

**Jayanta Chakraborty**

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**EDUCATION**

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**August 2008-June 2010:** School of Chemical Engineering, Purdue University, USA.  
Postdoctoral Research Associate, Advisor: Professor Doraiswami Ramkrishna.  
Projects: Modeling of evolution of crystal morphology, modeling of milling.

**January 2005-August 2008:** Department of Chemical Engineering, Indian Institute of Science, India  
Ph.D. in Chemical Engineering, Advisor: Professor Sanjeev Kumar Gupta  
Dissertation: “*Modeling and Simulation Frameworks for Synthesis of Nanoparticles*”

**August 2002- August 2004:** Department of Chemical Engineering, Indian Institute of Science, India.  
M.E. in Chemical Engineering. Advisor: Professor Giridhar Madras  
Master’s Thesis: “Ultrasonic and Microwave Assisted Degradation of Polymers”

**July 1997-August 2001:** Department of Chemical Engineering, Jadavpur University, Kolkata, India.  
B.E. in Chemical Engineering (First Class with Hons.)

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**PROFESSIONAL EXPERIENCE**

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**May 2017-Present:** Indian Institute of Technology, Kharagpur, India.  
Assistant Professor of Chemical Engineering.

**Aug 2016-May 2017:** Purdue University, West Lafayette, USA.  
Visiting Assistant Professor of Chemical Engineering.

**July 2011-Aug 2016:** Indian Institute of Technology, Kharagpur, India.  
Assistant Professor of Chemical Engineering. [Assumed additional responsibility as Assistant Professor, School of Energy Science and Engineering, Indian Institute of Technology, Kharagpur, since Fall 2015]

**July 2010-July 2011:** Indian Institute of Technology, Kharagpur, India.  
Assistant Professor of Chemical Engineering (Tenure Track).

**Aug. 2008-December 2008:** Purdue University, School of Chemical Engineering, West Lafayette, IN,  
USA Instructor for CHE 434.

**September 2004-Dec 2004:** Heritage College of Engineering, Kolkata  
Visiting Lecturer.

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## RESEARCH AREAS

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Synthesis of metal, metal oxide and alloy nanoparticles, production of nano-powder, stability of colloidal suspensions, continuous synthesis of nanoparticles, phase transfer of nanoparticles, formation of colloidal super lattice.

Crystal shape engineering: control of crystal morphology using additives, measurement of crystal shape.

Population balance modeling, Numerical solution techniques for multidimensional population balance equation, modeling of crystal shape distribution using morphological population balance modeling, Inverse problems in population balances.

Production of aluminum doped zinc oxide films using sol-gel technique, production of mesoporous layer of nanoparticles/nano-rods on conducting glass; assembly and testing of dye sensitized solar cells.

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## TEACHING\*

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- PG Electives:
  - Process modeling and simulation.
  - Fundamentals of particle technology.
  - Solar photovoltaic technology and systems.
- UG Core subjects
  - Transport Phenomena
  - Computer aided process engineering
  - Chemical Process Calculations
  - Heat transfer
  - Mass Transfer
  - Separation Processes
  - Chemical Reaction Engineering
  - Engineering Statistics
- UG Laboratories
  - Computer aided process engineering
  - Heat transfer
  - Mechanical operations
  - Chemical engineering design
  - Process control
- PG Core subjects
  - Renewable energy resources

[\* According to institute regulation, all subjects should be taken by two faculties. Hence, JC has taken 50% of the lectures/laboratories for most of the subjects mentioned. Some of the subjects are taken while at Purdue University]

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## RESEARCH STUDENTS

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- B-Tech projects supervised: 28
- M-Tech Projects supervised: 20
- PhD Project Supervised: 1
- Ongoing Ph. D Projects:
  - Efficient synthesis of nanomaterials and films for dye sensitized solar cells. Research Scholar: Mr. Surajit Ghosh (Completed four years)
  - Continuous synthesis of nanoparticles. Research Scholar: Netai Chandra Maji (completed three years).

