CHE 41100 - CHE 41200 or HONORS RESEARCH PROJECTS
2020-21

Rakesh Agrawal (FRNY 3053D) Phone: 494-2257, agrawalr@purdue.edu
1. Nanocrystal Based Solar Cells
2. Solution Processed Solar Cells
3. Novel and Energy Efficient Separation Processes
4. Modeling of Energy Systems
5. Process Modeling for Shale Gas Processing (CISTAR)

Alina Alexeenko (ARMS3000) Phone: 496-1864, alexeenk@purdue.edu
1. Process modeling for pharmaceutical lyophilization
2. PAT for pharmaceutical lyophilization

Xiaoping Bao (FRNY 1158) Phone: 496-3094, bao61@purdue.edu
1. Stem Cell Immunoengineering for CAR-T and CAR-NK cell therapy;
2. Optogenetic-mediated heart tissue engineering;
3. Hematopoietic stem cell expansion with oxygen-gradient biomaterials

Osman A. Basaran (FRNY 3060) Phone: 494-4061, obasaran@ecn.purdue.edu
1. Drop Dynamics: Experimental Analysis and Ultra-Fast (Down To 10 Ns) Imaging of Singularities during Drop Formation, Drop Coalescence, and Drop Impact
2. Crop Protection Systems and Aiming for Zero Spray Drift
3. Drop-Based Methods for Making Particles and Capsules for Pharmaceutical (E.G. Controlled Release) and Materials Science Applications
4. Ink Jet Printing
5. Complex Fluids: Polymeric Fluids (E.G. DNA Solutions), Foams, And Surfactant Solutions
6. Nonlinear Dynamics and Chaos in Chemical Engineering
7. Safety and Process/Product Assurance (Especially Flow Assurance)
8. Mathematical Analysis and Computing: Finite Elements and Asymptotic Methods

Bryan W. Boudouris (FRNY 2148) Phone: 496-6056, boudouris@purdue.edu
1. Synthesis of New Polymers
2. Design of Gas Sensing Devices

James M. Caruthers (FRNY 2043C) Phone: 494-6625, caruther@ecn.purdue.edu
1. Engineering Properties of Polymers
2. Design of unit operations to make lignin binders for composite boards (with Prof.Martinez

William Clark (FRNY 2158) Phone: 496-8647, clarkw@purdue.edu
1. Effect of fouling on dialysis membrane transport characteristics (Co-Advised with Vivek Narsimhan)
2. Analysis of new flow configurations for hollow fiber dialysis devices (Co-Advised with Vivek Narsimhan)

David S. Corti (FRNY 1055) Phone: 496-6064, dscorti@ecn.purdue.edu
1. Colloidal Stability of High-Density Particle Dispersions (Co-Advised With Prof. Franses)
2. AFM Measurement of the Hamaker Constants of Solids
3. Molecular Thermodynamics of Model Fluids

Letian Dou (FRNY 3053B) Phone: 494-4194, dou10@purdue.edu
1. Synthesis and characterization of novel 2D hybrid electronic materials
2. High performance perovskite solar cells and LEDs.

Rajamani P. Gounder (FRNY 2160) Phone: 496-7826, rgounder@purdue.edu
(Honors or 2 semester CHE 41100 commitment)
1. Synthesis of Zeolite Catalysts
2. Catalysis of Nox Abatement
3. Catalysis of Hydrocarbon Conversion

Jeffrey Greeley (FRNY 2154) Phone: 494-1282, jgreeley@purdue.edu
1. Density Functional Theory Studies of Propane Dehydrogenation
2. First Principles Studies of Electrocatalysis

Michael T. Harris (FRNY 3043) Phone: 494-0963, mtharris@ecn.purdue.edu
1. Pharmaceutical Powder Characterization Using Microwave Spectroscopy
2. Colloidal Particle Deposition During Drop Evaporation.
3. Hydrothermal Metal Coating on Plant Viruses

Michael R. Ladisch (POTR 218) Phone: 494-7022, ladisch@purdue.edu
1. Bioseparation
   a. Liquid Chromatography Modeling
   b. Enzyme Mimetics
   c. Protein Chromatography
2. Food Safety
3. Biofuels

Julie C. Liu (FRNY 1160) Phone: 494-1935, julieliu@purdue.edu
(Honors or 2 semester CHE 41100 commitment)
1. Protein-based Biomaterials for Tissue Engineering
2. Designing Surgical Adhesives and Sealants

Enrico N Martinez (Forney G015) Phone: 496-6998, marti309@purdue.edu

1. Biodiesel from Spent Coffee Grounds
2. Jet Fuel from Vegetable Oils
3. Lignin conversion to bio-fuels and high value added chemicals

Ray Mentzer (FRNY 3019) Phone: 936-443-5579, rmentzer@purdue.edu

1. Assess the effectiveness of Dow Reactive Chemical modeling tools through comparison with sophisticated CFD models to predict industrial monomer runaway scenarios
2. As layers of protection analysis (LOPA) has wide acceptance in industry is there new data or a new process that could supersede LOPA in the future
3. Contribution of implementation of 'fitness for service' assessments with a PSM framework in petro-chem sites
4. Corrosion Under Insulation – literature review of latest inspection techniques
5. Survey of heats of reaction for some common reaction types in pharma industry. The experimental data will then be compared with various calculation techniques.
6. Incorporation of pressure onsets into Stoessel Classifications for pharma related reaction hazards.
7. Thermal hazards in the pharmaceutical industry. Analysis of time to maximum rate and Td24, its measurement and comparison with calculation techniques.
8. After drilling into high T & P oil & gas reservoirs, high density fluids containing calcium & zinc may be used to contain the pressure, which pose issues with their ultimate disposal. This project will consist of a literature review and development of modeling technique.

