

7th EUROPEAN SOFC FORUM

Oral Presentations

Tuesday, 4 July 2006 - 14:00 – 15:30

Session B03

Operational Experience

Chairteam: Piero Lunghi, U. Perugia / Italy
Bert Rietveld, ECN, Petten / The Netherlands

14:00h

Solid Oxide Fuel Cell Development Status at Versa Power Systems

Brian Borglum, Eric Tang, Michael Pastula and James Kelsall

Versa Power Systems, Calgary / Canada

14:15h

Microtube SOFC Module and Its Electrochemical Evaluation

Misuzu Yokoyama, Kohki Nagai, Kenji Ukai and Yasunobu Mizutani

Toho Gas Co., Tokai / Japan

14:30h

Operation Characteristics of 5kW Planar SOFC Stack under the Pressurized Condition at KIER

Tak-Hyoung Lim¹, Rak-Hyun Song¹, Dong Ryul Shin¹, Jung Il Yang¹, Heon Jung¹ and Izaak C. Vinke²

¹KIER, Daejeon / Korea

²FZJülich / Germany

14:45h

Solid Oxide Fuel Cell Development at Topsoe Fuel Cell A/S and Risø

Niels Christiansen¹, John B. Hansen¹, Helge Holm-Larsen¹, Søren Linderøth², Peter H. Larsen², Peter V. Hendriksen² and Mogens Mogensen²

¹Topsoe Fuel Cell, Lyngby / Denmark

²Risø National Laboratory, Roskilde / Denmark

15:00h

Operational Data for SOFC Operated with Simulated Gasoline Reformate and Pure Carbon Monoxide

Holger Apfel¹, Ulrich Stimming^{1,2} and Carsten Cremers²

¹Technische Universität München, Garching / Germany

²Bavarian Center for Applied Energy Research (ZAE Bayern), Garching / Germany

15:15h

Installation and Operation of kW-Class Stacks from Jülich in External Laboratories

Izaak C. Vinke¹, Reinhard Erben¹, Rak-Hyun Song² and Jari Kiviaho³

¹Forschungszentrum Jülich, IWV-3, Jülich / Germany

²Korea Institute of Energy Research, Daejeon / Korea

³VTT Technical Research Centre of Finland, VTT / Finland

Tuesday, 4 July 2006 - 16:00 – 17:30

Session B04

Design and Development

Chairteam: Mihail Kusnezoff, IKTS Dresden / Germany
Ander Laresgoiti, Ikerlan, Arrasate / Spain

16:00h

Development of Disc-Type Seal-Less SOFC

Takashi Miyazawa¹, Katsuya Hirata¹, Norikazu Komada¹, Kei Hosoi¹, Makoto Shibata¹, Masaharu Yamada¹, Satoru Yamasaki², Futoshi Nishiwaki², Jiro Kano² and Toru Inagaki²

¹Mitsubishi Materials Corporation, Naka-shi / Japan

²The Kansai Electric Power Co., Amagasaki / Japan

16:15h

Lightweight Cassette Type SOFC Stacks for Automotive Applications

Andreas Gubner, Thinh Nguyen-Xuan, Martin Bram, Josef Rimmel and L.G.J. (Bert) de Haart
Forschungszentrum Jülich, IEV-3, Jülich, Germany

16:30h

Development of Solid Oxide Fuel Cells and Short Stacks for Mobile Application

Michael Lang, Corinna Auer, Andreas Eismann, Thomas Franco, Christina Lachenmann, Günter Schiller and Patric Szabo

German Aerospace Center (DLR), Stuttgart / Germany

16:45h

Development of Advanced Ceramic Reactors

Masanobu Awano, Yoshinobu Fujishiro, Toshio Suzuki, Toshiaki Yamaguchi, and Koichi Hamamoto
AIST, Nagoya / Japan

17:00h

Development of 500W-Class Anode-Supported Flat-Tube Solid Oxide Fuel Cell Stack in KIER

Rak-Hyun Song, Jong-Hee Kim, Dong-Yoo Chung, Hui-Joung Son, Ki-Seok Yun, Tak-Hyoung Lim, Seong-Bok Lee, Dong-Hyun Peck and Dong-Ryul Shin

