

Curriculum Vitae

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PERSONAL DATA

Born on November 24, 1969 at Calcutta, India; Male; Married.

PRESENT POSITION

Assistant Professor, Department of Chemical Engg, Indian Institute of Technology Kanpur, India; 22nd Sept., 2003 - to date.

WORK EXPERIENCE

Postdoctoral researcher, Department of Chemical Engg., Univ. of California at Los Angeles, Los Angeles, USA, 2002-2003.

Postdoctoral researcher, Dept. of Materials Sc. & Engg., Univ. of Utah, Salt Lake City, USA, 2001-2002.

Postdoctoral researcher, Dept. of Chemical Engg., Ben-Gurion Univ. of the Negev, Beer-Sheva, Israel, 2000-2001.

EDUCATION

Ph. D., Chemical Engg., Indian Institute of Science, Bangalore, India, 2000.
Thesis: Modeling of precipitation in reverse micelles
Advisor: Prof. R. Kumar, Prof. K. S. Gandhi
(N. R. Kuloor memorial award for best PhD thesis in Chemical Engg., Dept., IISc, Bangalore, for the period 1999-2001).

M. E. (Distn.), Chemical Engg., Indian Institute of Science, Bangalore, India, 1994. First Class with Distinction (Grade point: 7.2/8.0, Rank: 2/10).
Thesis: Precipitation in emulsion-emulsion reaction

B. Ch. E. (Hons.), Chemical Engg., Jadavpur University, Calcutta, India, 1992.
First Class with Honours (Marks: 85.50 %, Rank: 3/60)
Thesis: Software for optimum heat exchanger design

AREAS OF RESEARCH

- Nanomaterials: Nanoparticles, porous materials, nanotubes, thin films
- Colloid and interfacial science: Self-assembly, switchable surfaces
- Nanocomposites: Silica-polymer, polymer-nanotube, silica-nanoparticle
- Mathematical modeling: Population balance, Monte Carlo simulation
- Aerosols: Measurement, simulation

HONORS AND AWARDS

N. R. Kuloor memorial medal, (best PhD thesis in Chemical Engg., IISc, Bangalore, awarded biannually), 2002.

Research Fellowship, IISc, Bangalore, 1994-1999.

GATE Scholarship, (for all India ranking of 98.5 percentile), 1992-94.

Dr. H. L. Roy Memorial Medal (first position in Grand-Viva of Chemical Engg., Jadavpur University, Calcutta), 1992.

National Merit Scholarship (state level rank in Higher Secondary examination, West Bengal), 1988.

TEACHING

As instructor: (2004-06)

Modeling and simulation in chemical engineering (developed the course and its contents for postgraduate and senior undergraduates) - taught 4 times.

Electronic, polymeric and ceramic materials and processing (4-th year undergraduates) – taught 2 times.

Unit operation laboratory (4-th year undergraduates) – instructed twice.

As tutor: (2004-06)

Fluid mechanics and rate processes (2-nd year undergraduates) – tutored once.

As guest lecturer:

IIT Kanpur: Nanomaterials and nanotechnology (2004), Thermodynamics (2004).
UCLA, Los Angeles: Advanced mass transfer (2003), Fundamentals of aerosol science (2002).

IISc, Bangalore: Nonlinear dynamics and chaos (1998, 1999).

RESEARCH SUPERVISION

Ph.D.

Experimental investigations in air-water interfacial systems (Sandip Patil, 2006-ongoing, jointly with Prof. A. Sharma).

Nanoparticle formation induced by evaporation of soluble materials: Experiments and models (C. Ravikumar, 2006-ongoing).

Mechanism of formation of nanoparticles in soft and hard templates and delivery applications (Sudhir K. Singh, 2006-ongoing).

Modeling and simulation of nanoparticle formation in water-in-oil microemulsions (M. Ethayaraja, 2003-ongoing).

M. Tech.

Engineering thin mesoporous films for development of sensors (Krishnarao Korada, 2006-ongoing).

Thin film coatings of CdS nanoparticles for display applications (Asheesh Shukla, 2006-ongoing).

Molecular dynamics simulation of clustering and nucleation of metal atoms (Alka Kumari, 2005-ongoing).

