu, Weiwei Tong and Tingyong Fang.....251

[Estimating hourly global solar irradiance using artificial neural networks – A case study of Hong Kong](#)

Wenqiang Chen, Danny H. W. Li, Shuyang Li and Joseph C Lam.....257

[Analysis of Point Daylight Factor \(PDF\) Average Daylight Factor \(ADF\) and Vertical Daylight Factor \(VDF\) under various unobstructed CIE Standard Skies](#)

Danny H W Li, Shuyang Li, Wenqiang Chen and Siwei Lou.....263



[Influencing factor Analysis of collecting capability over a year by the panel typed solar collector for seven representative cities in Yunnan, China](#)

Ming yang, Long enshen, Xu kuo, Li yanru, Zhang yin and Jin zhenghao.....269

[Analysis on the influence of solar radiation on heating load of existing residential buildings in Western Sichuan](#)

Yi Huang and Yong Liu.....275

[Experimental and theoretical research on bending behaviour of photovoltaic panels with a special boundary condition](#)

T Y Zhang, L Z Xie, Y X Li, T K Mallick, Q Z Wei, X Hao and B He.....283

[Mechanical analysis of photovoltaic panels with various boundary condition](#)

Y X Li, L Z Xie, T Y Zhang, Y P Wu, Y Y Sun, Z C Ni, J Q Zhang and B He.....289

[Study on the hysteresis characteristic of solar thermal storage system](#)

N Mao, E S Long, J Li and D T Xiao.....295

[A smart hybrid pole with street lighting and EV charging based on DC micro-grid and renewable energy](#)

Yongming Zhang, Li Li, Zhe Yan and Jiawei Yao.....301

[Skylight Sizing based on balancing Daylighting Performance and Visual Comfort in Atrium Buildings](#)

Jie Li, Xueming Chen, Qichao Ban and Jiawei Yao.....307

[Movable insulation in building integrated semi-transparent photovoltaic thermal \(BiSPVT\) system](#)

G K Mishra, G N Tiwari and T S Bhatti.....313

[Challenges and research needs in life cycle analysis of building-integrated photovoltaic](#)

Xiaoyu Yan.....320

[The Design of Sustainable Retrofitting Strategies and Energy-efficiency Optimization for Residential Buildings](#)

Guopeng Li, Yingqing Xu and Yue Fan.....325

[The relative change of drying rate as a function of the cumulative ventilation air drying potential in a thin-layer solar drying facility](#)

P Krawczyk.....331

[It's not just power generation: The positive effect of building integrated photovoltaic design on architecture](#)

A Ju Xiaolei, B Lu Yongfei and C Guo Junnan.....337

[A novel Fluid-Structure Interaction modelling and optimisation of roofing designs of buildings for typhoon resilience](#)

Conrad Allan Jay Pantua, John Kaiser Calautit and Yupeng Wu.....343

[The potential of phase change energy storage for office cooling load shifting](#)

J P Cunha and P C Eames.....350

[Steady-Flow-Type Particle Receiver for High-Temperature Solar Thermal Storage](#)

Koji Matsubara, Yudai Suzuki, Atsushi Sakurai, Selvan Bellan and Tatsuya Kodama.....359

[Direct Simulation of Volumetric Solar Receiver with Highly Concentrated Radiation](#)

Mitsuho Nakakura, Koji Matsubara, Selvan Bellan and Tatsuya Kodama.....365

[A method for a cradle-to-cradle life cycle assessment of integrated collector-storage solar water heaters](#)

Ruth M Saint, Francesco Pomponi and John I Currie.....371

[The analysis on applicability of hourly horizontal diffuse radiation estimation model of Shanghai Zone](#)

Qimeng Cao, Liu Yang and Ying Yu.....377

[Improvement of Airtightness for Lightweight Prefabricated Building Envelope through Optimized Design of Panel Joints](#)

Zhenghao Lin, Yehao Song and Dongchen Han.....383

[BIM-based real time building energy simulation and optimization in early design stage](#)

Hao Gao, Liwenbo Zhang, Christian Koch and Yupeng Wu.....389