POLYTECHNIQUE MONTRÉAL
LE GÉNIE EN PREMIÈRE CLASSE

Brajesh K. Singh, PhD

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Education

- **Indian Institute of Technology Delhi, New Delhi, India** (2019)

Ph.D. Degree, Department of Chemical Engineering
Thesis: "Dynamics of Unary and Binary Gas-Solid Flows in a Cylindrical Fluidized Bed: Electrical Capacitance Tomography Measurements and CFD Simulations"

- **Indian Institute of Technology Roorkee, Roorkee, India** (2012)

M.Tech. Degree, Department of Chemical Engineering
Thesis: "Modeling and Simulations of Under-ground Coal Gasification"

- **Heritage Institute of Technology, Kolkata, India** (2010)

B.Tech. Degree, Department of Chemical Engineering
Thesis: "Study of Heat Transfer on Thermal Energy Storage using Paraffin Wax as a Phase Change Material."

Research Interests

- Process Design, Development, and Optimization
- Design and Optimization of Multiphase Reactors
- Fluidization Engineering
- Recycling and Extraction of Rare Earth Elements
- Green Ammonia and Hydrogen Productions
- Computational Fluid Dynamics
- Chemical Reaction Engineering
- Pyrolysis, Gasification, and Combustion
- Thermodynamic Simulations
- Tomographic Measurement Techniques
- Lattice Boltzmann Simulations
- Heat and Mass Transfer Equipment Design

Work Experience

Postdoctoral Researcher 2020-
Process Engineering Advanced Research Lab (PEARL), Chemical Engineering Department, Polytechnique Montreal, Montreal, QC, Canada

- Project-1: Process development and techno-economic analysis for carbo-thermal reduction of phosphate ore to produce phosphoric acid.
- Project-2: CFD simulations of top-submerged lance (TSL) reactor.
- Project-3: Process development and CFD simulations for recycling waste electronics/magnets to extract rare earth elements.

Postdoctoral Researcher 2019-2020
Computer Science Department, Friedrich-Alexander University Nuremberg, Erlangen, Germany

- Project-1: Particle resolved LBM simulations of gas-solids flow using the source codes WalBerla and Physics Engine.
- Project-2: Free surface and phase-field LBM simulations for the prediction of foaming in multiphase flows using source code WalBerla.

Doctorate Researcher
2012-2019

Chemical Engineering Department, Indian Institute of Technology Delhi, New Delhi, India

- Project-1: Dynamics of Unary and Binary Gas-Solid Flows in a Cylindrical Fluidized Bed: Electrical Capacitance Tomography Measurements and CFD Simulations.
- Project-2: Dynamics of gas-liquid flow in a cylindrical bubble column: Comparison of electrical resistance tomography and voidage probe measurements.
- Project-3: Feasibility of Electrical Resistance Tomography for measurements of liquid holdup distribution in a trickle bed reactor.
- Project-4: Predictions of filtration efficiency of fibrous filter through Euler-Lagrange simulation using OpenFOAM

M.Tech. Researcher
2010-2012

Computer-Aided Process Plant Design, Chemical Engineering Department, Indian Institute of Technology Roorkee, Uttarakhand, India

- Project-1: CFD simulations of underground coal gasification.
- Project-2: Design of a loop heat pipe.

Technical Skills

- **Multiphase Measurement Techniques**: Electrical Capacitance Tomography, Electrical Resistance Tomography, Particle Image Velocimetry, Voidage Probe, and High-Speed Imaging and Processing.
- **Simulation Software**: OpenFOAM, ANSYS Fluent, Aspen, FactSage, MATLAB, waLBerla, and COMSOL.
- **Programming Languages**: C/C++ and Python.

Journal Publications

Review Articles

- Hassan Gezzaz**, Brajesh K. Singh,** Jaber Shabanian, Mohammad Latifi, Jamal Chaouki, "Review on Carbo-thermal Production of Phosphate Ore to Produce Phosphorus Gas." *Under preparation.*
- **Brajesh K. Singh,** Mohammad Latifi, Jamal Chaouki, "Integration of Renewable Hydrogen Sources with Haber-Bosch Process: Challenges and Opportunities." *Under preparation.*

Research Articles

- **Brajesh K. Singh,** Hassan Gezzaz**,** Jaber Shabanian, Mohammad Latifi, Jamal Chaouki**,** "Decomposition and Carbothermal Reduction of Different Grades of Phosphate Ore: Thermodynamic Evaluation of Phosphorus Production." *Under preparation.*
- Roshanak Rabbiee, **Brajesh K. Singh**, Jaber Shabanian, Mohammad Latifi, Jamal Chaouki, "Prediction of Gas Induced Mixing Behavior of Viscous Liquid in Top-submerged Lance Reactor." *Under preparation.*