Measurements and simulation of indoor aerosols (Anirban Roy, 2005-ongoing).

Mesoporous silica-polymer nanocomposites for enhanced mechanical performance (M. Venkatasivaiah, 2005-ongoing).

Simulation of nucleation, coagulation and sintering in nanoparticulate aerosol aggregate formation (Natasha Kataria, 2004-06).

Functionalization and composites of mesoporous silica as adsorbents and sensor (Dipak B. Patel, 2004-06).

Monte Carlo simulation of nanoparticle formation in reverse micelles (Kanchan Dutta, 2003-05).

Mesoporous silica and nanoparticle composite: Analysis of structure and formation mechanism (Sanjoy Saha, 2003-05).

B. Tech.

Silylation of mesoporous silica for benzene extraction from benzene-water system (Saurabh Singh, 2006).

Preparation of mesoporous silica containing congo red dye as a pH sensor (Sandeep Singh, 2006).

Rheological study of water-in-oil microemulsion of laponite clay dispersion (Mansi Tewari, 2006, jointly with Prof. Y. M. Joshi).

Modeling of carbon nanotubes synthesis (Rachit Agrawal, Robin Gupta, 2005, jointly with Prof. D. Kunzru).

Simulation of DNA hybridization on a substrate (Tushit Roy, 2005).

Simulation of self-assembly of surfactant molecules (Deependra S. Nayal, 2004).

RESEARCH FUNDING

- Mechanism of formation and control of size and morphology of nanoparticles in liquid phase self-assembled templates, Department of Science and Technology, (as principal investigator), 2006-2009, Rs. 24 lakhs.
- Scanning mobility particle sizer (SMPS) for gas borne nanoparticulate system, Care Scheme (IIT Kanpur), (as Co-principal investigator with Prof. S. N. Tripathi), 2005-ongoing, Rs. 31.8 lakhs.
- Engineering thin mesoporous films for development of sensor, Ministry of Human Resource and Development, (as principal investigator), 2005-2008, Rs. 20 lakhs
- As a member of the contributing team to DST Unit/Centre on Nanosciences, Department of Science and Technology, 2005-2009. Co-ordinator: Prof. A. Sharma.

- Thin mesoporous silica films by liquid phase self-assembly, Initiation scheme (IIT Kanpur), (as principal investigator), 2004, Rs. 8.6 lakhs.

PROFESSIONAL ACTIVITIES

Session chair (for the session: Material Synthesis and Nanoparticle Technology) in 4-th Asian Aerosol Conference, Bombay, December 2005.

Panelist and session chair (for the session: Fundamentals and Overall Opportunities) in the Nanoparticle Aerosol Science and Technology workshop, held jointly between Indian and US scientists in Bombay, December, 2005. Conducted panel discussions and compiled research recommendations from this workshop.

Member, Technical committee, and reviewer of submitted papers in 4-th Asian Aerosol Conference, Bombay, December, 2005.

Nanomaterials for Spacecraft Structural and Thermal Applications, discussion and technical sessions, ISRO Satellite Centre, Bangalore, October, 2005.

Workshop on SAXS for Nanotechnology, IIT Bombay, July, 2005.

Joint course co-ordinator (with Prof. A. Sharma) and lecturer in the DST sponsored short-term course on Colloids and Interfaces: Fundamentals and Research Challenges, IIT Kanpur, February 2005.

Session chair (for the session Nanotechnology) of Indo-US joint Chemical Engg. Congress, Chemcon 2004, Bombay, December, 2004.

Technical committee member of International conference on Aerosol, Cloud and Indian Monsoon, IIT Kanpur, November, 2004.

Organizing committee member of first Indo-US workshop on 'Futuristic Manufacturing: Generative Manufacturing, Self-Assembly and Micro-Electro-Mechanical Systems', IIT Kanpur, March, 2004.

Reviewer of papers for following journals:

Indian Chemical Engineer, Colloids and Surfaces, J. Materials Research, Advanced Materials, J. Nanoscience and Nanotechnology, Nanotechnology, Surface Science, J. Physical Chemistry B., J. American Chemical Society, Current Science.

Reviewer of research proposals submitted to Department of Science and Technology (DST), India.

