ISSN 1978-2993



# Bulletin of Chemical Reaction Engineering & Catalysis

Volume 6, Number 1, Year 2011, 27 May 2011

An Electronic Journal. Available online at: http://bcrec.undip.ac.id/

Department of Chemical Engineering,
DIPONEGORO UNIVERSITY

Masyarakat Katalis Indonesia – Indonesian Catalyst Society (MKICS)





Bull. Chem. React. Eng. Catal.	Vol. 6	No. 1	1—62	Semarang May 2011	ISSN 1978 -2993
-----------------------------------	--------	-------	------	----------------------	--------------------



# Bulletin of Chemical Reaction Engineering & Catalysis, 6(1), 2011, i



# AIMS AND SCOPE

BULLETIN OF CHEMICAL REACTION ENGINEERING and CATALYSIS (ISSN 1978-2993), an electronic journal, provides a forum for publishing the novel technology related to chemical reaction engineering and catalysis engineering.

Scientific articles dealing with chemical reaction engineering, catalysis engineering, catalyst characterization, novel innovation of chemical reactor, etc. are particularly welcome. The journal encompasses research articles, original research report, review articles, short communications, and scientific commentaries in chemical reaction engineering and catalysis, including: fundamental of catalysis, fundamental of chemical reaction engineering, chemistry of catalyst, applied chemical reaction engineering, applied catalysis, applied bio-catalysis, applied bio-reactor, chemical reactor design, catalyst regeneration, and industrial practice of catalysis and chemical reactor engineering.

The articles should be submitted electronically in MS Word / OpenOffice file to Editorial Office email (bcrec@undip.ac.id) or through **Online Submission at http://ejournal.undip.ac.id/index.php/bcrec**. Please read the author guidelines before manuscript submission.

# **ABSTRACTING & INDEXING**

Bulletin of Chemical Reaction Engineering and Catalysis (ISSN 1978-2993) has been covered by following indexing services:

SCOPUS; EMBASE; Engineering Village; REAXYS; SCIRUS; CABI; EBSCOHOST—Academic Search Complete; Chemical Abstract Services; Google Scholar; UNDIP Institutional Repository; Directory of Open Access Journal (DOAJ); University of Delaware Library; OPEN J-GATE; Geneva Foundation for Medical Education and Research; Academic Resources; DMOZ Open Directory Project; RESEARCH GATE - Scientific Network; SOCOLAR; NCSU Libraries; ALUMNI E-LIBRARY; Science Chemistry Publication Journals

For detail please visit BCREC website: http://bcrec.undip.ac.id

# **PUBLICATION INFORMATION**

Bulletin of Chemical Reaction Engineering and Catalysis (ISSN 1978-2993)

Short journal title: Bull. Chem. React. Eng. Catal. For year 2011, Volume 6, Number 1-2 are scheduled for publication.

Bulletin of Chemical Reaction Engineering and Catalysis is electronically published via journal website (http://bcrec.undip.ac.id). The BCREC journal has been distributed by **EBSCO PUBLISHING** (ACADEMIC SEARCH COMPLETE—http://search.ebscohost.com) started from Volume 4 Number 1 Year 2009 to present.

The BCREC journal is published by Department of Chemical Engineering, Diponegoro University, and Masyarakat Katalis Indonesia—Indonesian Catalyst Society (MKICS)

Commencement of publication: January 2006

Copyright © 2011, BCREC, ISSN 1978-2993



# Bulletin of Chemical Reaction Engineering & Catalysis, 6(1), 2011, ii



#### EDITORIAL BOARD

#### **EDITOR-IN-CHIEF:**

#### Dr. Istadi

Department of Chemical Engineering, Diponegoro University, Jln. Prof. Sudharto, Kampus UNDIP Tembalang, Semarang, Central Java, INDONESIA 50239; E-mail: bcrec@undip.ac.id

#### **Editorial Member:**

**Prof. Dr. Purwanto**, Department of Chemical Engineering, Diponegoro University, Jln. Prof. Sudharto, Kampus UNDIP Tembalang, Semarang, INDONESIA 50239, E-mail: purwanto@undip.ac.id

