

Table of Contents

Preface

Committees

SECTION I – MATERIALS FOR DIRECT THERMAL-TO-ELECTRICAL ENERGY CONVERSION

Multi-Layered Thermoelectric Power Generator

R.O. Suzuki 1

Theoretical Performance Characteristics of Wearable Thermoelectric Generators

V. Leonov 9

Study and Design for High Thermoelectric Properties for $\text{Ag}_x\text{Te}_y\text{Tl}_z$ Compound with First Principle Band Calculation

H. Funashima and N. Hamada 15

Effect of Cobalt-Substitution on the Structure and Thermoelectric Properties of Chimney-Ladder Solid Solution $(\text{Mn}_{1-x}\text{Co}_x)\text{Si}_\gamma$ ($\gamma \sim 1.7$)

Y. Miyazaki, Y. Saito, K. Hayashi, K. Yubuta and T. Kajitani 22

Effect of Strontium and Europium Substitutions on Thermoelectric Properties in Silicon-Based Clathrate Compounds

H. Anno, T. Nakabayashi and M. Hokazono 26

Thermoelectric Properties of the Heavy Element Doped Heusler Fe_2VAl Alloy Prepared by Powder Metallurgy Technique

M. Mikami, K. Kobayashi and S. Tanaka 32

The Evaluation of TiTe_2 as a Diffusion Barrier in the Formation of Low Thermal Conductivity Nanolaminates with Bi_2Te_3 and Sb_2Te_3

C. Mortensen, P. Zschack and D.C. Johnson 38

Structural Characterization of Nano-Crystalline Mg_2Si Prepared by Ball Milling

M. Ioannou, E. Hatzikraniotis, C.B. Lioutas, K.M. Paraskevopoulos and T. Kyratsi 48

High-Temperature Transport Properties of Indium Added Cobalt-Antimonide Based Skutterudites Processed by Current Assisted Short-Term Sintering

A. Sesselmann, R. Hassdorf, S. Zastrow and E. Müller 54

Raman Spectroscopy Study on $\text{Na}_{2/3}\text{Mn}_{1-x}\text{Fe}_x\text{O}_2$ Oxides

M. Sendova-Vassileva, R. Stoyanova, D. Carlier, M. Yoncheva, E. Zhecheva and C. Delmas 60

Thermoelectric Iron Oxides

T. Kajitani, T. Nozaki and K. Hayashi 66

Thermoelectric Generating Properties of Perovskite Like Materials

H. Kohri, M. Kato, I.J. Ohsugi and I. Shiota 72

Improved Thermoelectrics Based on Bismuth and Antimony Chalcogenides for Temperatures below 240 K

L.N. Lukyanova, V.A. Kutasov, P.P. Konstantinov and V.V. Popov 77

Thermoelectric Application for Power Generation in Japan

T. Kajikawa 83

Modular Combustor-Radiator for Micro-TPV System Application

S.K. Chou, W.M. Yang and J. Li 93

SECTION II – MATERIALS FOR PHOTOVOLTAIC SOLAR ENERGY CONVERSION

II-1 Crystalline Cells and Thin Film Photovoltaics

Ultrapurification of Silicon for Photovoltaic Applications

C. del Cañizo, G. del Coso and A. Luque 99

P and Al Diffusion Process for Thin Si Wafers Studied by SEM and EDX

E. Ochoa-Martínez, A. Merchan, R. Romero, M. Gabas, L. Martínez, F. Martín, D. Leinen and J.R. Ramos-Barrado 107

Adhesion and Barrier Properties Analysis of Silica-Like Thin Layer on Polyethylene Naphthalate Substrates for Thin Film Solar Cells	113
M.L. Addonizio and L. Fusco	
Investigation of Thin Film Solar Cells on CdS/CdTe Base with Different Back Contacts	119
G. Khrypunov, A. Meriuts, H. Klochko, T. Shelest and A. Khrypunova	
17.0% Aperture Area Module Efficiency Using Large mc-Si Metal-Wrap-Through Cells	124
A.W. Weeber, I.J. Bennett, C. Tjengdrawira, M.W.P.E. Lamers, A.A. Mewe, I.G. Romijn and P.C. de Jong	
Design Analysis of <i>a</i>-Si/<i>c</i>-Si HIT Solar Cells	131
M. Nawaz	
Quantum Size Effects in a Si:H Films Prepared by PECVD with Different Hydrogen-Diluted Silane	
L. Prušáková, V. Vavruňková, M. Netrvalová, J. Müllerová and P. Šutta	137

