

GREEN PROCESSING AND SYNTHESIS

EDITOR-IN-CHIEF

Volker Hessel

Department of Chemical Engineering and Chemistry
Eindhoven University of Technology, The Netherlands

EDITORS

Galip Akay

Formerly School of Chemical Engineering and Advanced Materials
Newcastle University, UK

Isabel Arends

Biocatalysis and Organic Chemistry, Department of Biotechnology
Delft University of Technology, The Netherlands

Michael C. Cann

Environmental Science at Chemistry Department
University of Scranton, USA

Yi Cheng

Beijing Key Laboratory of Green Reaction Engineering and Technology
Tsinghua University Beijing, China

Giancarlo Cravotto

Organic Chemistry
University of Torino, Italy

Dana Kralisch

Institute for Technical Chemistry and Environmental Chemistry
Friedrich Schiller University Jena, Germany

Krishna D. P. Nigam

Department of Chemical Engineering
Institute of Technology Delhi, India

Basu Saha

Engineering, Science and The Built Environment, Department of Applied Science
London South Bank University, UK

Christophe A. Serra

Laboratory of Polymer Engineering for High Technologies
University of Strasbourg, France

Wei Zhang

Boston Center for Green Chemistry
University of Massachusetts Boston, USA

DE GRUYTER

ABSTRACTED/INDEXED IN Celdes, Chemical Abstracts Service (CAS), CNKI Scholar (China National Knowledge Infrastructure), CNPIEC, EBSCO Discovery Service, EBSCO TOC Premier, GeoArchive, Google Scholar, J-Gate, Naviga (Softweco), Paperbase, Pirabase, Polymer Library, Primo Central (ExLibris), Summon (Serials Solutions/ProQuest), TDOne (TDNet), TEMA Technik und Management, Thomson Reuters: Science Citation Index Expanded, Ulrich's Periodicals Directory/ulrichsweb, WorldCat (OCLC)

The publisher, together with the authors and editors, has taken great pains to ensure that all information presented in this work (programs, applications, amounts, dosages, etc.) reflects the standard of knowledge at the time of publication. Despite careful manuscript preparation and proof correction, errors can nevertheless occur. Authors, editors and publisher disclaim all responsibility for any errors or omissions of liability for the results obtained from use of the information, or parts thereof, contained in this work.

The citation of registered names, trade names, trademarks, etc. in this work does not imply, even in the absence of a specific statement, that such names are exempt from laws and regulations protecting trademarks etc. and therefore free for general use.

ISSN 2191-9542 · e-ISSN 2191-9550

All information regarding notes for contributors, subscriptions, Open access, back volumes and orders is available online at www.degruyter.com/gps

RESPONSIBLE EDITOR Prof. Volker Hessel, Micro Flow Chemistry and Process Technology Group, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, Den Dolech 2, 5600 MB Eindhoven, The Netherlands, Tel.: +31-40-247 2973, Email: v.hessel@tue.nl

ASSISTANT MANAGING EDITOR Jannelies Smit, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, Den Dolech 2, 5600 MB Eindhoven, The Netherlands, Tel.: +31-40-247 5280, Email: ST-GPS@tue.nl

JOURNAL MANAGER Dr. Gunda Stöber, De Gruyter, Genthiner Straße 13, 10785 Berlin, Germany, Tel.: +49 (0)30 260 05-279, Fax: +49 (0)30 260 05-298, Email: gps.editorial@degruyter.com

RESPONSIBLE FOR ADVERTISEMENTS Panagiota Herbrand, De Gruyter, Rosenheimer Str. 143, 81671 München, Germany, Tel.: +49 (0)89 76902-394, Fax: +49 (0)89 76902-350, E-Mail: panagiota.herbrand@degruyter.com

© 2014 Walter de Gruyter GmbH, Berlin/Boston

TYPESETTING Compuscript Ltd., Shannon, Ireland

PRINTING Franz X. Stücker Druck und Verlag e.K., Ettenheim
Printed in Germany



Contents

Editorial

Volker Hessel

Megatrends – megascience? Part 2 — 187

Feature

Jan Harmsen

Novel sustainable industrial processes: from idea to commercial scale implementation — 189

Original articles

Joana Lima-Ramos, Pär Tufvesson and John M. Woodley
Application of environmental and economic metrics to guide the development of biocatalytic processes — 195

Haibao Zhang, Tengfei Cao and Yi Cheng
Synthesis of nanostructured MgO powders with photoluminescence by plasma-intensified pyrohydrolysis process of bischofite from brine — 215

Suresh Kumar
A solvent free approach for Knoevenagel condensation: facile synthesis of 3-cyano and 3-carbethoxycoumarins — 223

Sayed M. Badawy
Green synthesis and characterisations of antibacterial silver-polyvinyl alcohol nanocomposite films for wound dressing — 229

Company profiles

Thomas Kläusli

AVA Biochem: commercialising renewable platform chemical 5-HMF — 235

Andreas Freitag

Invenios: micro process technology – chemical process technology of tomorrow — 237

Conference announcements

Mónica Martins

International Conference on Green Chemistry and Sustainable Engineering International (Barcelona, Spain, July 29–31, 2014) — 239

Sophie West

7th Annual European Forum for Industrial Biotechnology and the Biobased Economy (Reims, France, September 30–October 2, 2014) — 241

Luc Cloutier

19th International Symposium on Homogeneous Catalysis (ISHC-XIX; Ottawa, ON, Canada, July 6–11, 2014) — 243

Shawn Torres

248th American Chemical Society National Meeting and Exposition: Chemistry and Global Stewardship (San Francisco, CA, USA, August 10–14, 2014) — 245

Conferences 2014–2017 — 247

Book reviews

Anuradha Mishra and James H. Clark (Eds.)

Green materials for sustainable water remediation and treatment (*Annette Johnston*) — 253

Dmitry Yu. Murzin

Engineering catalysis (*Bhaskar Patil*) — 255