

ASHUTOSH SHARMA

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PERSONAL DATA

Born on August 22, 1961; Male; Married; one child.

PROFESSIONAL EXPERIENCE

Institute Chair Professor (2007) & **Ranjit Singh Endowed Chair Professor** (2008); **Professor** (1997); Department of Chemical Engineering, Indian Institute of Technology Kanpur.

Coordinator & PI, DST Center on Nanosciences, Indian Institute of Technology Kanpur (2005-)

Head, Department of Chemical Engineering, Indian Institute of Technology, Kanpur (2003-05).

Associate Professor (1994-97); **Assistant Professor** (1990-1994), Department of Chemical Engineering, Indian Institute of Technology at Kanpur.

Research Scientist, Department of Ophthalmology, School of Medicine and Biomedical Sciences, State University of New York at Buffalo (1987- 1990).

Visiting Appointments: University of Texas at Austin, 1997 (one semester); University of Western Ontario, 2005 (summer term); University of Erlangen-Nuremberg, 2006 (six months). Yeungnam University, South Korea, 2009-2010 (World Class University Professor).

EDUCATION

Ph.D., Chemical Engineering, State University of New York at Buffalo, 1987.
Graduated summa cum laude.

Advisor: Professor Eli Ruckenstein (a recipient of the US Medal of Science)

M.S., Chemical Engineering, The Pennsylvania State University, 1984.
Graduated summa cum laude.

B.Tech., Chemical Engineering, Indian Institute of Technology at Kanpur, 1982.
Graduated with distinction.

AREAS OF RESEARCH

- Mechanics, patterns and instabilities of soft visco-elastic interfaces, thin films and nano-confined systems
- Self-organized meso-patterning of polymers, ceramics, hydrogels and carbon
- Smart and functional materials: adhesives, catalytic, optical, super-hydrophobic and nano-composites
- MEMS/NEMS & Microfluidic Systems: Microbatteries and Bio-platforms
- Interfacial and colloidal interactions
- Wetting and adhesion
- Interfaces in membranes and microfluidics
- Biosurfaces: surface chemistry of cornea and tear film; cell adhesion

HONORS AND AWARDS

Awards and Prizes

- **The TWAS Prize in Engineering Sciences**, TWAS, The Academy of Sciences for the Developing World, Trieste, Italy (2008). <http://www.twas.org/>
- **Homi J. Bhabha Award for Applied Sciences**, University Grants Commission (UGC) National Hari Om Ashram Trust Awards (2007).
- **Distinguished Alumnus Award**, Indian Institute of Technology, Kanpur (2007) (<http://www.iitkalumni.org/daa/lastYearsDAA.asp>) (<http://www.iitkalumni.org/daa/DAAProfile2.asp?id=53>)
- **Friedrich Wilhelm Bessel Research Award**, Alexander von Humboldt Foundation (2006)
- **Shanti Swarup Bhatnagar Prize in Engineering Sciences** (2002) (http://www.niscair.res.in/ScienceCommunication/RnDNewsLetters/csirnews2k3/csirnews_30Jul03.asp)
- **Herdillia Award** of the Indian Institute of Chemical Engineers for excellence in basic research (2003). (<http://www.iiche.org.in/awards.htm>)
- **Maharashtra National Award** of the Indian Society for Technical Education for outstanding research (1996). http://www.isteonline.in/about_awards.php
- **Amar Dye Chem Award** of the Indian Institute of Chemical Engineers for excellence in research and development for scientists below the age of 35 years (1995).
- **ISTE--SGSITS National Award** of the Indian Society for Technical Education for best research by young scientists (1993). http://www.isteonline.in/about_awards.php

Fellowships & Editorships

- **Elected Member**, The Asia-Pacific Academy of Materials (APAM), (2008). [elected membership of APAM is from India, Russia, Japan, China, Uzbekistan, Korea, Taiwan and Australia].
- **J. C. Bose National Fellowship**, Department of Science & Technology (2006-2010) (http://dst.gov.in/whats_new/press_releases05/two-prestigious.htm)
- **Elected Fellow**, Indian National Science Academy (http://insaindia.org/e_site.htm) (<http://www.insa.ac.in/html/home.asp>)
- **Elected Fellow**, Indian National Academy of Engineering (<http://www.inae.org/>)
- **Elected Fellow**, Indian Academy of Sciences (<http://www.ias.ac.in/>)
- **Elected Fellow**, National Academy of Sciences, India (<http://www.nasi.org.in/>)
- **Member of Editorial Board**, Chemical Engineering Science (2007-2010). (http://www.elsevier.com/wps/find/journaldescription.cws_home/215/description#description)
- **Member of Editorial Advisory Board**, Canadian Journal of Chemical Engineering (2006-2007). (<http://www.cjche.ca/>)
- **Member of Editorial Board**, Indian Chemical Engineer (Journal of the Indian Institute of Chemical Engineers; 2006-2009). (<http://www.ice.org.in>)
- **Member of Editorial Board**, International Journal on Advances in Engineering Science and Applied Mathematics (2009-2011).
- **Member of Editorial Advisory Board**, Journal of Colloid and Interface Science (2000-2002). (http://www.elsevier.com/wps/find/journaldescription.cws_home/622861/description#description)

