



Education

- **Polytechnique Montreal, Montreal, QC, Canada** (2015)

Ph.D. Degree, Department of Chemical Engineering

Thesis: "Hydrodynamics of a Gas-Solid Fluidized Bed at High Temperature in the Presence of Interparticle Forces"

- **Sharif University of Technology, Tehran, Iran** (2009)

M.Sc. Degree, Department of Chemical and Petroleum Engineering

Thesis: "Exact Dynamic Simulation and Control for Hydrotreating Unit of Tehran Refinery"

- **Isfahan University of Technology, Isfahan, Iran** (2006)

B.Sc. Degree, Department of Chemical Engineering

Thesis: "Heat Transfer Coefficient of Non-Newtonian Fluid in a Stirred Tank Reactor"

Research Interests

- Process Design, Development, and Optimization
- Characterization of Multiphase Reactors
- Fluidization Engineering
- Chemical Reaction Engineering
- Pyrolysis, Gasification, and Combustion
- Reduction of Polluting Emissions
- Functionalizing ultrafine powders
- Transport Phenomena
- Separation Process
- Modeling and Simulation
- Optimization

Work Experience

Postdoctoral Researcher

2015-

Process Engineering Advanced Research Lab (PEARL), Chemical Engineering
Department, Polytechnique Montreal, Montreal, QC, Canada

- ❖ Characterizing the hydrodynamics of a gas-solid fluidized bed at elevated pressures and temperatures.
- ❖ Laboratory responsible and actively participated in the design, HAZOP study, commissioning, and operational steps of a pilot scale gas-solid fluidized bed operating under extreme conditions (up to 30 bar and 900°C).
- ❖ Communicating the novel experimental results with industrial partners, i.e., TOTAL and Orbite Technologies Inc.
- ❖ Design verification and improvement of industrial sized reactors and particulate solids transfer assembly to produce high purity alumina powders (industrial partner: Orbite Technologies Inc.).
- ❖ Optimizing a novel measurement technique for the simultaneous measurement of gaseous and liquid species compositions and phase volume fraction.

- ❖ Drafted a successful NSERC RTI and an industrial chair proposals (industrial partner: TOTAL).
- ❖ Designed an optical fiber probe capable of operation under extreme conditions (high pressure and temperature).
- ❖ Participated in development of a novel catalyst experiencing local high temperature on its active sites to result in a higher selectivity and yield for catalytic reactions.
- ❖ Participated in mass production of functionalized nanoparticles for battery applications.
- ❖ Published/submitted five scientific journal articles and two international conference proceedings.
- ❖ Wrote a comprehensive review article on effects of temperature, pressure, and interparticle forces on the hydrodynamics of a gas-solid fluidized bed.
- ❖ Supervising one M.Sc. and one Ph.D. students.

Doctorate Researcher

2009-2015

Process Engineering Advanced Research Lab (PEARL), Chemical Engineering Department, Polytechnique Montreal, Montreal, QC, Canada

- ❖ Characterized the hydrodynamics of a gas-solid fluidized bed at high temperature in the presence of interparticle forces.
- ❖ Introduced a novel approach to enhance the reaction performance of a bubbling gas-solid fluidized bed reactor.
- ❖ Developed a novel approach for the early detection of defluidization in a high temperature bubbling gas-solid fluidized bed reactor.
- ❖ Developed a new strategy to calibrate a solids concentration optical fiber probe.
- ❖ Participated actively in development of new technologies: (i) application of liquid-solid fluidized bed reactor to remove iron and manganese from groundwater, (ii) application of engineered fuel to reduce polluting emissions (SO_x, NO_x, mercury ...) from coal power plants.
- ❖ Participated in characterization of the mixing and size segregation in a rotating drum.
- ❖ Participated in characterization of the hydrodynamics of bubble column reactors at extreme conditions.
- ❖ Participated in fluidization and mixing characterization of biomass particles in a gas-solid fluidized bed.
- ❖ Coating of particles with spheronizer machine and/or through the chemical vapor deposition process.
- ❖ Communicated the novel experimental results with industrial partners, i.e., Total American Services Inc. and Accordant Energy.
- ❖ Designed a completely safe pilot scale gas-solid fluidized bed to operate at near-ambient conditions while satisfying the stringent safety remarks of Radioactive Particle Tracking (RPT) experiments.
- ❖ Published seven scientific journal articles and six international conference proceedings.
- ❖ Published a comprehensive review article on fluidization of ultrafine powders.
- ❖ Laboratory responsible and developed new experimental instruments.
- ❖ Organized the laboratory visits and progress meetings for different industrial, academic, and governmental partners.
- ❖ Supervised two intern B.Sc. students and involved in piloting company tests.

