

# 2005 CREL ANNUAL REPORT

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## **LISTING OF ACTIVE PROJECTS (2004/2005)**

### **AREA I. MULTIPHASE REACTORS AND PROCESSES: EXPERIMENTAL AND MODELING**

## **BUBBLE AND SLURRY BUBBLE COLUMNS**

- I-1. Investigation of Bubble Properties with Four-Point Optical Probes in Bubble Columns (J. Xue)**
- I-2. Modeling of Liquid Phase Methanol Synthesis in Slurry Bubble Column Reactors (A. Shaikh)**
- I-3. Mass Transfer and Hydrodynamics in Catalytic Slurry Reactors (K. Ruthiya)**
- I-4. Implementation of Bubble Population Balance Model in CFD (P. Chen)**
- I-5. High Pressure Slurry Bubble Column Reactor Consortium (M. Al-Dahhan, A. Shaikh, L. Han, W. Chen)**
- I-6. Solids Flow Visualization in Slurry Bubble Columns using Computed Automated Radioactive Particle Tracking (CARPT) and Computed Tomography (CT) (A. Shaikh)**
- I-7. Hydrodynamics Similarity in Bubble Column Reactors (A. Shaikh)**
- I-8. Combination of Computed Tomography (CT) and Electrical Capacitance Tomography (ECT) for Flow Visualization Investigation in Slurry Bubble Column Reactors (A. Shaikh)**
- I-9. Hydrodynamics and Mass Transfer in Slurry Bubble Columns (L. Han)**
- I-10. Heat Transfer Coefficient Measurements in High Pressure Slurry Bubble Columns (W. Chen)**

# **CIRCULATING FLUIDIZED BEDS**

- I-11. Solids Flow Mapping in Gas-Solid Risers: Velocity Field (S. Bhusarapu)**
- I-12. Solids Flow Mapping in Gas-Solid Risers: Concentration Field (S. Bhusarapu)**
- I-13. Modeling of Vaporization and Cracking of Liquid Oil Injected in a Gas-Solid Riser (S. Nayak)**

# **TRICKLE BEDS**

- I-14. Catalytic Wet Air Oxidation of Phenol in Packed-Bed Reactors over Pillared Clay Catalyst (J. Guo)**
- I-15. Experimental and CFD Study of the Liquid Flow Distribution in Trickle Bed Reactors (M. Capitaine)**
- I-16. Study of Liquid Spreading from a Point Source in a Trickle Bed via Gamma-Ray Tomography and CFD Simulation (C. Boyer, A. Koudil, P. Chen)**

# **STRUCTURED BEDS**

- I-17. Effect of Flow Maldistribution on Monolith Reactor Performance: A Modeling Approach (S. Roy)**

# **PACKED BEDS**

- I-18. Modeling of Catalytic Partial Oxidation of Methane to Syngas in Short Contact Time Packed Bed Reactors (R.C. Ramaswamy)**
- I-19. Reactor Models for Coupling Exothermic and Endothermic Reactions (R.C. Ramaswamy)**

# **MIXED TANKS**

- I-20. CFD-Based Compartmental Mixing Model for Stirred Tank Reactors (D. Guha)**

# **PROCESSES AND MINI AND MICROREACTORS**

- I-21. Mini and Micro Reactors Study for Liquid Hydrocarbons Oxidation (R. Jevtic)**
- I-22. Modeling the Effects of Temperature, Pressure, and Oxygen Solubility on Liquid Phase the Oxidation of a Cyclohexane (K. Ruthiya, R. Jevtic)**
- I-23. Mathematical Modeling and Experiments to Study Effective Diffusivity and Break-Through Curves for Alkylation Processes (S. Nayak)**
- I-24. The Integrated Struvite-CANON System (F. Mei)**

## **AEROSOL / PARTICULATE REACTORS**

- I-25. Aerosol Routes for Synthesis of Nanostructured Magnetic Oxides: Characterization and Transport Behavior (P. Kumar)**

## **MEASUREMENT TECHNIQUES AND STATISTICAL METHODS**

- I-26. Reduced Tomography For Industrial Application (Z. Kuzeljevic, S. Roy)**
- I-27. Development of Dual Source Computed Tomography for Imaging Three Phase Systems (R. Varma)**
- I-28. Development of Multiple Particle Tracking (MP-CARPT) (M. Vesvikar)**
- I-29. Testing Optical Probes for Phase Transition and Volumetric Expansion at Subcritical and Supercritical Conditions (S. Meuller)**
- I-30. Time Series Analysis in Multiphase Reactors (M. Cassanello)**

# **BIOREACTORS AND BIOPROCESSES ENGINEERING LABORATORY (BBEL)**

- I-31. Analyzing and Modeling of Photobioreactors for Microalgal and Cyanobacteria Cultures (H. Luo)**
- I-32. Shear Mapping in Impeller Mixed Anaerobic Digester Using CARPT (M. Vesvikar)**
- I-33. Hydrodynamic Study of Gas Recirculation Bioreactors Using Radioactive Particle Tracking and Gamma Ray Tomography (R. Varma)**
- I-34. Performance Study of a Pilot Plant Scale Anaerobic Digester (M. Vesvikar)**
- I-35. Effect of Shear on Performance and Microbial Community in Anaerobic Digesters Treating Cow Manure (R. Hoffman, K. Karim)**

## **USER FRIENDLY MODULES FOR MULTIPHASE REACTORS MODELING**

- I-36. Developing User Friendly Modules for Modeling Multiphase Reactors (C. Tunca)**

### **AREA II. PREPARATION OF NEW MATERIALS**

#### **II-1. Semiconductor Grade Silicon**

### **AREA III: PROCESS MONITORING AND CONTROL**

#### **III-1. Washington University Reactor and Plant Process Control**

#### **➤ CREL PUBLICATIONS (1995 – Present)**