Affiliation: Member, American Physical Society, 2001-02.
Member, Materials Research Society, USA, 2002-03.
Life member, Indian Society for Advancement of Materials and
Process Engineering, 2006 onwards.

ADMINISTRATIVE WORK

Convener, Chemical Engg. undergraduate committee, IIT Kanpur (2005-onwards).

Faculty Counselor, Student counseling service, IIT Kanpur (2004-onwards).

OTHER DEVELOPMENTAL WORK

Designed and developed a laboratory on Colloids and Nanomaterials at Chemical Engg. Dept., IIT Kanpur; with applications in thin film, nanoparticles, porous materials, composites etc., 2004-2005.

It has facilities like photo resist spinner, rotary vacuum pump, ultrasonicator, wet bench, electronic balance, fume hood, high speed centrifuge, high temperature furnace, hot air oven, scanning mobility particle sizer etc. Facilities to be acquired soon include, UV-Visible spectrometer, dynamic light scattering, water purification system, controlled temperature bath, optical microscope etc.

Designed and built a continuous emulsion liquid membrane column under a AICTE project at Jadavpur University, Calcutta, 1996-97.

PUBLICATIONS

Total number of citation of all papers published so far is about 226.

Refereed Journals:

1. Bandyopadhyaya R, Kumar, R., Gandhi, K. S., Ramkrishna, D.,
Modeling of precipitation in reverse micellar systems, **Langmuir**, 1997, 13(14),
3610-3620.
2. Bandyopadhyaya R, Bhowal, A., Datta, S., Sanyal, S., K.,
A new model of batch-extraction in emulsion liquid membrane: Simulation
of globule-globule interaction and leakage, **Chemical Engng. Science**, 1998,
53(15), 2799-2807.

3. Bandyopadhyaya R, Kumar, R., Gandhi, K. S.,
Simulation of precipitation reactions in reverse micelles, **Langmuir**, 2000, 16(18), 7139-7149.
4. Bandyopadhyaya R, Kumar, R., Gandhi, K. S.,
Modeling of CaCO₃ nanoparticle formation during overbasing of lubricating oil additives, **Langmuir**, 2001, 17(4), 1015-1029
5. Bandyopadhyaya R, Nativ-Roth, E., Regev O., Yerushalmi-Rozen, R.,
Stabilization of individual carbon nanotubes in aqueous solutions, **Nano Letters**, 2002, 2(1), 25-28.

This paper was highlighted in following two journal articles.

Highlights of the recent literature: Editor's choice
Nonadhesive Gum Arabic, **Science**, December 2001, v 294, pp 2253.

Sugary ways to make nanotubes dissolve, **Chemical & Engineering News**
(American Chemical Society), July 2002, 80 (28), 38-39.

6. Bandyopadhyaya R, Nativ-Roth, E., Yerushalmi-Rozen, R., Regev O.,
Transferable thin films of mesoporous materials, **Chemistry of Materials**, 2003, 15(19), 3619-3624.
7. Borodin, O., Smith, G. D., Bandyopadhyaya, R., Bytner, O.,
Molecular dynamics simulation of solid interfaces on poly(ethylene oxide) structure and dynamics, **Macromolecules**, 2003, 36(20), 7873-7883.
8. Bandyopadhyaya, R., Lall, A. A., Friedlander, S. K.,
Aerosol dynamics and the synthesis of fine solid particles, **Powder Technology**, 2004, 139(3), 193-199.
9. Borodin, O., Smith, G. D., Bandyopadhyaya, R., Redfern, P., Curtis, L., S.,
Molecular dynamics study of nanocomposite polymer electrolyte based on poly(ethylene oxide)/LiBF₄, **Modeling and Simulation in Materials Science & Engng.**, 2004, 12(3), S73-S89.
10. Bandyopadhyaya, R., Rong, W., Friedlander, S. K.,

Dynamics of chain aggregates of carbon nanoparticles in isolation and in polymer films: Implications for nanocomposite materials, **Chemistry of Materials**, 2004, 16(16), 3147-3154.
11. Ethayaraja, M., Dutta, K., Bandyopadhyaya, R.,