KIER, Daejeon / Korea

17:15h

New Approaches for a Highly Integrated SOFC APU

Jürgen Rechberger, Peter Prenninger, Erich Ramschak and Martin Schüssler

AVL List GmbH, Graz / Austria

Wednesday, 5 July 2006 – 09:00 – 10:30

Session B05

Electrolytes

Chairteam: Nigel M. Sammes, U. Connecticut, Storrs / USA
San Ping Jiang, Nanyang Technological University / Singapore

09:00h

Development of Apatite-Based Solid Oxide Fuel Cells

Peter R. Slater, Jonathan E. H. Sansom, Emma Kendrick, Andrew Scullard, Christopher Olsen, M. Saiful Islam and Paul A. Sermon
University of Surrey, Guildford / United Kingdom

09:15h

Grain Size Dependence of Ionic Conductivity in 8YSZ Nanostructured Ceramics for IT-SOFC

Samir Boulfrad, Laurent Dessemond and Elisabeth Djurado
ENSEEG-INP Grenoble, St Martin d'Hères / France

09:30h

The Effects of Transition Metal Oxide Addition to Nano $\text{Ce}_{0.9}\text{Gd}_{0.1}\text{O}_{1.95}$ Powder on the Sinterability and Other Properties for an SOFC Electrolyte

Shin-ichi Hashimoto¹, Yu Liu¹, Masashi Mori¹, Eisaku Suda², Keiichiro Murai³, Takashi Kunimoto⁴ and Toshihiro Moriga³

¹Central Research Institute of Electric Power Industry (CRIEPI), Yokosuka / Japan

²Research and Development Dept., Anan Kasei Co., Ltd., Anan, Tokushima / Japan

³Department of Chemical Science and Technology, U. of Tokushima, Tokushima / Japan

⁴Department of Nano Material and Bio Engineering, Tokushima Bunri U., Sanuki, Kagawa / Japan

09:45h

Oxide Ion Conduction Behaviour in Y-Doped Barium Cerate Electrolyte for SOFCs

Walairat Suksamai¹, Danai Poulidi², Alan Thursfield² and Ian S. Metcalfe²

¹The University of Manchester, Manchester / United Kingdom

²University of Newcastle upon Tyne, Newcastle upon Tyne / United Kingdom

10:00h

Nanocrystalline CGO Thin Film Electrolytes for Micro-Solid Oxide Fuel Cells

Jennifer L. M. Rupp, Anna Infortuna and Ludwig J. Gauckler
Nonmetallic Inorganic Materials, ETH Zürich, Zürich / Switzerland

10:15h

Improved Conductivity of Lanthanide-Doped Ceria with Submicrometer Grain Sizes

Pedro Núñez¹, Domingo Pérez-Coll¹, Jorge R. Frade²

¹Universidad de La Laguna, La Laguna / Spain

²Universidade de Aveiro, CICECO, Aveiro / Portugal

Wednesday, 5 July 2006 – 11:00 – 12:30

Session B06

Cathodes

Chairteam: Mogens Mogensen, Risø, Roskilde / Denmark
Anja Bieberle-Hütter, ETH Zürich / Switzerland

11:00h

***In situ* X-Ray, Electrochemical, and Modeling Investigation of the Oxygen Electrode Activation**

Bilge Yildiz, Kee-Chul Chang, Deborah Myers, J. David Carter and Hoydoo You
Argonne National Laboratory, Argonne, IL / USA

11:15h

Properties of $(Pr_{1-x}Sr_x)CoO_{3-\delta}$ as a Cathode Material for Intermediate Temperature-Operating Solid Oxide Fuel Cell (IT-SOFC)

Jung Hyun Kim and Joongmyeon Bae
Korea Advanced Institute of Science and Technology, Daejeon / Korea

11:30h

Suitability of Nickelate Compounds for SOFC Cathode Applications

Cécile Lalanne¹, Fabrice Mauvy¹, Jean-Marc Bassat¹, Jean-Claude Grenier¹, Philippe Stevens², Gabriele Proserpi³, Jan Van herle³, Stefan Diethelm⁴ and Raphaël Ihringer⁴

¹ICMCB – CNRS, Pessac / France, ²EDF – EifER, Karlsruhe / Germany

³EPFL, LENI, Lausanne, ⁴HTceramix SA, Yverdon-les-Bains / Switzerland

11:45h

Modelling of the Polarization Resistance from Surface Exchange and Diffusion Coefficient Data