Other Distinctions

- **Ranjit Singh Endowed Chair Professor**, Indian Institute of Technology, Kanpur (2008-)
- **Institute Chair Professor**, Indian Institute of Technology, Kanpur (2007-current)
- **Senior Associateship** of the CSIR Centre for Mathematical Modelling and Computer Simulation (C-MMACS), Bangalore (2001-2003).
- **Featured Speaker** in the 1st Indo-US Frontiers of Engineering (FOE) Conference, Agra, 2006 and the FOE Award for collaboration with NIST.
(<http://www.nae.edu/NAE/NAEFOE.nsf/weblinks/VBAN-6FEH2G?OpenDocument>)
- **Invited Speaker**, Theoretical Physics Seminar Circuit of the Department of Science and Technology (2000-2002 & 2004-2006).
- **Professor CNR Rao Lecture**, IIT Kanpur (2004; inaugural lecturer of the annual lecture series).
(<http://www.iitkalmuni.org/lectures/cnrils.htm>)
- **Professor Gopal Tripathi Memorial University Lecture**, Banaras Hindu University (2005).
- **RPG Life Science Padma Vibhushan Professor M M Sharma Medal and Chemcon Distinguished Speaker Award**, Indian Institute of Chemical Engineers (2006).
(<http://www.iiche.org.in/awards.htm>)
- **Kvaerner Powergas India's Prof. N.R. Kamath Memorial Lecture**, Indian Institute of Chemical Engineers, CHEMCON (2008).
- **Professor S. R. Kal Memorial Lecture**, IIT Kharagpur (inaugural lecturer; 2009).
- **The Research Competition Award** of the School of Medicine, SUNY (Buffalo) for initiation of research by new faculty (1988).
- **Dean's Certificates of Merit** in undergraduate program at I.I.T. Kanpur (1980-1982).
- **The Indian National Merit Scholarship** (1977-82).
- Second rank in India in the Mathematics Olympiad (1977).
- Second rank in the state of Rajasthan in High School examination (1977).

Service to the Institute

- Head, Department of Chemical Engineering (2003-2005)
- Coordinator & PI, DST Unit on Nanosciences at IIT Kanpur (2005-).
- Institute Research & Development Committee (2006-2008).
- Committee on Research Vision Document for the Institute (2008-09).
- Institute Faculty Affairs Committee (2006-2007).
- Department Faculty Affairs Committee, Department of Biosciences and Bioengineering (2000-2008).
- Consultative Committee, Centre of Environmental Science & Engineering (2008-2010).
- Head, TV Centre and Coordinator, Resource Development Cell (2000-02).
- Faculty Counselor, Student Gymkhana Library (2002-2004)

- Member, Core Committee, SIDBI Centre, IITK (2004-).
- Senate Nominee, Library Committee (2002-2002)
- Member, Undergraduate Review Committee (1999-2000); formed once in 10 years.
- Faculty Counselor, Student Counseling Service (1992, 94, 97, 2002)
- Convener, Department Undergraduate Committee (1991-93, 1994-96) and various other department committees.

