# **ADVANCES IN ECOMATERIALS**

7th International Conference on Ecomaterials (ICEM7)
3rd International Conference on Advanced Materials (ICMAT2005)

## Volume 2

EDITORS
Tim White
Cristiano Ferraris
Liya Yu
Kohmei Halada
Osamu Umezawa



Singapore London New Jersey Chennai

Published by

Stallion Press (S) Pte Ltd 5 Toh Tuck Link Singapore 596224

INDIA office: No. 16, South West Boag Road, T. Nagar, Chennai 600017, INDIA

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

Advances in Ecomaterials – 7th International Conference on Ecomaterials (ICEM7) and 3rd International Conference on Advanced Materials (ICMAT 2005)

Copyright © 2005 by Stallion Press (S) Pte Ltd

All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the publisher.

For photocopying of materials in this volume, please pay a copying fee through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA. In this case permission to photocopy is not required from the publisher.

ISBN 981-05-3611-9

## Contents

## **VOLUME 1**

### **ELECTROCHEMISTRY AND CATALYSIS**

Developing an Apatite for Fuel Cells P.R. Slater, J.R. Tolchard, J.E.H. Sansom and M.S. Islam	
Cyclic Properties of Hydrogen Absorbing Alloys Hideaki Itoh, Hironobu Arashima, Tomohiro Ueno, Takaaki Miyaki, Toshiki Kabutomori and Keizo Ohnishi	,
Mineralization of Reactive Dye-Black B by Fenton, Electro-Fenton and Photo-Fenton  Yi-Fong Huang, Po-Shun Chang, Yao-Hui Huang and Chih-Yung Chen	2
Photocatalytic $H_2$ Evoution over a New Series of Photocatalysts $ln_{12}NiM_2$ $Tl_{10}O_{42}$ ( $M$ = $Al$ , $Cr$ , $Ga$ ) under Visible Light Irradiation Defa Wang, Zhigang Zou and Jinhua Ye	2
Structural Characterisation of Nanophase Titania Photocatalysts Ian Grey, Ian Madsen, Pierre Bordet, Nick Wilson and Christina Li	3
Synthesis of Titanium Dioxide-Bentonite Nanocomposite by Using Indonesian Natural Bentonite as Raw Material and Its Application for Degradation of Methyl Orange under Solar Light Irradiation Yateman Arryanto, Indriana Kartini, Thio Kay Hok, Luke Matthew, G.O. Lu and Hisao Yoshida	4
A Novel Calcium-Ferrite Based Catalyst for Propylene Oxidation Daisuke Hirabayashi, Takeshi Yoshikawa, Kazuhiro Mochizuki, Yoshihiro Kojima and Kenzi Suzuki	4
Influence of Micro-Structural Features on Conducting Properties in Nano-Structured $M_x Ce_{1-x} O_{2-x/2}$ (M: Sm, Gd, or Dy, x=0.1-0.25) Compounds for Fuel Cell Application Toshiyuki Mori, Ding-Rong Ou, Fel Ye, Richard Buchanan, Yarong Wang and John	5
Drennan	
Properties of TiO <sub>2</sub> Functionally Graded Material Fabricated by Vacuum Filtration and Compression  Yoshihisa Uchida, Shuntaro Higa, Yoshiyuki Uchida and Niichi Hayashi	6
	7
Application of TiO₂ Photocatalyst in Water Treatment  Jong-Ho Kim, Kyong Ju Na, Gon Seo, Dong-Lyun Cho, Byung-Chul Choi,  Jong-Beom Kim, Sun-Jung Song, Sang-Mi Lee, Hee-Ju Park and Geon-Joong Kim	,
Ammonia Decomposition Catalyst with Resistance to Coexisting Sulfur Compounds Shigeyuki Uemiya, Masayuki Uchida, Hiroshi Moritomi, Ryo Yoshile and Makoto Nishimura	7