- **Brajesh K. Singh,** Shantanu Roy, and Vivek V. Buwa. "Bubbling/slugging flow behavior in a cylindrical fluidized bed: ECT measurements and two-fluid simulations." Chemical Engineering Journal 383 (2020): 123120.
- **Brajesh K. Singh,** Shantanu Roy, and Vivek V. Buwa. "Dynamics of segregation and fluidization of binary mixtures in a cylindrical fluidized bed." AIChE Journal 65.10 (2019): e16682.
- **Brajesh K. Singh,** Ekta Jain, and Vivek V. Buwa. "Feasibility of Electrical Resistance Tomography for measurements of liquid holdup distribution in a trickle bed reactor." Chemical Engineering Journal 358 (2019): 564-579.
- **Brajesh K. Singh,** Abdul Quiyoom, and Vivek V. Buwa. "Dynamics of gas-liquid flow in a cylindrical bubble column: Comparison of electrical resistance tomography and voidage probe measurements." Chemical Engineering Science 158 (2017): 124-139.
- **Brajesh K. Singh,** Shantanu Roy, and Vivek V. Buwa. "Effect of Solid-Phase Viscosity on Bubbling/Slugging in a Cylindrical Fluidized Bed." *Under review.*

Conference Publications and Presentations

- **Brajesh K. Singh**, Shantanu Roy, Vivek V. Buwa, Effect of Solid Phase Viscosity on Unary and Binary Gas-Solid Fluidization: ECT Measurements and CFD Simulations, presented at Fluidization XVI, Guilin (China), 2019.
- Sirisha Parvathaneni, **Brajesh K. Singh**, Vivek V. Buwa, Characterization of Polydisperse and Binary Gas-Solid Flow in a Semi-Batch Fluidized Bed using Electrical Capacitance Tomography, presented at International Symposium on Chemical Reaction Engineering (ISCRE 25), Florence (Italy), 2018.
- **Brajesh K. Singh**, Shantanu Roy, Vivek V. Buwa, Characterization of Dynamics of Unary and Binary Gas-Solid Flow in a Cylindrical Fluidized Bed using Electrical Capacitance Tomography, presented at Gas-Liquid and Gas-Liquid-Solid Reactor Engineering (GLS 13), Brussels (Belgium), 2017.
- **Brajesh K. Singh**, Ekta Jain, Vivek V. Buwa, Measurements of Liquid Volume Fraction Distribution in a Packed Bed using Electrical Resistance Tomography and Voidage Probes, presented at Gas-Liquid and Gas-Liquid-Solid Reactor Engineering (GLS 13), Brussels (Belgium), 2017.
- **Brajesh K. Singh**, Dominik Schuster, Christoph Rettinger, Ulrich Rude, Vivek V. Buwa, Gas-Solid Flow in Fluidized Bed: Lattice Boltzmann Simulation and Experimental Verification, presented at Discrete Simulation of Fluid Dynamics (DSFD 26), Erlangen (Germany), 2017.
- **Brajesh K. Singh**, Ekta Jain, and Vivek V. Buwa, Spatial- and Time-resolved Measurements of Liquid Hold-up Distribution in a Packed Bed using Electrical Resistance Tomography and Voidage-Probes, presented at International Conference on Multiphase Flow (ICMF 9), Florence (Italy), 2016.
- **Brajesh K. Singh**, Shantanu Roy, Vivek V. Buwa, Dynamics of Unary and Binary Gas-Solid Flows: ECT Measurements and CFD Simulations, presented at Gas-Liquid and Gas-Liquid-Solid Reactor Engineering (GLS 12), New York (USA), 2015.
- **Brajesh K. Singh**, Abdul Quiyoom, Shantanu Roy, Vivek V. Buwa, Instantaneous and Time-averaged Gas Volume Fraction Measurements in a Cylindrical Bubble Column: Comparison of Electrical Resistance Tomography and Voidage Probe Measurements, presented at International Union of Theoretical and Applied Mechanics (IUTAM), Hyderabad (India), 2014.
- **Brajesh K. Singh**, Shantanu Roy, Vivek V. Buwa, Characterization of Gas-Solid Flows in a Fluidized Bed using Electrical Capacitance Tomography, presented at International Symposium on Chemical Reaction Engineering (ISCRE 23), Bangkok (Thailand), 2014.