American Institute of Chemical Engineers

Topical Conference on Energy Processes 2006

Held at the 2006 AIChE Spring National Meeting

April 23-27, 2006 Orlando, Florida, USA

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 www.proceedings.com

ISBN: 978-1-60423-529-6

Some format issues inherent in the e-media version may also appear in this print version.

American Institute of Chemical Engineers

Topical Conference on Energy Processing 2006

TABLE OF CONTENTS

Session 28 - Process Fired Heaters

Chair: Vishwas V. Wadekar

- 1 Kinetic Analysis of Boudouard Reaction and Its Dependence on Porous Structure Shabi Ulzama, Eckehard Specht
- 11 **Two-Phase Pipe Side Process Model for Fired Heaters** C.B. Panchal, Steven A. Lottes, Michael Petrick

Session 29 - Recent Advances in Clean Energy Sources I

CoChair: Xie Xiao Feng

Chair: Virendra K. Mathur

- 22 **Pem Fuel Cells Challenge in Science and Technology** Virendra K. Mathur, Xiaofeng Xie
- 23 Effect of Sub-Freezing Conditions on a Pem Fuel Cell Qiangu Yan, Hossein Toghiani, Young-Whan Lee, Kaiwen Liang
- 33 Electrochemical Impedance Spectroscopic Studies of Non-Fluorinate Proton Exchange Membranes in Dmfc Xiaofeng Xie, Yuming Shang, Jiangwei Guo, Virendra K. Mathur
- 34 Photoproduction of Hydrogen from Hydrogen Sulfide Using a Novel Metal Oxide Photocatalyst Jin-Ook Beag, Sang-Jin Moon, Chul Wee Lee, and Hyunju Chang

Session 63 - Recent Advances in Clean Energy Sources II

- 44 **Down-Hole Combustion Method for Gas Production from Methane Hydrate** Marco J. Castaldi, Yue Zhou, Tuncel Yegulalp
- Evaluation of Process Variables Interaction by Biodiesel Production from Castor Oil Ethanolise
 Nívea Lima Silva, Cesar Benedito Batistella, Maria Regina Wolf Maciel, Rubens Maciel Filho
- 66 Selective Co Oxidation in the Presence of Excess Hydrogen over Promoted Pt Catalyst Akkarat Wongkaew, Erdogan Gulari
- Selective Catalytic Oxidation of Co in the Presence of Hydrogen over Au/Mno2-Ceo2 Catalysts
 Hsin-yu Lin, Yu-Wen Chen

74 Neural Modeling of a Continuous Alcoholic Fermentation Process and Its **Optimization by Successive Quadratic Programming** Elmer Alberto Ccopa Rivera, Aline Carvalho Costa, R. Maciel Filho

Session 64 - Simulation of Heat and Mass Transfer Equipment in Process Plants

- Chair: Vishwas V. Wadekar
 - 83 Performance of a Nonlinear Catalytic Tubular Reactor Alan Machac, Redhouane Henda
 - 85 Development of Different Strategies of Refrigeration for Fixed Bed Catalytic Reactor: Mixed Coolant Flow as Optimal Factor Edvaldo Rodrigo Morais, Igor Ricardo de Souza Victorino, Eduardo Coselli Vasco de Toledo, Rubens Maciel Filho
 - 87 A Thermal Kinetic Model for the Study of Stereolithography Process André Luiz Jardini, R. A. Rezende, S.A. Ducatti, R. Maciel Filho, R. A. Rezende, S. A. Ducatti, R. Maciel Filho, R. A. Rezende, S. A. Ducatti, R. Maciel Filho
 - 88 Melting Heat Transfer in Energy Storage Subrahmaniyam Susarla Sr.

Session 95 - Low Grade Heat Utilization

CoChair: C.B. Panchal

- 89 Hestia Distributed Hydrogen Generator Brook Porter, Richard Root Woods, Kandaswamy DuraiSwamy, Hazen Burford
- Enhanced Waste Energy Recovery Targeting Using Real-Time Energy Integration 92 in Pulp & Paper Plant Mahmoud Bahy Noureldin, Saleh Al Hashimi, Ahmed S. Aseeri, Saleh A Qahtani, Karmul A. Hassan
- 103 Technology Assessment of Rejecting Process Heat C.B. Panchal
- 104 Spiral Flow Heat Exchanger for Heat Recovery from Gases Pramod Madhukar Deshpande

Session 96 - Microfluidic Devices for Energy Applications Tutorial

- CoChair: Yangchuan Xing
- Chair: Kim Henthorn
 - 113 Methanol Powered Microchannel Fuel Processing Systems Robert Dagle, Daniel Palo, Jamelyn D. Holladay
 - 114 Comparison of Adiabatic Gas-Liguid Two-Phase Flows in Microchannels and **Minichannels**

Masahiro Kawaji, Hideo Ide

- 115 Modeling and Evaluation of an Integrated Microfluidic Fuel Processor for Miniature Power Sources Dongying Qian, R.S. Besser, Adeniyi Lawal
- 127 Air-Breathing Laminar Flow Fuel Cells Operating in Alkaline or Acidic Media Paul J.A. Kenis, Ranga S. Jayashree, Daniela Egas, Dilip Natarajan, Jacob Spendelow, Larry J. Markoski
- 128 Addressing Critical Issues in Microscale Fuel Processing: Demonstration of an Integrated Silicon Microreactor Based Methanol Steam Reformer Keyur Shah, R.S. Besser

Session 132 - Combustion - Nox and Sox Control and Modeling

- CoChair: Virendra K. Mathur
- Chair: Paul Tripathi
 - 137 **Long-Term Sulphation Behavior of Limestone Sorbents** Jinsheng Wang, Edward J. Anthony
 - 138 Novel Sorbents for Mercury Capture from Fuel Gas Evan J. Granite, Christina Myers, Dennis Stanko, Henry W. Pennline
 - 139 **The Pco Process for Photochemical Removal of Mercury from Flue Gas** Evan J. Granite, Henry W. Pennline, Christopher R. McLarnon
 - 140 Performance Optimization and Emission Reduction of a Baled Biomass Combustor Michael E. Harasek, Martin Miltner, Angela Miltner, Christian Jordan, Anton Friedl
 - 141 **Modeling and Simulation of Diesel Particulate Filters** Herbert DaCosta

Session 146 - Water Reuse Technologies in Industrial Processes - Opportunities and Challenges Tutorial

- Chair: C.B. Panchal
 - 142 Desalination and Water Reuse Technologies in the Petroleum Refining Industry Tom Pankratz
 - 143 Waste Heat and Thermal Desalination John Tonner