Solid-State Chemistry of Inorganic Materials VIII
MATERIALS RESEARCH SOCIETY
SYMPОSIUM PROCEEDINGS VOLUME 1309

Solid-State Chemistry of Inorganic Materials VIII

Symposium held November 29–December 3, Boston, Massachusetts, U.S.A.

EDITORS

P. Shiv Halasyamani
University of Houston
Houston, Texas, U.S.A.

Simon J. Clarke
University of Oxford
Oxford, United Kingdom

David G. Mandrus
The University of Tennessee
Knoxville, Tennessee, U.S.A.

Kyoung-Shin Choi
Purdue University
West Lafayette, Indiana, U.S.A.
CONTENTS

Preface ................................................................. ix

Materials Research Society Symposium Proceedings ................. xi

NOVEL SYNTHETIC METHODS

Superconducting Parent Compound Pr$_2$CuO$_4$ Achieved by Special Post-reduction ........................................... 3
Hideki Yamamoto, Osamu Matsumoto, Keitaro Yamagami, Michio Naito, and Yoshiharu Krockenberger

Controlled Hydrothermal Synthesis of Complex Mixed Oxides Using Solution Redox Chemistry ......................... 9
Richard I. Walton, Kripasindhu Sardar, Helen Y. Playford, Deena R. Modeshia, Richard J. Darton, Janet Fisher, and David Thompsett

Building 3D Materials from Adjustable 2D-units; Towards the Design of New Bi-based Compounds ......................... 15
M. Colmont, D. Endara, M. Huvé, S.V. Krivovichev, and O. Mentre

POSTER SESSION: SOLID STATE CHEMISTRY OF INORGANIC MATERIALS VIII

Growth of Ruthenium and Ruthenium Oxide Nanoplates ............... 23
Lamartine Meda and Geoffrey D. Stevens

Synthesis of Layered Titanate Micro/Nano-materials for Efficient Pollutant Treatment in Aqueous Media .................... 27
Y.X. Tang, Y.K. Lai, D.G. Gong, Zhili Dong, and Z. Chen

Thermodynamic Aspects of Transition Metals Doped ZnO .......... 33
David Sedmidubský, Zdeněk Sofer, Stěpán Huber, and Jindřich Leitner
What is the True Nature of Conducting Proton in Perovskite Ceramic Membrane: Hydroxyl Ion or Interstitial Proton? .......... 39
Aneta Slodczyk, Philippe Colomban, Oumaya Zaafrani, Olivier Lacroix, Johan Loricourt, Frederic Grasset, and Beatrice Sala

Thermodynamics of Oxygen Chemistry on PbTiO₃ and LaMnO₃ (001) Surfaces ....................... 45
Ghanshyam Pilania and R. Ramprasad

The Effect of Boron on Processing and Phosphorescence Behavior of SrAl₄O₇ (SA₂) Co-doped with Eu²⁺ and Dy³⁺ ............... 51
Murat G. Eskin, Hasan Kurt, Mehmet Ali Gulgun, and Cleva W. Ow-Yang

pO₂ stability of Ba₀.₅Sr₀.₅Co₀.₈Fe₀.₂O₃−δ ......................................... 57
Stefan F. Wagner, Simon Taufall, Christian Niedrig, Holger Götz, Wolfgang Menesklou, Stefan Baumann, and Ellen Ivers-Tiffée

THERMOELECTRICS AND RELATED MATERIALS

* Thermoelectric Properties of New Thallium Tellurides ............... 67
Cheriyyedath Raj Sankar, Savitree Bangarigadu-Sanasy, and Holger Kleinke

POSTER SESSION: SOLID STATE INORGANIC MATERIALS CHEMISTRY - VIII

DLC-coated Substrate for Infrared Absorption Spectroscopy in Supercritical Water ............... 79
Takuji Ube and Takashi Ishiguro

Two-step Sintering Process for Lutetium Oxide Transparent Ceramics ........................................ 85
Xiaomei Guo, Kewen K. Li, Yanyun Wang, Yingyin K. Zou, and Hua Jiang

Low Temperature Phase Diagram of NH₃BH₃ .................................... 91
Bertil Sundqvist, Ove Andersson, Issam Quwar, and Alexandr Talyzin