### iv Advances in Ecomaterials

Photocatalytic Decomposition of Gaseous Organic Compounds over $ABi_2Nb_5O_1$ (A=Na, K, Rb, and Cs) Tetsuya Kako, Zhigang Zou and Jinhua Ye	6 86
Zincoaluminophosphate ZnAPO-5: Synthesis by Dry-Gel Conversion Methods an Catalytic Properties in the Isopropylation of Biphenyl Shyarnal Kurnar Saha, Suresh B. Waghmode, Hiroyoshi Maekawa, Yoshihiro Kubota, Yoshihiro Sugi and Sung June Cho	d 92
Evaluation of Nanoporous Aluminum Silicate Including Active Oxygen Species K. Mochizuki, D. Hirabayashi, Y. Kojima and K. Suzuki	100
Comparison of Stability for Two Crystal Structures of $\rm Zr_7Ni_{10}$ Metal and Hydroge Solid Solution Takuya Kishida and Hiroyuki T. Takeshita	n 105
PROCESSES FOR R	ECYCLING
A New Method of Recycling Textile Goods  Ali Akbar Merati and Masaaki Okamura	115
Changes in Lead Silicate Cathode-Ray Tube Glasses François Méar, Pascal Yot, Martine Cambon and Michel Ribes	122
Glass-Ceramics Prepared from Sludge Generated by a Water Purification Plant Aiko Nakamura, Tomohiro Toya, Yoshikazu Kameshima, Akira Nakajima and Kiyoshi Okada	130
Effect of Irradiation Conditions on Aluminum Alloy Sorting by Using Nd: YAG Lase Hiroshi Nishikawa, Kouhei Seo, Seiji Katayama and Tadashi Takemoto	er 135
Removal of Lead from Aqueous Effluents by Adsorption on Coconut Shell Carbo M. Chandra Sekhar	n 142
Recovery of Non-Renewable Resources from Waste Franz-Georg Simon, Christian Adam, Burkart Adamczyk and Karin Weimann	148
Effects of Seeding on Synthesis of MCM-22 (MWW) by Dry-Gel Conversion (DGC Method Shyamal Kumar Saha, Yoshihiro Kubota and Yoshihiro Sugi	156
Study on the Treatment of Heavy Metal Solution by Adsorption of an Industria Waste Iron Oxide Material (BL adsorbent) L.C. Su, C.P. Huang, Y.H. Huang and C.Y. Chen	al 163
Water Absorpsion as a Tool for Evaluating the Fiber-Matrix Interaction in Composites  Bibin Mathew Cherian, Sherly A. Paul and Sabu Thomas	173
Preparation of Eu <sup>2+</sup> and Dy <sup>3+</sup> Co-Doped Strontium Aluminate (SrAl <sub>2</sub> O <sub>4</sub> ) Phosphors by Spark-Plasma Sintering Kazuhiro Hasezaki, Gen-yo Kaneko, Hiroshi Araki, Chika Yoshida, Hirovuki Kitagawa and Yasutoshi Noda	184
I moyuki khagawa and fasulosiii 1400a	189