- Mechanism of nanoparticle formation in self-assembled colloidal templates: Population balance model and Monte Carlo simulation, **J. Physical Chemistry B**, 2006, 110(33), 16471-16481.
12. Kulkarni, M. M., Bandyopadhyaya, R., Bhattacharya, B., Sharma, A.,
Microstructural and mechanical properties of Silica-PEPEG polymer composite xerogels, **Acta Materialia**, 2006, 54(19), 5231-5240.
 13. Ethayaraja, M., Bandyopadhyaya, R.,
Population balance models and Monte Carlo simulation for nanoparticle formation in water-in-oil microemulsions: Implications for CdS synthesis, **J. American Chemical Society**, 2006, 128(51), 17102-17113.
 14. Ethayaraja, M., Dutta, K., Muthukumaran, D., Bandyopadhyaya, R.,
Nanoparticle formation in water-in-oil microemulsions: Experiments, mechanism and Monte Carlo simulation, **Langmuir**, 2007 (accepted).
 15. Ethayaraja, M., Ravikumar, C., Muthukumaran, D., Dutta, K., Bandyopadhyaya, R.,
CdS-ZnS core-shell nanoparticle formation: Experiment, mechanism and simulation, **J. Physical Chemistry C**, 2007 (accepted).
 16. Ethayaraja, M., Bandyopadhyaya, R.,
Mechanism and Modeling of Nanorod Formation from Nanodots, (submitted to **J. American Chemical Society**), 2006.
 17. Dutta, K., Bandyopadhyaya, R.,
Universal trend in the effect of nucleation and growth on final nanoparticle size in self-assembled templates, (to be submitted to **Colloids and Surfaces**), 2006.
 18. Saha, S., Bandyopadhyaya, R.,
Analysis of structure and formation mechanism of mesoporous silica-nanoparticle composite (to be submitted to **Langmuir**), 2006.
 19. Patel, D. B., Singh, S., Bandyopadhyaya, R.,
Silylation and benzene adsorption study in mesoporous silica (to be submitted to **Langmuir**), 2006.
 20. Venkatasivaiah, M., Bhattacharya, B., Bandyopadhyaya, R.,
Origin of enhanced mechanical properties and damping characteristics of polyester-mesoporous silica composites, (to be submitted to **Macromolecules**), 2006.
 21. Kulkarni, M. M., Bandyopadhyaya, R., Sharma, A.,
Transferrable Janus silica film grown at oil-water interface with superhydrophobic and hydrophilic surfaces, (to be submitted to **Chemistry of Materials**), 2006.

Book Chapter:

Book chapter on **Thin films and nanoparticle composites of mesoporous silica and related classes of ceramics**, in the Handbook of Nanoceramics and Their Based Nanodevices (under preparation). To be published by American Scientific Publishers.

Conference Proceedings:

1. Bandyopadhyaya R, Dutta, T. K.,
Optimum heat exchanger replacement policy by monte carlo simulation, Chemcon (Indian Chemical Engg. Congress), 1996.
2. Bandyopadhyaya, R., Nativ-Roth, E., Regev, O., Yerushalmi-Rozen, R.,
Utilizing old Egyptian wisdom for stabilization of individual carbon nanotubes in aqueous dispersions, Mat. Res. Soc. Symp. Proc., USA, Vol. 706 (Making Functional Materials with Nanotubes), 2002, pp 313-321.
3. Bandyopadhyaya, R., Rong, W., Suh, Y. J., Friedlander, S. K.,
Dynamics of nanoparticle chain aggregates of carbon under tension, Mat. Res. Soc. Symp. Proc., USA, Vol. 778, 2003.
4. Lall, A. A., Bandyopadhyaya, R., Friedlander, S. K.,
The effect of maximum temperature and quench rate on fine solid particle formation by flame synthesis and laser ablation, American Institute of Chemical Engineers (AIChE) annual conference CD-ROM, 2003.
5. W. Rong, R. Bandyopadhyaya, S. K. Friedlander,