**Dr. Didi Dwi Anggoro**, Department of Chemical Engineering, Diponegoro University, Jln. Prof. Sudharto, Kampus UNDIP Tembalang, Semarang, INDONESIA 50239, E-mail: anggoro\_phd@yahoo.com

**Dr. Mohammad Djaeni**, Department of Chemical Engineering, Diponegoro University, Jln. Prof. Sudharto, Kampus UNDIP Tembalang, Semarang, Central Java, INDONESIA 50239, E-mail: mzaini98@yahoo.com

# ADVISORY INTERNATIONAL EDITORIAL BOARDS

#### Prof. Dr. Mostafa Barigou

School of Chemical Engineering, University of Birmingham, Edgbaston, Birmingham B15 2TT, United Kingdom, Tel: +44 (0) 121 414 5277, Fax: +44 (0) 121 414 5324, Email: m.barigou@bham.ac.uk

#### Prof. Dr. Raghunath V. Chaudhari

Center for Environmental Beneficial Catalysis, Department of Chemical and Petroleum Engineering, The University of Kansas, 1501 Wakarusa Dr., Building B-Room 112B, Lawrence, KS 66047-1803, USA, Phone: 785 864 1634; Fax: 785 864 6051

#### Prof. Dr. Dmitry Yu. Murzin

Laboratory of Industrial Chemistry and Reaction Engineering, Abo Akademi University, Biskopsgatan 8, 20500, Turku/Åbo, Finland, ph: + 358 2 215 4985 fax:+ 358 2 215 4479, e-mail: dmurzin[at]abo.fi

#### Dr. Yibo Zhou

2351 Gilman Hall, Department of Chemistry, Iowa State University, USA, Phone: 1-515-294-6986, Email: yibozhou[at]iastate.edu

#### Assoc. Prof. Dr. Sibudjing Kawi

Department of Chemical and Biochemical Engineering, National University of Singapore, Singapore, E-mail:chekawis@nus.edu.sg

#### Prof. Dr. Ram Prasad

Department of Chemical Engineering and Technology, Institute of Technology, Banaras Hindu University, India, E-mail: rprasad.che[at]itbhu.ac.in

#### Assoc. Prof. Dr. Subagjo

Department of Chemical Engineering, Institut Teknologi Bandung, Jl. Ganesha 10, Bandung, Indonesia, E-mail: subagjo@che.itb.ac.id

### Assoc. Prof. Dr. Abdullah

Department of Chemical Engineering, Diponegoro , University, Semarang, Indonesia, E-mail: abd\_busairi@yahoo.com

#### Prof. Dr. Nor Aishah Saidina Amin

Chemical Reaction Engineering Group (CREG), Faculty of Chemical and Natural Resources Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia, E-mail: profnoraishah@yahoo.com

# Assoc. Prof. Dr. Y. H. Taufiq-Yap

Putra Centre for Catalysis Science and Technology, Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia, E-mail: yap@fsas.upm.edu.my

#### Prof. Dr. Hadi Nur

Ibnu Sina Institute for Fundamental Science Studies, Universiti Teknologi Malaysia , 81310 UTM Skudai, Johor, Malaysia, E-mail: hadi@kimia.fs.utm.my

#### Prof. Dr. Abdul Rahman Mohamed

School of Chemical Engineering, Universiti Sains , Malaysia, 14300 Nibong Tebal, Pulau Penang, Malaysia, E-mail: chrahman@eng.usm.my

#### Dr. Hery Haerudin

Research Center for Chemistry, Indonesian Institute Of Sciences (PP Kimia – LIPI), Kawasan PUSPIPTEK, Tangerang, Banten, Indonesia; E-mail: h.haerudin@katalisis.org; h\_haerudin@yahoo.com

#### Dr. Yang Hong

Dalian Institute of Chemical Physics, Chinese Academy of Sciences, 457 Zhongshan Road, Dalian 116023, China; E-mail: vanghong@dicp.ac.cn

# Dr. Oki Muraza

CENT & Department of Chemical Engineering, King Fahd University of Petroleum and Minerals (KFUPM), PO Box 5040 Dhahran 31261 KSA, Saudi Arabia , E-mail: omuraza@kfupm.edu.sa

