C1-2.30

2008CMCEE &LCS

The 9th International Symposium on
Ceramic Materials and Components for Energy and Environmental Applications

The 4th Laser Ceramics Symposium:
International Symposium on Transparent Ceramics for Laser

Book of Program and Abstracts

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Shanghai Institute of Ceramics, Chinese Academy of Sciences

November 10~14, 2008

Shanghai, China

W. Rossner, U. Bast, S. Lampenscherf, and U. Rettig, Siemens AG, Corporate Technology, Ceramics, Munich, Germany

14:55-15:15
Tea Break

14:45-17:00
Poster

Thursday, 13 November 2008

CCEC-18, Nov.13, 9:00-9:30 **(invited)**
Monolithic dye sensitised solar cells

Yi-Bing Cheng, Department of Materials Engineering Monash University, Clayton, Victoria 3800 Australia

CCEC-19, Nov.13, 9:30-10:00 **(invited)**
Porous ceramics for hot gas cleaning; degradation mechanisms of SiC-based filters controlling the long term durability

P. Laurila and T. Mantyla, Dept .Materials Science, Tampere University of Technology, Tampere, Finland

CCEC-20, Nov.13, 10:00-10:25 **(oral)**
Synthesis of Ni/Olivine ($LiFePO_4$) catalysts for gas production from physic nut waste pyrolysis

C. Pechyen [1], D. Aht-Ong [1], V. Sricharoenchaikul [2], and D. Atong [3], [1] Department of Materials Science, Faculty of Science, Chulalongkorn University, Thailand, [2] Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University, Thailand, [3] National Metal and Materials Technology Center, 114 Thailand Science Park, Thailand

10:25-10:45
Tea Break

CCEC-21, Nov.13, 10:45-11:15 **(invited)**
CMC materials and biomorphic SiSiC for energy applications

B. Heidenreich, J. Schmidt, Sandrine Denis, Nicole Lützenburger, DLR – German Aerospace Center, Institute of Structures and Design, Stuttgart, Germany, J. Göring, M. Schmücker, DLR – German Aerospace Center, Institute of Materials, Research, Cologne, Germany

CCEC-22, Nov.13, 11:15-11:45 **(invited)**
The role of materials on power generation and the transformation, distribution, storage and use of energy

Edgar Lara-Curzio, Oak Ridge National Laboratory, USA.

CCEC-23, Nov.13, 11:45-12:10 **(oral)**
Synthesis and thermoelectric properties of half-Heusler compoundsZrCoBi1-*x*Pb*x*

P. F. Qiu[1,2], T. W[1,2], and L. D. Chen[1], [1] State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 200050, China, [2] Graduate School of Chinese Academy of Sciences, Beijing 100049, China

12:10-13:30
Lunch

CCEC-24, Nov.13, 13:30-14:00 **(invited)**
Si_3N_4 based ceramics for energy and environmental applications

H. Mandal[1], F. Kara[1], S. Turan[1], A. Kara[1] and N. Calis Acikbas[2], [1] Department of Materials Science & Engineering, Anadolu University, Eskisehir, TURKEY, [2] MDA Advanced Ceramics Ltd. Co., Technology Development Region, Eskisehir, Turkey.

IV.SOFC: *Solid oxide fuel cell (SOFC) materials and technology*

Tuesday, 11 November 2008

SOFC-1, Nov.11, 13:30-14:00 **(invited)**
Studies of SOFC electrode microstructure by focused ion beam-scanning electron microscopy

Scott A. Barnett and James Wilson, Northwestern University

SOFC-2, Nov.11, 14:00-14:25 **(oral)**
Development of nano-structured yttria-stabilized zirconia electrolyte for solid oxide fuel cells via sol-gel route

F. Han[1], T. Van Gestel[1] and H. P. Buchkremer[1], [1] Institute of Energy Research, IEF-1, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany

SOFC-3, Nov.11, 14:25-14:55 (invited)
Sintering behavior of Y_2O_3 doped Bi_2O_3 ceramics

Moztarzadeh F [1] ,Nosoudi.N[1]Alizadeh M[2], Maghsoudipour A[2], AhmadiK[2] and Saremi M[3], [1] Dept. Biomedical en.,Amirkabir University of Technology, Iran. [2] Material and energy research center, Iran. [3] Tehran University, Iran.