M.Sc. Researcher

2006-2009

Process Modeling, Simulation & Control Research Center, Chemical & Petroleum Engineering Department, Sharif University of Technology, Tehran, Iran

- ❖ Performed an exact dynamic simulation and control for hydrotreating unit of Tehran Refinery.
- ❖ Implemented a pattern-based fuzzy predictive control and a neural network nonlinear model predictive control to control a PH neutralization process.
- ❖ Developed an expert system for fault diagnosis in pipelines.
- ❖ Elaborated an adaptive multi-surface sliding control for non-autonomous systems with mismatch uncertainties.

- ❖ Analysis of microchannel heat sink performance using nanofluids in turbulent and laminar flow regimes and its simulation using artificial neural network.

Research Background

- Significant experience in design, development, control, and scale up of various chemical processes.
- Solid background in fluidization and chemical reaction engineering.
- Proficient in experimental data analysis and process modeling and simulation.
- Specialist in particle transfer, drying, mixing, and coating, polluting emission reduction from a gas-solid fluidized bed combustor, and early detection of defluidization.
- Specialist in fluidization of ultrafine powders and hydrodynamics of gas-solid fluidized beds at high temperature and pressure in the presence of interparticle forces.
- Skilled in designing, commissioning, and operating different reactors.
- Extensive experience in material characterization and various measurement techniques.
- Expert in writing technical and scientific reports and supervising junior scientists.
- Reliable and self-confident in making decisions and proven troubleshooting ability.
- Innovative and team player with strong communication, interpersonal, and leadership skills.

Teaching Experience

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| • Design of Gas-Solid/Fluidized Bed Reactors,
Polytechnique Montreal, Montreal, QC, Canada | Teaching
Assistant | 2015 |
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Journal Publications

- Dashtban Kenari, S.L., **Shabanian, J.**, Barbeau, B. "Comparison of Pyroclite Fixed and Fluidized Beds for Iron and Manganese Control in Groundwater: A Pilot-Scale Study". Submitted to Journal of Environmental Chemical Engineering, 2017.
- **Shabanian, J.**, Chaouki, J. "Effects of Temperature, Pressure, and Interparticle Forces on the Hydrodynamics of a Gas-Solid Fluidized Bed". Chemical Engineering Journal, 313, 2017, 580-590.
- **Shabanian, J.**, Sauriol, P., Chaouki, J. "A Simple and Robust Approach for Early Detection of Defluidization". Chemical Engineering Journal, 313, 2017, 144-156.
- **Shabanian, J.**, Sauriol, P., Mostoufi, N., Chaouki, J. "Performance Evaluation of Different Approaches for Early Detection of Defluidization". Powder Technology, Accepted for publication, 2017.
- **Shabanian, J.**, Chaouki, J. "Fluidization Characteristics of a Bubbling Gas-Solid Fluidized Bed at High Temperature in the Presence of Interparticle Forces". Chemical Engineering Journal, 288, 344-358, 2016.
- **Shabanian, J.**, Chaouki, J. "Influence of Interparticle Forces on Solids Motion in a Bubbling Gas-Solid Fluidized Bed". Powder Technology, 299, 98-106, 2016.
- **Shabanian, J.**, Chaouki, J. "Performance of a Catalytic Gas-Solid Fluidized Bed Reactor in the Presence of Interparticle Forces". International Journal of Chemical Reactor Engineering, 14, 433-444, 2016.