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## PUBLICATIONS

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1. Economical and high throughput synthesis of copper nanopowder using continuous stirred tank and tubular flow reactors by Swarnendu Chatterjee, Nitai Chandra Maji, Aabid Hussain Shaik, **J. Chakraborty**, *Chemical Engineering Journal*, 304 (241–250) (2016)
2. Rapid synthesis of zinc oxide nanoforest: use of microwave and forced seeding by Surajit Ghosh, **J. Chakraborty**, *Materials Research Express*, 3 (125004) (2016)
3. A simple room temperature fast reduction technique for the preparation of copper nanosheet powder by Aabid Hussain Shaik and **J. Chakraborty** RSC Advances, 6 (14952-14957) (2016)
4. Synthesis of monodisperse copper nanoparticles using a modified digestive ripening technique and formation of superlattices. by A. H. Shaik and **J. Chakraborty** RSC Advances, 2015, **5**, 85974-85977
5. Obviating the post annealing step in sol-gel synthesis of aluminum doped zinc oxide coated conducting glass using rapid thermal treatment by S. Ghosh and **J. Chakraborty** *Thin Solid Films*, (accepted).
6. Stability of Crystallizer Producing Shape Engineered Crystals by K. Pal and **J. Chakraborty** *Industrial and Engineering Chemistry Research*, **In Press** (2015)
7. Inverse Problem in Population Balances: Determination of Aggregation Kernel by Weighted Residuals by **J. Chakraborty**, J. Kumar, M. Singh, A. Mahoney and D. Ramkrishna *Industrial and Engineering Chemistry Research*, 2015, **54** (42), pp 10530–10538
8. P. P. Chowdhury, A. H. Shaik and **J. Chakraborty**. Preparation of stable, sub 10 nm copper nanopowders re-dispersible in polar and non-polar solvents. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*. **466** (2014), 189-196.
9. A. H. Shaik and **J. Chakraborty**. Use of repeated phase transfer for preparation of thiol coated copper organosols at higher particle loading. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*. **456** (2014), 46-56.

10. A. Dutta, **J. Chakraborty**, B. L. V. Prasad and P. Sahu. Synthesis and in-situ observation of 3D Superlattices of gold nanoparticles using oil-in-water emulsion. *Journal of Colloid and Interface Science*. **420** (2014), 41-49
11. N. Singh, R. Yeri and **J. Chakraborty**. Effect of Ionic Surfactants and Alcohols on the Morphology of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  Crystals: Combined Use of Factors and Significance of Threshold Surfactant Concentration. *Industrial & Engineering Chemistry Research*. **52** (2013), 15041-15048
12. M Singh, **J Chakraborty**, J Kumar and R Ramakanth. Accurate and efficient solution of bivariate population balance equations using unstructured grids. *Chemical Engineering Science*, **93** (2013), 1-10
13. **J Chakraborty**, D Sarkar, A Singh and A. K. Bharti. Measuring the Three-Dimensional Morphology of Crystals Using Regular Reflection of Light. *Crystal Growth & Design* **12** (2012), 6042-6049
14. Meenesh R. Singh, **Jayanta Chakraborty**, Nandkishor Nere, Hsien-Hsin Tung, Shailendra Bordawekar and Doraiswami Ramkrishna, "Image-Analysis-Based Method for 3D Crystal Morphology Measurement and Polymorph Identification Using Confocal Microscopy" *Crystal Growth & Design* **12** (2012), 3735-3748
15. Manish Kumar Niranjana, **Jayanta Chakraborty**, "Synthesis of oxidation resistant copper nanoparticles in aqueous phase and efficient phase transfer of particles using alkanethiol". *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, **407** (2012), 58-63
16. **Jayanta Chakraborty** and Doraiswami Ramkrishna, "Population balance modeling of environment dependent breakage: role of granular viscosity, density and compaction. Model formulation and similarity analysis". *Ind. Eng. Chem. Res.*, **50** (2011) 13116-13128
17. **Jayanta Chakraborty**, Meenesh R. Singh, Doraiswami Ramkrishna, Christian Borchert and Kai Sundmacher, "Modeling of crystal morphology distributions. Towards crystals with preferred asymmetry." *Chemical Engineering Science*, **65** (2010), 5676-5686.
18. Sivendra Singh Chauhan, **Jayanta Chakraborty** and Sanjeev Kumar. "On the solution and applicability of bivariate population balance equations for mixing in particle phase" *Chem. Eng. Sci.*, **65** (2010), 3914-3927.
19. **Jayanta Chakraborty** and Doraiswami Ramkrishna, "Identification of Markov Matrices of Milling Models," *Ind. Eng. Chem. Res.* **48** (2009), 9763-9771
20. **Jayanta Chakraborty** and Sanjeev Kumar "A new framework for solution of multidimensional population balance equations," *Chem. Eng. Sci.*, **62** (2007), 4112-4125
21. Vijaylakshmi S. P., **Jayanta Chakraborty** and Madras G., "Thermal and microwave-assisted oxidative degradation of poly(ethylene oxide)", *Journal of Applied Polymer Science*, **96** (2005), 2090-2096

