



***Chemical Reaction Engineering Laboratory
2005/2006 Annual Report***

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➤ **LISTING OF ACTIVE PROJECTS (2005/2006)**

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

BUBBLE AND SLURRY BUBBLE COLUMNS

- I-1. Hydrodynamics of Slurry Bubble Columns Using Computer Automated Radioactive Particle Tracking (CARPT) and Computed Tomography (A. Shaikh, L. Han, C. Wu)**
- I-2. Phase Distribution, Solids/Liquid Velocity, and Solids/Liquid Turbulence in a High Pressure Slurry Bubble Column Reactor Operated at Mimic Fischer-Tropsch Conditions (A. Shaikh, L. Han, C. Wu)**
- I-3. Scale-Up of Bubble Column Reactors (A. Shaikh)**
- I-4. Characterization of Hydrodynamic Flow Regime in Bubble Column Reactors via Computed Tomography (CT) (A. Shaikh)**
- I-5. A New Methodology to Measure the Solids Axial Dispersion in a High Pressure Slurry Bubble Column Reactor (L. Han)**
- I-6. Gas-Liquid Mass Transfer in a High Pressure Bubble Column Reactor with Different Gas Sparger Designs (L. Han)**
- I-7. Heat Transfer Coefficients in a High Pressure Bubble Column (C. Wu)**
- I-8. Modeling of Gas Distributor for 3D Simulation of Bubble Columns (A. Akhtar)**
- I-9. Multiple Particle Tracking (MP-CARPT) Implementation: Low L/D Slurry Bubble Column Reactor (M. Vesvikar)**

FLUIDIZED BEDS

- I-10. Investigation of Catalytic Gas-Phase Olefin Polymerization Reactors - Radioactive Particle Tracking and CFD Studies RPT-CFD (M. Capitaine)**
- I-11. Experimental Investigation of the Hydrodynamics of Fluidized Bed Reactors (W. Jalil)**

TRICKLE BEDS

- I-12. Flow Distribution in a High Pressure Trickle Bed Reactor (P.-Y. Lanfrey)**
- I-13. Multiphase Kinetic and Reactor Models (J. Guo, R.C. Ramaswamy)**

STRUCTURED BEDS

- I-14. Effect of Flow Maldistribution on Monolith Reactor Performance: A Modeling Approach (S. Roy)**

PACKED BEDS

- I-15. Steady State and Dynamic Reactor Models for Coupling Exothermic and Endothermic Reactions (R.C. Ramaswamy)**
- I-16. Exergy Analysis and the Reactor Performance (R.C. Ramaswamy)**

STIRRED REACTORS

- I-17. Quantification of Solids Distribution and Solids Flow Field in Solid-Liquid Stirred Tank Reactors (D. Guha)**
- I-18. Compartmental Model for Stirred Tank Reactors: Evaluation of Turbulence Models (D. Guha)**

PROCESSES AND MINI AND MICROREACTORS

- I-19. Mini Reactors for Characterization of Hydrocarbon Oxidations (R. Jevtic)**
- I-20. Modeling the Effects of Temperature, Pressure, and Oxygen Solubility on Liquid Phase Oxidation of Cyclohexane (K. Ruthiya, R. Jevtic)**
- I-21. Experiments and Mathematical Modeling to Evaluate Solid Acid Alkylation Processes (N. Subramanya)**
- I-22. Molecular Simulation Studies of Adsorption Isotherms for Solid Acid Alkylation Catalysts (C. Tunca)**
- I-23. Kinetic modeling and mass transfer effects in Homogeneous Catalytic Hydroformylation of 1-Octene in CO₂ – Expanded Solvent (D. Guha)**
- I-24. Membrane Steam Reforming Reactor for Pure Hydrogen Production (Z. Kuzeljevic)**

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)**
- I-27. Development of Dual Source Computer Tomography for Imaging Three Phase Systems (R. Varma)**
- I-28. Development and Validation of Multiple Particle Tracking (MP-CARPT) (M. Vesvikar)**
- I-29. Volumetric Expansion and Phase Transition of Expanded Solvents Using an Optical Fiber Probe (S. Meuller)**

BIOREACTORS AND BIOPROCESSES ENGINEERING LABORATORY (BBEL)

- I-30. Enzymatic Dewatering of Distiller Dried Grains (DDGs) (A. Henriques)**
- I-31. Analyzing and Modeling Photobioreactors for Microalgal and Cyanobacteria Cultures (H. Luo)**
- I-32. Effect of Scale and Mixing on the Performance of Anaerobic Digesters (M. Vesvikar)**
- I-33. Effect of Sparger Design on Hydrodynamics of a Gas Recirculation Anaerobic Bioreactor (R. Varma)**

USER FRIENDLY MODULES FOR MULTIPHASE REACTORS MODELING

- I-34. Developing User Friendly Modules for Modeling Multiphase Reactors (C. Tunca)**

➤ AREA II. PREPARATION OF NEW MATERIALS

- II-1. Semiconductor Grade Silicon (M.P. Dudukovic, P.A. Ramachandran)**
- II-2. Melt Dynamics in Czochralski Crystal Growth of Silicon (P. Gunjal)**

➤ AREA III: PROCESS MONITORING AND CONTROL

- III-1. Washington University Reactor and Plant Process Control (G. McMillan)**

➤ CREL PUBLICATIONS (1996 – Present)