Jeffrey T. Miller (FRNY 2152) Phone: 496-0462, mill1194@purdue.edu

1. Synthesis and Kinetics of Novel Nano-alloy Catalysts for Alkane Dehydrogenation
2. New, High Temperature, Hydrogen-Tolerant Transition Metal Oligomerization Catalysts

John A. Morgan (FRNY 1053) Phone: 494-4088, jamorgan@ecn.purdue.edu
(Honors or 2 semester CHE 41100 commitment)

1. Production of High Value Chemicals in Algae
2. Biofuels from glycerol in yeast

Zoltan K. Nagy (FRNY G027D) Phone: 494-0734, zknagy@purdue.edu

1. Advanced Control of Crystallization Processes
2. Active Feedback Control of a Continuous Tablet Manufacturing System
3. Real-time Release Continuous Crystallization (R2C2)

Narsimhan, Vivek (FRNY 1029B) Phone: 494-4282, vnarsim@purdue.edu

3. Effect of fouling on dialysis membrane transport characteristics (Co-Advised with William Clark)
4. Analysis of new flow configurations for hollow fiber dialysis devices (Co-Advised with William Clark)
5. Separation of particulates using microfluidics
6. Droplet dynamics with complex membranes
7. Modeling and experiments of red blood cells and vesicles under flow
8. Modeling and experiments to predict the texture of starches during swelling/pasting
9. Mass and heat transfer during freeze drying

Vilas G. Pol (FRNY 2146) Phone: 494-0044, vpol@purdue.edu

1. All Solid State Safer Batteries using Polymer Based Electrolytes
2. Synthesis of New Electrode Materials, Characterization and Li ion Battery Testing
3. Next Generation High Energy Li-S Batteries
4. *In situ* Diagnostics of Batteries for their Safety Understanding

Doraiswami (Ramki) Ramkrishna (FRNY 1164) Phone: 494-4066, ramkrish@ecn.purdue.edu

1. Bioreactor Modeling and Control
2. Computer Simulation of Advanced Materials
3. Modeling of Antibiotic Resistance in Bacteria
4. Simulating Phase Transitions for Advanced Materials Design
5. Modeling Metabolic Regulation and Control (based on small networks and omic data)
6. Modeling of the Microbiome
7. Mixing and Agglomeration in an Agitated Dryer

G. V. Reklaitis (FRNY G027B) Phone: 494-9662, reklaiti@purdue.edu

1. Real Time Operations Management of continuous pharmaceutical manufacturing
2. On-line process sensors and sensor network performance in Continuous Manufacturing of Tablets
3. Modeling & sensing of dust dispersions arising in pharmaceutical manufacturing

Fabio H. Ribeiro (FRNY 2158) Phone: 494-7799, fabio@ecn.purdue.edu

1. Shale Oil and Gas as a Bridge Fuel: Dehydrogenation of Alkanes
2. Shale Oil and as a Bridge Fuel: Oligomerization of Olefins
3. Shale Oil and as a Bridge Fuel: Methane Activation

Kendall Thomson (FRNY 1152) Phone: 496-6706, thomsonk@ecn.purdue.edu
Honors two-semester commitments or CHE 41100 for summer

1. Computational Analysis of Direct Epoxidation Pathways on Au-Supported Titanosilicates
2. Computational Analysis of Cu(1)-Catalyzed Aryl-Halide Coupling Systems for Pharmaceuticals Synthesis

Nien-Hwa Linda Wang (FRNY 1015) Phone: 494-4081, wangn@ecn.purdue.edu
Two semester commitment of CHE 41100 or 41200, or Honors BS Thesis

1. Continuous Chromatography
2. Separation and Purification of Rare Earth Elements
3. Conversion of Plastic Waste into Valuable Products

You-Yeon Won (FRNY 2031) Phone: 494-4077, yywon@ecn.purdue.edu

1. Polymer Lung Surfactant
2. Polymer Drug/Gene Delivery
3. Nanoparticle Radiation Therapy

Chongli Yuan (FRNY 1154) Phone: 494-5824, cyuan@ecn.purdue.edu
(Honors or 2 semester CHE 41100 commitment)

1. Reconstitution of synthetic neuronal network via bioengineering
2. Monitor environmental chemical impact on long-term human health using stem cells.
3. Single cell fluorescent tools for tracking tumor cell heterogeneity.