22. **Jayanta Chakraborty**, Sarkar J, Kumar R. and G. Madras, “Ultrasonic degradation of poly(butadiene) and isotactic polypropylene”, *Polymer degradation and stability*, **85** (2004), 555-558

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## PRESENTATIONS

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1. Jayanta Chakraborty and Aabid Hussain Shaik. Synthesis and phase transfer of Cu nanostructures. Hydrophobic Conference 2016, KAUST, Saudi Arabia.
2. Jayanta Chakraborty, Surajit Ghosh and Sashibhushan Barnawal. A new method for preparation of AZO glass and their performance evaluation towards dye sensitized solar cells. ICMAT 2015, Singapore.
3. Jayanta Chakraborty, Debasis Sarkar and Abhishek Singh. Measurement of Crystal Morphology: A New Method Based on Reflection of Light From Crystal Faces. AIChE Annual Meeting, Pittsburgh, USA 2012
4. Manish Niranjana, Jayanta Chakraborty and Aabid Hussain Shaikh. Synthesis and Phase Transfer of Oxidation Resistant Copper Nanoparticles to Various Organic Solvents. AIChE Annual Meeting, Pittsburgh, USA 2012
5. Meenesh Singh, *Jayanta Chakraborty* and Doraiswami Ramkrishna “Population Balance Modeling of morphology distribution of asymmetric crystals” AIChE Annual Meeting, Salt Lake City, November 2010.
6. Meenesh Singh, *Jayanta Chakraborty* and Doraiswami Ramkrishna “Morphological measurements of faceted crystals using image analysis.” AIChE Annual Meeting, Salt Lake City, November 2010.
7. *Jayanta Chakraborty, Meenesh Singh, Doraiswami Ramkrishna* "Population Balance Modeling of Faceted Asymmetric Crystals." ISCRE 21, Philadelphia, June 2010
8. *Jayanta Chakraborty* and Doraiswami Ramkrishna. “Markov Chain modeling of milling processes” at AIChE annual meeting, Nashville, November 2009
9. *Jayanta Chakraborty* and Sanjeev Kumar, “Prediction of Large Population Behaviour from Extremely Fast and Statistically Inadequate Kinetic Monte-Carlo Simulations”, at 4th Asian Particle Technology Symposium, New Delhi, September 14-16, 2009
10. D. Mohana Rao, M. Anusha, **J. Chakraborty**, S. Sankar Kalidas, Sanjeev Kumar, and S. Venugopal, "*Kinetics and modeling of gold nanoparticle formation*", at CHEM FERENCE, Chennai, August 2009
11. **Jayanta Chakraborty**, S. Venugopal, Sanjeev Kumar, “Understanding Bottom up Synthesis of (Gold) Nanoparticles” at Unilever Research Center, Bangalore, June 3, 2009.
12. **Jayanta Chakraborty**, M.K. Nandanwar and Sanjeev Kumar, “A New discretization of space for solution of multidimensional population Balance equations”, at The third international conference on population balance modeling, Quebec City, Quebec, Canada. September 2007

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### BOOK PUBLISHED

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1. 'Engineering of submicron particles: theory and modeling'. Publishing Agreement signed with Wiley.

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### INVITED LECTURES

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2. 'Nanofluids in heat exchange: current scenario and practical challenges.' Lecture delivered at NIT Durgapur at 'A summer course on design and optimization of heat exchangers.'

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### PROJECTS

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1. Production of monodispersed nanoparticles for a large class of materials using heat treatment based post processing technique. **PI: Dr. Jayanta Chakraborty** (2011-2014) Sponsor: SRIC, IIT Kharagpur **(Completed)**
2. Development of continuous methods for manufacturing of flexible transparent conducting surfaces using Cu based nanowire inks. **PI: Dr. Jayanta Chakraborty**, Co-PI: Dr. J. N. Roy **(Revised proposal under consideration at MNRE)**
3. Assessment of Technology for TCO Manufacturing. (Consultancy project) **PI Jayanta Chakraborty**. Sponsor: Sudha Industries, Kolkata. **(Completed)**
4. Reduction of use of water for classification of particulate product (Consultancy project under process)

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### MAJOR ADMINISTRATIVE RESPONSIBILITIES

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- Assistant warden, Azad Hall of Residence, IIT Kharagpur
- Faculty Advisor: 12CH Batch of B-Tech and Dual degree students
- Departmental research scholar coordinator