*Invited Paper
Growth and Characterization of Shape-controlled Single Crystals by a Micro-pulling-down Method .......................................................... 97
Yuui Yokota, Hidehiko Tanaka, Masato Sato, Valery Chani, Kazushige Tota, Ko Onodera, Takayuki Yanagida, and Akira Yoshikawa

Correlation between Deep-Level Defects and Current Collapses in AlGaN/GaN Heterostructures Probed by Steady-State Photo-Capacitance Spectroscopy .................................................. 101
Yoshitaka Nakano, Yoshihiro Irokawa, Yasunobu Sumida, Shuichi Yagi, and Hiroji Kawai

Deep-Level Characterization of Free-Standing HVPE-grown GaN Substrates Using Transparent Conductive Polyaniline Schottky Contacts .................................................. 107
Yoshitaka Nakano, Nobuyuki Matsuki, Mickael Lozac’h, Kauaki Sakoda, and Masatomo Sumiya

Hydrogen Atom Adsorption on Aluminum Clusters: An Electronic Structures Density Functional Study .................. 113
Phung Thi Viet Bac and Hiroshi Ogawa

Synthesis and Characterization of Indium Oxide-doped Hematite $\text{xIn}_2\text{O}_3(1-\text{x})\alpha-\text{Fe}_2\text{O}_3$ Solid Solution ...................... 119
Monica Sorescu, Tianhong Xu, and Lucian Diamandescu

Periodically Ordered Mesoporous Co$_3$O$_4$/Heteropoly Acid Composite Frameworks for Catalytic Applications .................. 125
Gerasimos S. Armatas, Ioannis Tamiolakis, and Dimitris E. Petrakis

Preparation of Protonated Titanate Nanotube Films with an Extremely Large Wetting Contrast .................. 133
Y.K. Lai, Y.X. Tang, D.G. Gong, J.J. Gong, Y.C. Chen, C.J. Lin, and Z. Chen

WIDE-BAND-GAP SEMICONDUCTORS AND CATALYTIC MATERIALS

A DFT and HRTEM Study on MoS$_2$/Co: Locating Promoters in Catalytic Nanostructures .......................... 141
Manuel Ramos, Gilles Berhault, Jose Rurik Farias, Jose Trinidad Elizalde, Domingo Ferrer, Brenda Torres, and R.R. Chianelli
POROUS MATERIALS AND METAL-ORGANIC FRAMEWORKS

Covalently Interconnected and Separated Vanadosilicate Shells ....... 151
Xiqu Wang, Lumei Liu, and Allan J. Jacobson

Author Index ............................................................. 157

Subject Index............................................................. 159
PREFACE

Symposium EE, “Solid-State Chemistry of Inorganic Materials VIII,” was held Nov. 29–Dec. 3 at the 2010 MRS Fall Meeting in Boston, Massachusetts. Solid-state chemistry is a truly interdisciplinary field, attracting investigators from chemistry, condensed-matter physics, materials science engineering, ceramics, metallurgy, chemical engineering, and mineralogy/geology, to name but a few. Solid-state chemistry encompasses synthesis of new materials, preparation of materials in new forms (nanocrystalline, thin-film heterostructures, porous, etc.), investigations of the relationships between composition, structure and properties, as well as the application of cutting-edge characterization methods. The scope and importance of solid-state chemistry has grown not only with the discovery of new materials but also through the advancement of techniques for preparing and studying them, and in advanced computational predictions for structures and properties. Our knowledge of the diverse properties of solids continues to expand. The intent of the symposium was to provide researchers from academics, government, and industrial laboratories an interdisciplinary forum for interaction, discussion, and exchange of ideas on recent fundamental advances in Solid-State Chemistry and their impact on the development and application of inorganic materials.

Important topics that were covered in this symposium included:

- Synthetic methods for new and novel materials.
- Structure-property-theory relationships
- Crystal chemistry, including incommensurate structures
- New computational and theoretical methods in solid-state materials
- Battery, fuel cell, and materials for energy
- Dielectric and multiferroic materials
- Microporous and nanostructural materials
- Novel magnetic, optical and electronic properties

The organizers thank the National Science Foundation – Division of Materials Research (DMR-1041307), The University of Houston, and Materials Research Society for financial support.

P. Shiv Halasyamani
Simon J. Clarke
David G. Mandrus
Kyoung-Shin Choi

February 2011