14:55-15:15
Tea Break

the use of metallic nickel as active phase doped on Olivine compounds. Phospho olivine ($LiFePO_4$) was chosen as catalyst support because of its activity in biomass pyrolysis and tar cracking, along with its high attrition resistance. $LiFePO_4$ was synthesized by co-precipitation synthesis using Lithium phosphate (1M), phosphoric acid (1M), and ferric citrate n-hydrate (1M) as starting materials. The wet powder obtained was then heated at 140 °C for 12 h, ground, fired under Ar up to 500-700 °C for 24 h, and then air quenched to obtain crystallized $LiFePO_4$. The synthesis of Ni/Olivine was carried out by wet impregnation of synthesized olivine supports with $Ni(NO_3)_3$ solutions for 6h. After drying, the catalyst sample was calcined in air at 800°C for 2 h and then reduced at 900-1100°C under H_2 atmosphere. The crystalline phases, microstructure, particle size, and surface area of olivine and Ni/olivine were investigated by XRD, SEM, particle size analyzer, and BET, respectively. The preliminary study of the efficiency of synthesized catalyst on the co-pyrolysis reaction of physic nut waste to produce fuel product was also reported.

CCEC-21
CMC materials and biomorphic sisic for energy applications

B. Heidenreich*, J. Schmidt, Sandrine Denis, Nicole Lützenburger, DLR–German Aerospace Center, Institute of Structures and Design, Stuttgart, Germany
J. Göring, M. Schmücker, DLR – German Aerospace Center, Institute of Materials
Research, Cologne, Germany

Ceramic materials offer high thermal and chemical stability and therefore are potential candidates for high temperature applications in severe environments, where metals cannot be used any more. In future energy applications, high process temperatures > 1200 °C are required to increase efficiency, lower fuel consumption and decrease emissions. To achieve these goals, novel ceramic materials and manufacturing processes for complex structures are under development.
At DLR, three different classes of ceramic materials have been developed for the use in energy applications: Oxide/oxide and non oxide ceramic matrix composites (CMC) as well as monolithic SiSiC. By integrating fibres in the ceramic matrix, CMC materials offer a high thermal shock resistance and a quasi ductile fracture behaviour. CMC structures have been developed for the use as lightweight hot gas liners in gas turbines and for heat exchangers in coal fired power stations. SiSiC materials based on wood and carbon/carbon preforms showed excellent long term stability in porous burner systems and are in development for heat exchangers in plate design as well as for receivers in solar power applications. Thereby, the typically high brittleness and low thermal shock resistance of monolithic ceramics could be overcome by the build up of thin walled, highly porous structures, offering structural integrity even at high temperature gradients.
In this paper, an overview of the different DLR approaches for integrating ceramic components in energy applications is given. Thereby the materials, the methods for manufacturing complex structures as well as the test results are described.

CCEC-22
The role of materials on power generation and the transformation, distribution, storage and use of energy

Edgar Lara-Curzio, Oak Ridge National Laboratory, USA.
E-mail: laracurzioe@ornl.gov

According to current projections energy usage in the world will increase from 400 EJ in 2000 to more than 800 EJ by 2050. These projections are based on assumptions about energy prices, economic growth, and changes in weather patterns, public policies and scientific and technological developments. In this presentation the role of materials to address the impending energy challenge will be discussed.

CCEC-23
Synthesis and thermoelectric properties of half-heusler compounds ZrCoBi1-xPbx

P. F. Qiu[1,2]*, T. W[1,2], and L. D. Chen[1]
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Half-Heusler compound ZrCoBi is a new promising thermoelectric material for thermoelectric power generation by utilizing waste heat in the intermediate temperature region. In this study, ZrCoBi1-xPbx (x = 0, 0.05, 0.1) half-Heusler compounds have been prepared by solid reaction method and spark plasma sintering (SPS) technique. The thermoelectric properties were investigated from room temperature to 800K. For the pure ZrCoBi compound, the seebeck coefficient (S) is negative in the entire temperature range, indicating that the compound is n-type conduction. However, doping Pb on Bi site, the sign of S change into positive, which is associated with increasing hole carriers. The electrical resistivity (ρ) of ZrCoBi1-xPbx decrease with Pb content increasing. Thermal conductivity (κ) shows little change after doping Pb on Bi site owing to the close ionic radius of Pb and Bi. The maximum ZT value is 0.065 at 800 K for ZrCoBi0.9Pb0.1.

CCEC-24
Si_3N_4 based ceramics for energy and environmental applications

H. Mandal[1]*, F. Kara[1], S. Turan[1], A. Kara[1] and N. Calis Acikbas[2]
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Si_3N_4 based ceramics have a wide range of applications due to their favorable mechanical and thermal properties. They are one of the main groups of materials being considered for high temperature load bearing applications and room to moderate temperature applications involving mechanical and/or chemical processes. However, wide spread use of Si_3N_4 based ceramics has not been realized due to high cost of raw materials and of processing. In this study, improvements in materials properties and processing of Si_3N_4 based ceramics by compositional design will be given with various application examples. Particular emphasis will be given to the application of wear parts and diesel particulate filter applications.

SOFC-1
Studies of SOFC electrode microstructure by focused ion beam – scanning electron microscopy

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