Service to Profession

- Member, Advisory Board, Elsevier (India), 2008-.
- Research Advisory Council, Hari Shankar Singhanian Elastomer and Tyre Research Institute, Kankroli, 2009-2011.
- Council Member (Materials), Indo-French Centre for the Promotion of Advanced Research (IFCPAR), New Delhi, 2008-2010.
- Member, Governing Body, Translational Health Science & Technology Institute (THSTI; DBT-MIT-Harvard partnership institute), Faridabad, 2008-.
- Member, Board of Governors & Research Advisory Committee, Indian Institute of Science Education and Research (IISER), Mohali (2007-2009).
- Member, Research Council, National Institute for Interdisciplinary Science and Technology (NIST-CSIR), Trivendrum (2007-09).
- Member, Research Advisory Committee, Indian Association for the Cultivation of Science, Kolkata (2007-09).
- Member, Swarnajayanti Fellowship Committee (Engineering Sciences) of the Department of Science & Technology, Govt. of India (2008-).
- Member, Search-cum-Selection Committee, Post-Doctoral Fellowships in Nano Science and Technology, Department of Science & Technology, Govt. of India (2008).
- Member, Sectional Committee for Engineering and Technology, Indian Academy of Sciences (2007-2008).
- Member, Sectional Committee for Engineering and Technology, Indian National Science Academy (2006-2008).
- Member, Sectional Committee on Chemical Engineering and Biotechnology, Indian National Academy of Engineering (2005-2008).
- Member, Program Advisory Committee for International Division's Program on Materials, Mining and Mineral Engineering, (PAC-MAT), Department of Science and Technology, New Delhi (2009-1011).
- Member, Program Advisory Committee for Chemical Engineering Program (PAC-ChE), Department of Science and Technology, New Delhi (2007-2010).
- Member, The Nano Applications and Technology Advisory Group (NATAG), Department of Science & Technology, New Delhi (2008-2010).

- Member, Platinum Jubilee Advisory Group of the Indian Academy of Sciences, Bangalore & Editor, Platinum Jubilee Proceedings Volume, Engineering sciences (2008).
- Expert Panel Member, TATA NEN Hottest Startup Awards, National Entrepreneurship Network (2008).
- Member, External Review Committee, School of Computational Sciences, Korea Institute of Advanced Studies (KIAS), Seoul (ten yearly review; 2007).
- Member, External Peer Review Committee, Department of Chemical Engineering, Indian Institute of Technology, Kharagpur, 2008 (first review of the academic and research programs at IITKgp).
- Member (UGC Nominee), Advisory Committee, Center for Advanced Studies, Phase VII at University Institute of Chemical technology, Mumbai (2007-).
- Member (UGC Nominee), Advisory Committee, Center for Advanced Studies, Department of Chemical Engineering, Benaras Hindu University Institute of Technology (2007-).
- Member, SSB Prize Advisory Committee in Engineering Sciences (2007).
- Member, IChE Awards Committee (2007).
- Member, National Technical Committee on Nanotechnology, Bureau of Indian Standards, New Delhi, 2006-.
- Member, National Advisory Committee of the Centre of Nanotechnology, IIT Roorke, 2006-2008.
- Committee Member from India, Asian Society for Colloids and Surface Science, Tokyo, Japan, 2005-07.
- Council Member, Materials Research Society of India (MRSI), 2004-2011 (membership ~ 2000).
- Member, Research Council, Central Glass and Ceramic Research Institute (CGCRI), Kolkata (2004-06).
- Member, Research Council, Indian Institute of Chemical technology (IICT), Hyderabad (2004-2006).
- Member, Advisory Committee, Amity Institute of Nanotechnology, Noida (2005).
- Member, Scientific Advisory Committee (SAC) of the Ministry of Petroleum and Natural gas, Government of India, and Centre for High Technology, New Delhi (2003-2006).
- Member, Nanoscience and Technology group of 25 scientists called by the Honourable President of India to prepare a position paper, Rashtrapati Bhawan, April 29, 2004.
- Member, Advisory Board, National Sugar Institute, Kanpur (2003-2004).
- Member, Faculty Selection Committee, Materials Science, IISc Bangalore (2008)
- Member, Faculty Selection Committee, IIT Kharagpur (2000, 2002)
- Member, Faculty Selection Committee, IIT Bombay (2002)
- Member, Faculty Selection Committee, IIT Guwahati (2005)
- Member, Subject Expert Committee, Chemical Engineering, Biotechnology and Materials, MHRD (2002, 2003).
- Member, Executive Advisory Council, Shriram College of Engineering and Management, Morena, M. P.; www.srcem.org (2003-).
- Member, Board of Studies of Malviya Regional Engineering College (now MNIT Jaipur) (1996-98) and Aligarh Muslim University College of Engineering (1995-97).