Martin Søgaard¹, Peter Vang Hendriksen¹, Torben Jacobsen² and Mogens Mogensen¹

¹Risø National Laboratory, Roskilde / Denmark

²Technical University of Denmark, Lyngby / Denmark

12:00h

Oxygen Exchange Properties of Perovskite-Type Cathode Materials Obtained by Different Techniques

Werner Sitte¹, Edith Bucher¹, Peter Ried², Andreas Mai³ and Frank Tietz³

¹University of Leoben, 8700 Leoben / Austria,

²EMPA, Dübendorf / Switzerland

³FZJülich, IWV-1, Jülich / Germany

12:15h

Fast ¹⁸O Incorporation Paths along the Hetero Phase Boundary with $(La,Sr)CoO_3 / (La,Sr)_2CoO_4$

Maya Sase¹, Florian Hermes¹, Keiji Yashiro¹, Takanori Otake¹, Atsushi Kaimai¹, Tatsuya Kawada¹, Junichiro Mizusaki¹, Natsuko Sakai², Katsuhiko Yamaji², Teruhisa Horita² and Harumi Yokokawa²

¹Tohoku University, Sendai

²AIST, Tsukuba / Japan

Wednesday, 5 July 2006 – 14:00 – 15:30

Session B07

Anodes

Chairteam: Kazunari Sasaki, Kyushu U., Fukuoka / Japan
Gus McEvoy, EPFL Lausanne / Switzerland

14:00h

An Open Circuit Potential Investigation of Methane Oxidation Reaction on $(\text{La}_{0.75}\text{Sr}_{0.25})(\text{Cr}_{0.5}\text{Mn}_{0.5})\text{O}_3$ Anodes

San Ping Jiang¹, Wei Wang¹, Lan Zhang^{1,2}, Yujun Zhang²

¹Nanyang Technological University / Singapore

²School of Materials Science and Engineering, Shandong University, Jinan / China

14:15h

Propane Conversion on Ru/CGO Catalysts for Application in Intermediate Temperature Solid Oxide Fuel Cells

Massimiliano Lo Faro¹, Daniela La Rosa¹, Giuseppe Monforte¹, Antonino Salvatore Aricò¹, Vincenzo Antonucci¹ and Pierluigi Antonucci²

¹CNR-ITAE Institute, Messina / Italy

²University of Reggio Calabria, Reggio Calabria / Italy

14:30h

Towards an Understanding of Ni Anodes in Solid Oxide Fuel Cells: Electrochemical Modeling and Experimental Validation Using Patterned Anodes

Marcel Vogler¹, Wolfgang G. Bessler¹, Jürgen Warnatz¹, Anja Bieberle-Hütter² and Ludwig J. Gauckler²

¹IWR, Universität Heidelberg, Heidelberg / Germany, ²ETH Zürich, Zürich / Switzerland

14:45h

Tubular Solid-Oxide Fuel Cells Using either Anode Recycle or Barrier Layers

Robert J. Kee¹, Huayang Zhu¹ and Scott A. Barnett²

¹Colorado School of Mines, Golden CO / USA

²Northwestern University, Evanston IL / USA

15:00h

SOFC Performance Evaluated by FEM-Modeling of Electrode Microstructures with a Randomly Generated Geometry

Bernd Rüger, André Weber, Daniel Fouquet and Ellen Ivers-Tiffée

Universität Karlsruhe, IWE, Karlsruhe / Germany

15:15h

Electrical, Microstructural Properties and Sulphur Tolerance of Anodes for SOFCs

Aurélie Rolle and John T. S. Irvine

University of St Andrews, St Andrews / United Kingdom

Wednesday, 5 July 2006 – 16:00 – 17:30

Session B08

Interconnects

Chairteam: Willem J. Quadakkers, FZ Jülich / Germany
Anke Hagen, Risø, Roskilde / Denmark

16:00h

Protection of SOFC Interconnects Against Cr-Evaporation Using Atmospheric Plasma-Sprayed Spinel Layers

Maria-Jose Garcia-Vargas¹, Mohsine Zahid², Frank Tietz², Thomas Kiefer^{2,3}, Philippe Stevens¹ and Robert Vaßen²

¹EDF / EIFER European Institute for Energy Research, Karlsruhe / Germany

²FZ Jülich, / Germany

³ErlingKlinger AG, Dettingen (Erms) / Germany

16:15h

Adhesion of Oxide Scales on Stainless Steels SOFC Interconnects Influence of Oxidising Atmosphere