#### Prof. Dr. Liu Yan

School of Chemical Engineering , Qinghai University, Xining, China Email: liuyan\_qhu@163.com



# Bulletin of Chemical Reaction Engineering & Catalysis, 6(1), 2011, iii



#### **PREFACE**

**BULLETIN OF CHEMICAL REACTION ENGINEERING & CATALYSIS** (ISSN 1978-2993), Volume 6, Number 1, Year 2011 is an electronic journal as a media for communicating all research activities in Chemical Reaction Engineering and Catalysis fields, and disseminating the novel technology and news related to chemical reaction engineering, catalyst engineering and science, and catalytic reactor engineering.

In this issue, articles related to: Oxidation of Carbon Monoxide in Hydrogen Rich Gases; Preparation Methods of Copper Based PGM-Free Diesel-Soot Oxidation Catalysts; Kinetic Study of Esterification of Acetic Acid with n-Buthanol and Isobuthanol; Fuzzy Modelling to Evaluate Effect of Temperature on Batch Transesterification for Biodiesel Production; Ion-exchange Resin Catalyzed Esterification of Lactic Acid with isopropanol; Modified Mathematical Model For Neutralization System In Stirred Tank Reactor; and In Situ Biodiesel Production from Residual Oil Recovered from Spent Bleaching Earth are highlighted.

The BCREC journal is an open access electronic journal. Visitors can read and download any full-text articles for free of charge. However, Authors may pay some processing fees once their articles has been accepted. The research articles submitted to the BCREC journal will be peer-reviewed by at least two reviewers. Accepted research articles will be available online (free download) following the journal peer-reviewing process. Language used in this bulletin is English.

Website address of BCREC journal is: http://bcrec.undip.ac.id, while website address for Online Submission System is: http://ejournal.undip.ac.id/index.php/bcrec.

Editor would like to appreciate all researchers, academicians, industrial practitioners focused on chemical reaction engineering and catalysis to contribute to this online journal. This journal is also expected to be a reputable international journal.

The BCREC journal has been distributed by **EBSCO PUBLISHING (ACADEMIC SEARCH COMPLETE—http://search.ebscohost.com)** started from Volume 4 Number 1 Year 2009 to present.

#### Dr. Istadi (Editor-in-Chief)

Chemical Reaction Engineering & Catalysis, Department of Chemical Engineering, Diponegoro University E-mail: bcrec@undip.ac.id



# Bulletin of Chemical Reaction Engineering & Catalysis, 6(1), 2011, iv



# TABLE OF CONTENTS

1.	Aims and Scope(i)
2.	Indexing and Abstracting(i)
3.	Editorial Board(ii)
4.	Preface(iii)
5.	Table of Content
6.	A Review on Preferential Oxidation of Carbon Monoxide in Hydrogen Rich Gases (A. Mishra, and R. Prasad)
7.	Comparison of Preparation Methods of Copper Based PGM-Free Diesel-Soot Oxidation Catalysts (R. Prasad, V.R. Bella)(15 - 21)
8.	Kinetic Study of Esterification of Acetic Acid with n-butanol and isobutanol Catalyzed by Ion Exchange Resin
	(Amrit Pal Toor , Mamta Sharma, Ghansyam and R. K. Wanchoo)
9.	Fuzzy Modeling to Evaluate the Effect of Temperature on Batch Transesterification of Jatropha Curcas for Biodiesel Production
	(Vipan Kumar Sohpal, Amarpal Singh, Apurba Dey)(31 - 38)
10.	Ion-exchange Resin Catalyzed Esterification of Lactic Acid with Isopropanol: a Kinetic Study (Amrit Pal Toor, Mamta Sharma, Sakshi, and R.K.Wanchoo)
11.	Modified Mathematical Model For Neutralization System In Stirred Tank Reactor (Ahmmed Saadi Ibrehem)
12.	In Situ Biodiesel Production from Residual Oil Recovered from Spent Bleaching Earth
	(Ramli Mat, Ow Shin Ling, Anwar Johari, Mahadhir Mohamed)(53 - 57)
13.	Author Guidelines (58 - 60)
14.	Copyright Transfer Agreement
15	Submission Information