#### Advances in Ecomaterials v

Recycling Technologies for Glass-Fiber-Reinforced Polycarbonate Used in Notebook Computers Takamitsu Nakamura, Koichi Kimura, Yuzo Horikoshi and Kouta Nishii	196
Removal of Lead from Copper Alloy Scrap by Compound-Separation Method Atsushi Nakano, Nurul Taufiqu Rochman and Hidekazu Sueyoshi	200
ENVIRONMENTAL IM	<b>IPACT</b>
SEM and TEM Characterization of Particulates Emitted during Coal and Tire Combustion Reto Gieré, Huijun Li, Katherine Smith and Mark Blackford	209
Separation of Toxic Chlorophenols from Its Aqueous Solution by IPN Membrane Pervaporation Swatilekha Das, Ajit K. Banthia and Basudam Adhikari	216
Addressing the Potential Environmental and Human Health Impact of Engineered Nanomaterials Andrew D. Maynard and Eileen D. Kuempel	222
Eco-Friendly Functional Nanoparticles K. Manzoor, V. Aditya, S.R. Vadera, N. Kumar and T.R.N. Kutty	232
Nanotechnology from the Viewpoint of Ecomaterial Kohmei Halada, Kotaro Kuroda and Masahiro Takemura	238
Reliability of Solder Joint with Sn-Ag-Cu-Ni-Ge Lead-Free Alloy under Heat Exposure Conditions Ikuo Shohji, Satoshi Tsunoda, Hirohiko Watanabe, Tatsuhiko Asai and Megumi Nagano	248
Drag Reduction of Thermal Transportation System Using Functional Fluids Masaya Kumada	255
Environmental Perspective of Lead-Free Copper Alloys Products Manufacturing System Using Scrap Atsushi Nakano, Nurul Taufiqu Rochman and Hidekazu Sueyoshi	262
ECO-FUN	CTION
Deformation Characteristics at Elevated Temperature in Recycled AZ91 Magnesium Alloy by Solid State Recycling Lee Jae-Seol, Yasumasa Chino and Mamoru Mabuchi	271
Dynamic Properties of Starch-Based Biodegradable Foams B. Wang, J. Song, Y. Wang and Y. Gao	277
Upgrade Recycling of AZ31 Mg Alloy Machined Chips by Solid State Recycling with High Extrusion Ratio  Yasumasa Chino, Lee Jae-Seol and Mamoru Mabuchi	283
Kenaf Fiber-Reinforced Polylactic Acid Used for Electronic Products Shin Serizawa, Kazuhiko Inoue and Masatoshi Iji	290

### vi Advances in Ecomaterials

Fabrication and Piezoelectric Properties of [Bi <sub>0.5</sub> (Na <sub>1-x-y-z</sub> K <sub>x</sub> Li <sub>y</sub> Ag <sub>z</sub> ) <sub>0.5</sub> TiO <sub>3</sub> Lead-Free Piezoelectric Ceramics Dunmin Lin, Dingquan Xiao, Jianguo Zhu and Ping Yu	296
Adsorption Properties of Woodceramics Riko Ozao, Toshihiro Okabe, Tadashi Arii, Yuko Nishimoto, Yan Cao, Nathan Whitely and Wei-Ping Pan	302
Influence of an Immersion Gold Plating Layer on Reliability of a Lead-Free Solder Joint Ikuo Shohji, Hiroki Goto, Kiyotomo Nakamura and Toshikazu Ookubo	309
Synthesis and Characterization of Periodic Copolymers from Succinate, 1,4-Butanediol, and 1,4-Diaminobutane Hideki Abe, Hiroaki Tetsuka and Yoshiharu Doi	316

(Continued to Volume 2)

### Advances in Ecomaterials vii

## **VOLUME 2**

### ECO-FUNCTION (Continued from Volume 1)

Flame Retardancy of Novel Clay Nanocomposites Hitoshi Nishizawa, Masayuki Okoshi and Naoto Okubo	322
Surface Structure of Woodceramics Manufactured from Cedar Yutaka Sawada, Sachiko Sezaki, Riko Ozao, Yuko Nishimoto, Toshihiro Okabe, Mieko Ide and Azusa Shida	328
High Speed Twin Roll Casting of Aluminum Alloy Thin Strips Containing Fe as Impurity Toshio Haga, Masaaki Ikawa, Hisaki Watari and Shinji Kumai	333
Flame-Retarding Epoxy-Laminate-Type Printed Wiring Board with No Halogen and Phosphorus Compounds  Yukihiro Kiuchi, Masatoshi Iji, Hiroaki Nagashima and Takashi Miwa	341
Comparison of Immersion Gold Plating in Reliability of a Lead-Free Solder Joint with Autocatalytic Electroless Gold Plating Kiyotomo Nakamura, Ikuo Shohji, Hiroki Goto and Toshikazu Ookubo	347
Japanese Ecomaterials in Recent Several Years through Web-Sites Survey Katsutoshi Yamada, Kohmei Halada and Kiyoshi Ijima	354
Novel Ecology-Friendly Flame Retardant Systems for Aromatic Vinyl Polymers Masanao Kawabe, Takashi Matsuda, Makoto Himeno, Yasuji Shichijo, Masahiro Shimoda, Hiroyuki Yano, Syuhei Namekawa and Isamu Akiba	360
Standard Gibbs Energies of Formation of the Mg–Zn Binary Compounds Determined by Solution Calorimetry and Measurement of Heat Capacity from Near Absolute Zero Kelvin Masao Morishita and Koichiro Koyama	368
Sustainable Circulation of Lignocellulosics Through the Phase-Separation System M. Funaoka, Y. Nagamatsu, K. Mikame, E. Ohmae and M. Aoyagi	375
Isothermal Fatigue Properties of Lead-Free Solder Alloy Evaluated by Miniature Size Specimen Yoshiharu Kariya and Tadatomo Suga	382
Innovative Reuse of Agricultural Wastes as Industrial Raw Materials to Form Magnesium Composites Katsutoshi Kondoh, Hideki Oginuma, Junko Umeda, Yoshinari Oki and Takateru Umeda	389
Geometrical Aspects of the Crystal Chemistry of Apatite: An Analysis of Calcium-Lead Fluoro-Vanadinites  Patrick H.J. Mercier, Pamela S. Whitfield, Lyndon D. Mitchell, Isobel J. Davidson, Yvon Le Page and Timothy J. White	396
Effects of Boron and Phosphorus on Surface Hot Shortness in Steels Containing Copper and Tin Chihiro Nagasaki and Koji Shibata	402