**Somrerck Chandra-ambhorn¹, Frédéric Charlot¹, Yves Wouters¹,
Alain Galerie¹, Laurent Antoni² and François Toscan³**

¹Institut National Polytechnique de Grenoble, Saint Martin d'Hères / France

²CEA, Grenoble / France

³Ugine & ALZ Research Center, Isbergues / France

16:30h

Investigation of TiC-Based Cermets for Solid Oxide Fuel Cell Interconnect Applications

Hua Xie, Rasit Koc and Yukun Pang

Southern Illinois University at Carbondale, Carbondale, IL / USA

16:45h

Development of High Strength Ferritic Steel for Interconnect Application in SOFCs

**Leszek Niewolak¹, Paweł Huczowski¹, Jan Froitzheim¹, Phil J. Ennis¹, Lorenz Singheiser¹,
Willem J. Quadakkers¹ and Heike Hattendorf²**

¹FZ Jülich / Jülich / Germany

²ThyssenKrupp VDM GmbH, Werdohl / Germany

17:00h

Powder-Metallurgical Processing of Interconnect Materials and Components for Stationary and Mobile SOFC Applications

Andreas Venskutonis and Georg Kunschert

Plansee GmbH, Reutte / Austria

17:15h

Chemical Stability of Fe-22Cr Ferritic Alloy Interconnect under SOFC Operation Conditions

**Natsuko Sakai¹, Katsuhiko Yamaji¹, Teruhisa Horita¹, Harumi Yokokawa¹, Toshihiro Uehara², Akihiro
Toji², Harukuni Kameda³, Kei Ogasawara³, Yoshio Matsuzaki³ and Teruhiro Sakurai³**

¹AIST, Tsukuba / Japan

²Hitachi Metals Ltd., Yasugi / Japan

³Tokyo Gas Co., Ltd., Tokyo / Japan

Thursday, 6 July 2006 - 09:00 – 10:30

Session B09

Cell, Stack and System Modeling

Chairteam: Ellen Ivers-Tiffée, U. Karlsruhe / Germany
Jorge Frade, U. Aveiro / Portugal

09:00h

A Parametrical Study of Diesel-Fed Fuel Cell Power Units for Mobile Applications

Pedro Nehter and Wolfgang Winkler
Hamburg University of Applied Sciences, Hamburg / Germany

09:15h

Dynamic Co-Simulation of a Solid Oxide Fuel Cell (SOFC) and the Balance of Plant (BoP) by Combining an SOFC Model with the BoP-Modelling Tool APROS®

Andreas Gubner¹, Jaakko Saarinen², Jukka Ylijoki², Dieter Froning¹, Andrea Kind¹, Matias Halinen²,
Matti Noponen² and Jari Kiviaho²

¹IWV-3, FZ Jülich / Germany

²VTT, Espoo / Finland

09:30h

Numerical Simulation of Single-Chamber SOFC

Yong Hao¹, David Goodwin¹, Sossina Haile², Zongping Shao²

¹Mechanical Engineering, California Institute of Technology, Pasadena, CA / USA

²Materials Science, California Institute of Technology, Pasadena, CA / USA

09:45h

FE-Simulations of a Complete SOFC-System (Stack plus Thermal Insulation) for Optimizing its Thermal Behavior

Thomas Hocker¹, Reto Flückiger², Jeannette Clifford³, Thomas Zähringer⁴ and Alexander Schuler⁵

¹ZHW Winterthur / Switzerland

²Paul Scherrer Institut, Villigen / Switzerland

³Sika AG, Baar / Switzerland

⁴HTceramix SA, Yverdon les Bains /Switzerland

⁵Hexis AG, Wintherthur / Switzerland

10:00h

Technical and Economic Modeling of Biogas-Fuelled Solid Oxide Fuel Cell Systems

Brant A. Peppley, Kunal Karan, Scott L. Kennedy, Ian R. Wheeldon, Christopher P. Thurgood
and Christopher P. Thurgood

Queen's U. at Kingston / Canada

10:15h

Modelling Support for the Development of a 1MW SOFC System at Rolls-Royce Fuel Cell Systems