Service in Conferences

- National Organizing Committee, International Conference on Nano Science & Technology (ICONSAT 2010), IIT Bombay, February 2010.
- **Coordinator**, Golden Jubilee Symposium on Fabrication At Small Scales and Indo-US conference on Fabrionics: Science of Advanced Fabrication, IIT Kanpur, December 09-12, 2009.
- International Advisory Committee, International Conference on Nanobiomaterials for Environmental Applications, National Environmental Engineering Research institute (NEERI), Nagpur, December 2009.
- Executive Committee, Bangalore Nano 2008, December 12-13, 2008.
- National Advisory committee, *Conference on Nanomaterials and Devices: Processing and Applications*, NADPA, IIT Roorkee. December 11-13, 2008.
- Scientific Committee, *International Conference on Multiscale structures and Dynamics of Complex Systems*, Bangalore, August 28-30th, 2008.
- Advisory Committee, *International and INCCOM-6 Conference on Future Trends in Composite Materials and Processing*, IIT Kanpur, December 12-14, 2007.
- National Executive Committee, *Eighth International Gas-liquid and Gas-liquid-solid Reactor Engineering Conference*, Delhi, December 2007.
- Organizing Committee, *Assembly, Organization and propulsion in Complex systems*, IIT Madras, February 2007.
- **Scientific Coordinator**, *International Workshop on Wave Dynamics and Stability of Thin Film Flow Systems*, Chennai, September 1-4, 2006
- Organizing Committee, *Nano-2006: The Eighth International Conference on Nanostructured Materials*, Bangalore, August 21-25, 2006.
- Advisory Committee, *International Conference on Nanomaterials*, IIT Delhi, March 16-18, 2006.
- Organizing Committee, *International Workshop on the Physics of Mesoscopic and Disordered Materials*, IIT Kanpur December 04 – 08, 2006.
- Organizing Committee, *National Symposium on Current Trends in Materials Characterization*, IIT Kanpur, December 05-07, 2005.
- National Advisory Committee, *National Conference on Advanced Characterization Techniques on Nanomaterials*, IIT Roorkee, August 24-26, 2005.
- Advisory Committee, *First Conference on Nanomaterials and Applications*, 27th - 28th May 2005, Amity University, Noida.
- **Coordinator**, 4 sessions on Colloids and Interfaces in *The joint meeting of the American and Indian Institutes of Chemical Engineers*, Mumbai, December 28-30, 2004
- **Coordinator**, *SERC School on Colloids and Interfaces: Fundamentals and Research Challenges*, IIT Kanpur, February 7-11, 2005.
- **Coordinator**, *Advanced Workshop on Microfabrication, Self-assembly, MEMS and NEMS*, IIT Kanpur, December 17-24, 2004.
- **Coordinator**, *Indo-US Workshop on Futuristic Manufacturing: Generative Manufacturing, Self-Assembly and Micro-Electro-Mechanical Systems*, IIT Kanpur (January 06-08, 2004).

- Organizing Committee, *1st National Conference of Research Scholars and Young Scientists in Chemical Engineering*, Kharagpur (September 25-27, 2004).
- National Organizing Committee, *Eleventh National Conference on Surfactants, Emulsions and Biocolloids (NATCOSEB-XI)*. India Society for Surface Science and Technology, Bombay (Dec. 11-13, 2003).
- Guest Editor, *Indian Journal of Chemical Technology*, special issue on Nanotechnology (2003).
- Organizing Committee, *Indo-Italian Workshop on Organic Semiconductors*, IIT Kanpur (October 14-17, 2003).
- **Coordinator**, *Nanovision: Directions in Nanoscience and Technology Conference* at IIT Kanpur (2002).

Service to Community

- Member, Kendriya Vidyalaya, IITK Management Committee (2003-2006).
- Member, Faculty Club Executive, IITK (2001-03).

SEMINARS

Wisley-Jessen (Chicago).
Armstrong World Industries (Lancaster).
PACO Pharmaceuticals (New Jersey).
University of Cincinnati.
Cambridge Instruments (Buffalo).
I.I.T. Kanpur (IIChE Seminar series; Advanced Center for Materials Science; Heat Transfer and Fluid Flow Lectures; Physics; Chemistry).
Hindustan Lever Research Centre (Bombay).
Oxford University.
University of Brussels (Belgium).
University of Leuven (Belgium).
Institut de Chimie des Surfaces et Interfaces, CNRS (Mulhouse, France).
SUNY at Buffalo.
Rice University.
University of Houston.
Illinois Institute of Technology.
Cleveland State University.
University of Texas Southwestern Medical Center at Dallas.
University of Basel (Switzerland).
Max Planck Institute for Colloids and Interfaces (Berlin).
Mehta Research Institute (Allahabad).
University of Rhode Island.
Unilever Research Institute (Bangalore)
Tata Institute of Fundamental Research (Bombay)
Physical Research Laboratory (Ahmedabad)
Indian Institute of Science (Bangalore)
Tata Research Design and Development Centre (Pune)
National Chemical Laboratory (Pune)
Lehigh University
University of Vigo (Spain)
DMSRDE (Kanpur)
Benaras Hindu University (Varanasi)
University of Western Ontario
Carnegie Mellon University
University of California at Irvine
National Center for Biological Sciences (Bangalore)
General Electric Research Center (Bangalore)
Central Glass and Ceramic research Institute (Kolkata)
University of Erlangen-Nuernberg (Germany)
National Institute of Standards and Technology (NIST, Maryland)
Northwestern University
Proctor & Gamble (Cincinnati)
Yeungnam University (South Korea)
Korea Advanced Institute of Science & Technology
Ulsan National Institute of Science & Technology (South Korea)
Korea Institute of Machinery & Materials (Daejeon)