- **Shabanian, J.**, Chaouki, J. “Similarities between the Gas-Solid Fluidization in the Presence of Interparticle Forces at High Temperature and Induced by a Polymer Coating Approach”. Submitted to Powder Technology, 2016.
- **Shabanian, J.**, Sauriol, P., Rakib, A., Chaouki, J. “Application of Temperature and Pressure Signals for Early Detection of Defluidization Conditions”. Procedia Engineering, 102, 1006-1015, 2015.
- **Shabanian, J.**, Chaouki, J. “Hydrodynamics of a Gas-Solid Fluidized Bed with Thermally Induced Interparticle Forces”. Chemical Engineering Journal, 259, 135-152, 2015.
- **Shabanian, J.**, Chaouki, J. “Local Characterization of a Gas-Solid Fluidized Bed in the Presence of Thermally Induced Interparticle Forces”. Chemical Engineering Science, 119, 261-273, 2014.
- **Shabanian, J.**, Jafari, R., Chaouki, J. “Fluidization of Ultrafine Powders”. International Review of Chemical Engineering, 4, 16-50, 2012.

Conference Publications and Presentations

- **Shabanian, J.**, Chaouki, J. “Effects of Temperature, Pressure, and Interparticle Forces on Gas-Solid Fluidization Behavior”. Accepted for an oral presentation at the 12th *International Conference on Fluidized Bed Technology (CFB-12)*, Krakow, Poland, 23-26 May 2017.
- **Shabanian, J.**, Sauriol, P., Rakib, A., Chaouki, J. “Co-Combustion of Coal and ReEF in a Bubbling Fluidized Bed Combustor: Defluidization Prediction and Prevention”. Accepted for presentation at the 8th *European Combustion Meeting (ECM 2017)*, Dubrovnik, Croatia, 18-21 April 2017.
- Latifi, M., Rakib, A., Sauriol, P., **Shabanian, J.**, Chaouki, J. “Co-combustion of Coal and a Re-Engineered Feedstock for Emissions Reduction”. Oral presentation at the 5th *International Conference on Green Process Engineering (GPE2016)*, Mont Tremblant, Canada, June 19-24, 2016.
- Shabanian, J., Sauriol, P., Mostoufi, N., Chaouki, J. “Performance Evaluation of Different Approaches for Early Detection of Defluidization”. Oral presentation at *Fluidization XV*, Fairmont Le Chateau Montebello, Canada, 22-26 May 2016.
- Shabanian, J., Chaouki, J. “Similarities between Gas-Solid Fluidization in the Presence of Interparticle Forces at High Temperature and Induced by a Polymer Coating Approach”. Oral presentation at Fluidization XV, Fairmont Le Chateau Montebello, Canada, May 22-26, 2016.
- Shabanian, J., Chaouki, J. “Effects of Temperature, Pressure, and Interparticle forces on the Hydrodynamics of a Gas-Solid Fluidized Bed: A review”, Oral presentation at *FCC Alliance Scientific Workshop*, TOTAL Research & Technology Gonfreville (TRTG), Le Havre, France, 26-27 April 2016.
- Shabanian, J., Elahipanah, N., Farag, S., Chaouki, J. “Hydrodynamics of a Gas-Solid Fluidized Bed at Elevated Pressures and Temperatures”, Oral presentation at *Total American Services Sponsored Students Meeting*, Cambridge, Massachusetts, United States, 21-22 March 2016.
- Sauriol, P., Rakib, A., **Shabanian, J.**, Jafari, R., Bai, D., Chaouki, J. “Simultaneous Reduction of Sulfur Oxides and Mercury Emissions During Co-Combustion of Coal with ReEngineered Feedstock™ (ReEF) in Bubbling Fluidized Bed Combustor”. In: Proceedings of the 22nd *International Conference on Fluidized Bed Conversion*, Turku, Finland, June 14-17, 2015.
- Shabanian, J., Sauriol, P., Rakib, A., Chaouki, J. “Application of Temperature and Pressure Signals for Early Detection of Defluidization Condition”, Oral presentation at the 7th *World Congress on Particle Technology (WCPT7)*, Beijing, China, 19-22 May, 2014.