Dynamics of nanocomposites of carbon nanoparticle chain aggregates in polymers, American Institute of Chemical Engineers (AIChE) annual conference CD-ROM, 2003.
6. Dutta, K., Saha, S., Bandyopadhyaya, R.,
Self-assembled amphiphilic molecules as templates for nanostructures, Chemcon (Indian Chemical Engg. Congress), 2005, pp 279.
7. Ethayaraja, M., Bandyopadhyaya, R.,
Modeling of nanoparticle formation in water-in-oil microemulsion, Chemcon (Indian Chemical Engg. Congress), 2005, pp 104-105.
8. Gupta, R., Agrawal, R., Bandyopadhyaya, R., Kunzru, D.,

Modeling of carbon nanotube synthesis in a tubular aerosol reactor, AAC 2005 (4-th Asian Aerosol Conference), Bombay, India, 2005.

ORAL PRESENTATIONS:

Invited talks:

Colloidal and multiphase systems for nanomaterials, Workshop on Colloids and Materials Chemistry, Regional Research Laboratory (RRL), Bhubaneswar, January, 2007.

Structure and Dynamics in Multiphase Systems for Nanomaterials Synthesis and Applications, First Indo-UK Nanotechnology Conference, British Council and S. N. Bose National Centre for Basic Sciences, Calcutta, November, 2006.

Nanostructured composites, short-term course on Recent Trends in Nanocomposites, IIT Kanpur, November, 2006.

The world of nanoparticles and nanocomposites, Nanotechnology Workshop, IIT Madras, October, 2006.

Nanoparticle aerosol science and technology (NAST): Fundamentals and overall opportunities, NAST workshop, Bombay, December, 2005.

Aerosol and colloidal route to materials at nanoscale, National Symposium on Chemical Engineering – The Journey Ahead, IISc, Bangalore, June, 2005.

Self-assembly in colloidal systems, Nanotechnology Symposium, IIT Bombay, March 2005.

A series of 4 invited lectures in the short-term course on Smart Materials: Opportunities and Future Challenges, NIT Allahabad, December, 2004.

Surfactant self-assembly: From nanometric particles to pores, Indo-US winter school on Futuristic Manufacturing, IIT Kanpur, December, 2004.

Effect of substrate on structure of thin films, 4-th Israel-German Minerva summer school on Molecular, Interfacial and Biological aspects of Mesostructures, Kibbutz Mashabei Sade, Israel, April, 2001.

Modeling of precipitation in reverse micelles, 4th Stadler symposium on Mesoscale Organization, Beer Sheva, Israel, April, 2000.

Contributing/Other Talks:

From molecules to materials: Surfactants as building block, National Chemical Laboratory, Pune, April, 2006.

Self-assembled template route to nanoscale materials and processes, Samtel Display Centre, IIT Kanpur, February, 2006.

Self-assembled amphiphilic molecules as templates for nanostructures, IIT-National Univ. of Singapore joint session, Chemcon (Indian Chemical Engg. Congress), Delhi, December, 2005.

Carbon nanotube: Modeling and interfacial engineering, 4-th Asian Aerosol Conference, Bombay, December, 2005.

Thermodynamics of interfaces, a series of two lectures in the short-term course on Colloids and Interfaces: Fundamentals and Research Challenges, IIT Kanpur, February 2005.

Nanoparticle chain aggregates and polymer composites, Indo-US joint Chemical Engg. symposium, Chemcon (Indian Chemical Engg. Congress), Bombay, December 2004.

Reinforcement by nanoparticle chain aggregates of carbon synthesized by laser ablation, International Symposium on Aerosols, Clouds and Indian monsoon, IIT Kanpur, November, 2004.

Dynamics of nanoparticle chain aggregates of carbon under tension, Annual meeting of Materials Research Society, San Francisco, USA, April, 2003.

Effect of fillers on structure and dynamics of polymer nanocomposites, Annual meeting of American Physical Society, Indianapolis, USA, March, 2002.

Surfactants as building blocks: From Nanoparticles to mesopores, U. Amsterdam, Netherlands, March, 2001.

A generalized model of nanoparticle formation, Particles 2001 conference, Orlando, USA, February, 2001.

Thin mesoporous silica films, Particles 2001 conference, Orlando, USA, February, 2001.

Thin films of mesoporous silicon oxide, International symposium on nanoscience and nanotechnology, Zichron Ya'akov, Israel, May, 2000.