Rowland P. Travis¹, Cristiano Balestrino¹, Robert Hill¹ and Davide Bernardi²

¹Rolls-Royce Fuel Cell Systems Limited, Loughborough / United Kingdom

²University of Genoa / Italy

Thursday, 6 July 2006 – 11:00 – 12:30

Session B10

Durability and Integrity

Chairteam: Karl Föger, Ceramic Fuel Cells Ltd., Noble Park / Australia
Peter Holtappels, EMPA, Dübendorf / Switzerland

11:00h

Integrity Assessment of Ceramic Sealing Joints

Jochen Hebel¹, Wilfried Becker¹, L. G. J. (Bert) de Haart², Andreas Gubner² and Rolf W. Steinbrech²

¹TU Darmstadt / Germany, ²IWV-1, FZ Jülich / Germany

11:15h

Solid State Reactions between Electrodes and Alumina Containing 10YSZ Electrolytes

Jon Love, Sudath Amarasinghe, Raj Ratnaraj and Xiao Zheng

Ceramic Fuel Cells Limited, Noble Park / Australia

11:30h

Objectives in Anode-Supported Cell (ASC) Development and Critical Aspects for Large-Scale Production - A Manufacturer Point of View

Stefan Stolz, Johannes Ernst and Jürgen Ruska

CeramTec AG, Marktrechwitz / Germany

11:45h

Studies of Material Interaction after Long-Term Stack Operation

Norbert H. Menzler, Peter Batfalsky, Ludger Blum, Martin Bram, Sonja M. Groß, Vincent A. C.

Haanappel, Jürgen Malzbender, Vladimir Shemet, Rolf W. Steinbrech and Ico Vinke

FZ Jülich / Germany

12:00h

Long-Term Stability of Ferritic Alloys for APU Application

Stefan Megel¹, Michael Kusnezoff¹, Viktor Sauchuk¹ and Andreas Reinert²

¹Fraunhofer IKTS, ²Staxera GmbH, Dresden / Germany

12:15h

Anode Supported Solid Oxide Fuel Cells Running on Coke Oven Gas (COG)

Piero Lunghi¹, Roberto Bove¹, Alessandro Corradetti¹, Matteo Dozzini¹, Nam Woong Cho²

¹University of Perugia, Perugia / Italy

²Research Institute of Industrial Science & Technology (RIST), Pohang / South Korea

Thursday, 6 July 2006 – 14:00 – 15:30

Session B11

Fuels and Fuel Issues

Chairteam: Stephen Pyke, Rolls Royce Fuel Cells / United Kingdom
Stephan Köhne, Oel-Wärme-Institut, Herzogenrath / Germany

14:00h

Fuel Impurity Tolerance of Solid Oxide Fuel Cells

Kazunari Sasaki^{1,2}, Katsushi Susuki², Akira Iyoshi², Shuuichi Adachi², Masanobu Uchimura², Naofumi Imamura², Yuusuke Shiratori¹, Hajime Kusaba² and Yasutake Teraoka²

¹Faculty of Engineering, Kyushu U., Fukuoka / Japan

²Interdisciplinary Engineering Sciences, Kyushu U., Fukuoka / Japan

14:15h

SOFC Performance Comparison for Internal Methanol and Methane Conversion

Karin Liegl, Korbinian Spies and Thomas Sattelmayer

Technische Universität München, Garching / Germany

14:30h

Solid Oxide Fuel Cell Operated under Bio-Gas: Simulation and Experimentation

Kelly Girona¹, Jérôme Laurencin¹, Bertrand Morel¹, Marie Petitjean¹,

Yann Bultel² and Florence Lefebvre-Joud¹

¹LITEN/DTH/LEV, CEA Grenoble / France

²LEPMI, CNRS-INPG-UJF, ENSEEG, Saint Martin d'Hères / France

14:45h

Conversion of Simulated Biogas in an SOFC: The Effect of Organic Components

Nico Dekker, Jan Pieter Ouweltjes, Simon Linnekamp and Bert Rietveld

ECN, Petten / The Netherlands

15:00h

Direct Feeding of Liquid Hydrocarbon Fuels to Ni-ScSZ Anode

Haruo Kishimoto, Katsuhiko Yamaji, Teruhisa Horita, Yueping Xiong, Natsuko Sakai, Manuel E. Brito and Harumi Yokokawa

AIST, Tsukuba / Japan

15:15h

Tests of a Portable SOFC Generator with Methanol

Beat Gut and Ulf Bossel

Fucellco AG, Mägenwil / Switzerland

Thursday, 6 July 2006 – 16:00 – 17:30

Session B12

Poster Session