- **Shabanian, J.**, Sauriol, P., Rakib, A., Chaouki, J. “Characterization of Gas-Solid Fluidization at High Temperature by Analysis of Pressure Signals”. In: proceedings of the *11th International Conference on Fluidized Bed Technology (CFB-11)*, Beijing, China, May 14-17, 2014. (**Keynote Presentation**)
- **Shabanian, J.**, Chaouki, J. “Hydrodynamics of a Gas-Solid Fluidized Bed at High Temperature in the Presence of Interparticle Forces”, Oral presentation at *Total American Services Sponsored Students Meeting*, Cambridge, Massachusetts, United States, 27-28 March 2014.
- **Shabanian, J.**, Chaouki, J. “The Effect of Interparticle Forces on Local Hydrodynamics of a Gas-Solid Fluidized Bed”, Oral presentation at *Total American Services Sponsored Students Meeting*, Berkeley, California, United States, 25-26 June 2013.
- **Shabanian, J.**, Chaouki, J. “Pressure Signals in a Gas-Solid Fluidized Bed with Thermally Induced Interparticle Forces”. In: Proceedings of *Fluidization XIV*; Noordwijkerhout, the Netherlands, May 26-31, 2013. (**Keynote Presentation**)
- **Shabanian, J.**, Chaouki, J. “Radioactive Particle Tracking in a Bubbling Gas-Solid Fluidized Bed with Thermally Induced Interparticle Forces”. Oral presentation at the *9th World Congress of Chemical Engineering*, Seoul, South Korea, August 18-23, 2013.
- **Shabanian, J.**, Chaouki, J. “The Influence of Interparticle Forces on Global Hydrodynamics of a Gas-Solid Fluidized Bed”, Oral presentation at *Total American Services Sponsored Students Meeting*, Montreal, Quebec, Canada, 23-24 April 2012.
- **Shabanian, J.**, Fotovat, F., Bouffard, J., Chaouki, J. “Fluidization Behavior in a Gas-Solid Fluidized Bed with Thermally Induced Interparticle Forces”. In: Proceedings of the *10th International Conference on Circulating Fluidized Beds and Fluidized Bed Technology (CFB-10)*, Sunriver Resort, United States, May 1-5, 2011.
- Fotovat, F., **Shabanian, J.**, Chaouki, J., Bergthorson, J. “Characterization of Fluidization and Mixing of Binary Mixtures Containing Biomass at Low Velocities through Analyzing Local Pressure Fluctuations”. In: Proceedings of the *10th International Conference on Circulating Fluidized Beds and Fluidized Bed Technology (CFB-10)*, Sunriver Resort, United States, May 1-5, 2011.
- Shokouhmand, H., Ghazvini, M., **Shabanian, J.** “Performance Analysis of Using Nanofluids in Microchannel Heat Sink in Different Flow Regimes and its Simulation Using Artificial Neural Network”. In: Proceedings of the *International Conference of Applied and Engineering Mathematics (ICAEM2008)*, London, U.K., July 2-4, 2008.
- Shokouhmand, H., Ghazvini, M., **Shabanian, J.** “Analysis of Microchannel Heat Sink Performance Using Nanofluids in Turbulent and Laminar Flow Regimes and its Simulation Using Artificial Neural Network”. In: Proceedings of the *10th International Conference on Computer Modelling and Simulation*, Emmanuel College, Cambridge, England, April 1-3, 2008.
- **Shabanian, J.**, Nasr Esfahani, M. “Heat Transfer Coefficient of Non-Newtonian Fluid in a Stirred Tank Reactor”. In: Proceedings of the *12th Iranian Chemical Engineering Congress, Sahand University of Technology*, Tabriz, Iran, October 21-23, 2008.