### viii Advances in Ecomaterials

Properties of Cast Magnesium Alloy by Horizontal Strip Casting Process Hisaki Watari, Toshio Haga, Keith Davey and Nobuhiro Koga	410
Compressive Properties of Porous Aluminum Fabricated at Various Conditions by the Spacer Method  Masataka Hakamada, Tatsuho Nomura, Tetsumune Kuromura, Yasuo Yamada and Mamoru Mabuchi	419
Luminescent Properties and Preparation of Fine-Grain Blue-Emitting Phosphor CaAl <sub>2</sub> O <sub>4</sub> : Eu <sup>2+</sup> for Color PDP Yuan Ximing, Yang Yingguo, Wang Yongqian, Wang Hongmei, Zhang Jihong, Hu Xiaohua and Pang Ming	427
Nanocomposites Based on Poly(butylene adipate-co-terephthalate) and Montmorillonite Mitsuhiro Shibata and Yoshihiro Someya	434
Production of 3-Dimensional Powder Laminating Fabrication to Metallic Components Kazumi Minagawa, Hideki Kakisawa, Susumu Takamori, Yoshiaki Osawa, Katuhiro Maekawa and Kohmei Halada	441
Isora Fibres: An Effective Reinforcement for Eco Friendly Composites Morphology, Surface Modification, Thermal and Mechanical Properties Lovely Mathew, Joseph K.U. and Rani Joseph	449
High Thermoelectric Properties of PbTe with Sb <sub>2</sub> Te <sub>3</sub> as Dopants Pinwen Zhu, Yoshio Imai, Yukihiro Isoda, Yoshikazi Shinohara, Xiaopeng Jia and Guangtian Zou	455
Temperature Dependence of Young's Modulus and Internal Friction in Sn-8Zn-3Bi and Sn-9Zn Alloys of Lead-Free Solders  Mohd. Redzuan Jamaludin and Teruaki Ono	462
Energy Absorption and Cushing Behaviour of Foam-Filled Aluminium Tubes Yasuo Yamada, Takumi Banno, Zhenkai Xie and Cui'e Wen	468
Woodceramic Heating Elements for Low Temperature Heating Junichiro Tsuji, Riko Ozao, Toshihiro Okabe, Toshikazu Suda and Ryouichi Yamamoto	474
Mechanical Properties of Thermomechanical Treated Hyper-Eutectic Al-Si-X Materials  Osamu Umezawa, Yoshiaki Osawa and Susumu Takamori	480
Surface Modification of Aluminum Alloyed Cast Iron Susumu Takamori, Hideki Kakisawa, Kazumi Minagawa, Yoshiaki Osawa and Kohmei Halada	485
Manufacture of Low-Density Boards from Wood Elements Obtained by the Water Vapor Explosion Process Yasushi Hiramatsu, Atsushi Miyatake and Kenta Shindo	494
Nondestructive Evaluation of Strength Performances for Finger-Jointed Wood Using Flexural Vibration Techniques Hee-Seop Byeon, Seung-Won Oh and Han-Min Park	499