II-2 Emerging and New Generation Solar Cells

Intermediate Band Solar Cells	143
A. Martí and A. Luque	
Active Materials Based on Implanted Si for Obtaining Intermediate Band Solar Cells	151
K. Sánchez, I. Aguilera, P. Palacios and P. Wahnón	
Tandem Dye-Sensitized Solar Cells Consisting of Floating Electrode Supported by Non-Conductive Glass Mesh	
K. Uzaki, S.S. Pandey, Y. Ogomi and S. Hayase	157
The Influence of the Fullerene on the Optical Constants of the Photoactive Blend Film of a Polymer Solar Cell	
P. Morvillo, E. Bobeico and S. Esposito	164
The Suitability of Organic Solar Cells for Different Indoor Conditions	170
B. Minnaert and P. Veelaert	
Optimizing Quantum Dot Solar Concentrators with Thin Film Solar Cells	176
W.G.J.H.M. van Sark, C. De Mello Donegá and R.E.I. Schropp	
Thin-Film Silicon Solar Cells Using Back Reflector with Embedded Metal Nanoparticles	182
R.R. Liang, R. Santbergen and M. Zeman	

SECTION III – MATERIALS FOR CONCENTRATING SOLAR TECHNOLOGIES

III-1 CPV Materials and Technologies

Improved Concentration Capabilities of Flat-Plate Fresnel Lenses	188
M.Z. Shvarts and A.A. Soluyanov	
Optical Methods for Indoor Characterization of Small-Size Solar Concentrators Prototypes	196
A. Parretta, A. Antonini, M.A. Butturi, E. Milan, P. Di Benedetto, D. Uderzo and P. Zurru	
Assessment of a Phase Change Material (PCM) System for Moderating Temperature Rise of Solar Cells under Concentrated Sunlight	
E. Casenove, L. Pujol, A. Vossier, A. Perona, V. Goetz and A. Dollet	205
CPV Modules Based on Lens Panels	
V.D. Rumyantsev, Y.V. Ashcheulov, N.Y. Davidyuk, E.A. Ionova, P.V. Pokrovskiy, N.A. Sadchikov and V.M. Andreev	211
Solar Divergence Collimators for Collector Tests	
E. Sani, P. Sansoni, D. Fontani, F. Francini, L. Mercatelli and D. Jafrancesco	219
Improvement of Radiation Resistance of Multijunction GaInP/Ga(In)As/Ge Solar Cells with Application of Bragg Reflectors	
V.M. Lantratov, V.M. Emelyanov, N.A. Kalyuzhnny, S.A. Mintairov and M.Z. Shvarts	225
AlGaAs/GaAs Photovoltaic Cells with InGaAs Quantum Dots	
V.M. Lantratov, S.A. Mintairov, S.A. Blokhin, N.A. Kalyuzhnny, N.N. Ledentsov, M.V. Maximov, A.M. Nadtochiy, A.S. Pauysov, A.V. Sakharov and M.Z. Shvarts	231

III-2 CSP Materials and Technologies

Material and Design Requirements for Advanced Concentrators	
R. Pitz-Paal and E. Lüpfert	237
New Method to Characterize Phase Change Materials	
E. Palomo Del Barrio and J.L. Dauvergne	243
Solar-Thermal Energy Conversion and Storage: Conductive Heat Transfer Using Self-Assembled Bulk Graphite	
C.C. Sorrell, T.C. Palmer, L.J. Bowen and A. Nakaruk	253
PCM-Graphite Latent Heat Storage Systems for Industrial Process Heat Recovery	
R. Schmitt, O. Öttinger, W.D. Steinmann and M. Johnson	259
Test Facility for Absorber Specimens of Solar Tower Power Plants	
K. Geimer, M. Sauerborn, B. Hoffschmidt, M. Schmitz and J. Götsche	266
Overview of PCMs for Concentrated Solar Power in the Temperature Range 200 to 350°C	
T. Bauer, D. Laing and R. Tamme	272

III-3 CPV and CSP Application

Building Integration Solutions for CPV	
D. Chemisana Villegas	278
On-Sun Performance of FLATCON® CPV Systems	
A. Gombert, I. Heile, J. Wüllner, T. Gerstmaier, S. van Riesen, E. Gerster and M. Röttger	288
A CPV System Based on NIR Reflecting Lamellae Integrated into a Greenhouse: Optimizing of Optics	
P. Sonneveld and G.J. Swinkels	297
Solar Thermochemical Production of Fuels	
A. Meier and A. Steinfeld	303
Optical and Thermal Characterization of Solar Receivers for Parabolic Trough Collectors	
M. Sanchez, E. Mateu, D. Perez, P. García, F. Villuendas, C. Heras and R. Alonso	313