#### Application of Fine Metal Powder to Rapid Tooling Process for Obtaining Dense P/M Products H. Kakisawa, K. Minagawa, S. Takamomi, Y. Osawa and K. Halada Improvement of Mechanical Properties of Recycled CFRP Reinforced by Thin 512 CF/PP Sheets Hiroaki Zushi, Dai Shiozawa, Isamu Ohsawa, Kiyoshi Uzawa and Jun Takahashi Fabrication Process for Controlling of the Solidification Structure for Recycling 520 Y. Osawa, S. Takamori, K. Minagawa, H. Kakisawa and K. Halada Fabrication of a Porous Alumina-Spinel Body through a Direct Polythiophene 529 Minoru Hashiba, Akinobu Harada, Naoki Adachi, Seizo Obata, Osamu Sakurada and Koichi Hiramatsu Effect of Electrolytic Conditions on Thermoelectric Properties of Polythiophene 536 Yoshikazu Shinohara, Kentaro Hiraishi, Hachiro Nakanishi, Yoshio Imai and Yukihiro Isoda **ENVIRONMENTAL DESIGN AND ASSESSMENT** Alternative Energy Technology: An Overview of Renewable Energy - Solar, Wind, and Biomass Zach Platsis, Jerry Ku and K. Y. Simon Ng Simulation and Prototype Development of a Closed-Loop Manufacturing System 549 for Realizing Inverse Manufacturing Shinsuke Kondoh, Masayuki Soma, Yoshihito Nishikiori and Yasushi Umeda Conceptual Design of Super Environment-Conscious Intelligient Composites 556 Incorporated with Life-Cycle Program of Self-Repair and Self-Collapse and Application for Environment-Consicous Interior Planning in Buildings Toshio Fukushima Comparison between Eco-Profiles of Innovative PA-CVD and Traditional Galvanic 563 B. DeBenedetti, S. Grassini and L. Maffia Factor X on Home Appliances at a Household Level in Japan: Study on the 568 Improvement of Resource Factor X Based, on this Study Taeko Aoe Life-Cycle Assessment of LSI Packaging Material Made from Bio-Based Polymer 576 Yuzo Horikoshi, Takafumi Hashitani, Kenichi Yazaki and Yukio Ando DfE Approach for Industrial Machinery - Identifying the Environmental Requirement 581 on QFDE Keijiro Masui, Kazuhiko Kaneko and Tomohiko Sakao Waste Input-Output Material Flow Analysis of Metals 586 Shinichiro Nakamura and Kenichi Nakajima Material-Lease Recycling: Proposal of New Shift of Global Material Flow 591 Kohmei Halada, Takashi Nakamura, Toru Morioka, Eiji Hosoda and Ryoichi Yamamoto

Advances in Ecomaterials ix

#### x Advances in Ecomaterials

Properties of Composite Boards Made of Sawdust and Rice Husk Seung Won Oh and Hee Seop Byeon	603
LCA Evaluation of Longevity and Recyclability of Materials in Eco-Design Hong Nguyen, Tomonori Honda and Ryoichi Yamamoto	608
Quantitative Evaluation of Recyclability of Materials for Material Selection Hong X. Nguyen, Tomonori Honda and Ryoichi Yamamoto	615
New Trend of Material Flow in the Era of Globalization Masanori Simada, Kiyoshi Ijima, Yasushi Sawatani, Kenichi Nakajima, Tetsuya Nagasaka, Takafumi Tsukihashi, Yuich Moriguchi and Kohmei Halada	620
Structural Analysis and LCA of Lightened Buses by Carbon Fiber Reinforced Plastics Tetsuya Suzuki, Mitsuharu Kan, Michitaka Yamamoto, Kiyoshi Uzawa, Jun Takahashi and Jun-ichi Kasai	634
Authors Index	A-I