TEACHING

- *Fluid Mechanics and Momentum Transfer Operations* (number of offerings: eight)
- *Fluid Mechanics and Rate Processes*. (A core level mandatory course for undergraduates across almost all departments; number of offerings: three)
- *Heat Transfer Operations* (number of offerings: four)
- *Kinetics and Reactor Design* (number of offerings: one)
- *Chemical Engineering Laboratory* (number of offerings: five)
- *Fundamentals of Colloid and Interface Science and Technology*. (A graduate level elective course open to undergraduates; typical enrollment ~ 40 students; number of offerings: fifteen).
This course was developed for introducing the fundamentals and applications of colloids and interfaces to chemical engineering students. Topics covered in the course are: capillarity, wetting and adhesion, surface properties, thermodynamics of surface phases, intermolecular and interparticle forces, stability of colloids, nucleation and growth, microhydrodynamics, electrical effects, surfactants, and adsorption.
- *Nanomaterials and Nanotechnology*. (A graduate level elective course open to undergraduates; typical enrollment ~ 50 students; number of offerings: three). This course was developed for introducing the fundamentals and applications of nanoscience and engineering, open to both undergraduates and graduate students across all the departments.
- *Summer in-plant Training; Graduate Seminars*.

RESEARCH

Current Research Activities

- Meso-scale self-organized large area patterning of soft materials for opto-electronics, bulk-nano applications and MEMS.
- Intermolecular and interfacial forces, dynamics, morphology and stability of nano-clusters, and ultra-thin liquid and solid (< 100 nm) films.
- Equilibrium and dynamics of wetting/dewetting and contact angle phenomena: modulation by surfactants and polymers.
- Hydrodynamics and stability of free surface flows.
- Silica-polymer and polymer-clay nanocomposites.
- Carbon micro- and nano-structures for microbatteries, bio-MEMS and catalytic adsorption /filtration.
- Biosurfaces: wetting, adhesion and defense in the cornea-tear film system.
- Characterization of surface properties with applications in wetting and adhesion of ceramic, polymeric and bio surfaces.
- Interfacial interactions in transport through porous media/membranes: Roles of solute-solute, solute-membrane, and solute-solvent interactions.

Supervised Research

Ph.D.s

1. *Nonlinear stability and morphology of thin films on solid surfaces* (Ahmad T. Jameel, 1994).
2. *Role of Surface Interactions in prediction of flux Decline during Ultrafiltration* (Subir Bhattacharjee, 1996; co-advisor: Prof. P. K. Bhattacharya).
3. *Equilibrium, dynamics and morphology of thin films* (Rajesh Khanna, 1998).
4. *Studies on gas phase mass transfer in a centrifugal contactor* (P. Shandilya, 1999; co-advisor: Prof. D. P. Rao).
5. *Pattern formation and dewetting in thin liquid films* (Kajari Kargupta, 2001).
6. *Membrane pervaporation, characterization, modeling and optimization of pervaporation* (S. Venkata Satyanarayana, 2003; co-advisor: Prof. P. K. Bhattacharya).
7. *Instabilities of soft confined interfaces: adhesion, debonding, dewetting and pattern formation* (Jayati Sarkar, 2005).
8. *Preparation and characterization of activated carbon fiber for the control of BTX, SO₂ and Nox emissions* (Vivekanand Gaur, 2005; co-advisor: Prof. N. Verma).

9. *Stability and patterning of thin liquid films* (Ruhi Verma, 2006).
10. *Self-organized patterning of thin polymer films* (Manoj Gonuguntala, 2006).
11. *Self-organization and patterning of soft polymer films* (Rabibrata Mukherjee, 2007).
12. *Analysis of interfacial instabilities in adhesion, dewetting and phase change* (Gaurav Tomar, 2008).
13. *Instability morphology and dynamics of thin viscoelastic bilayers* (Dipankar Bandyopadhyay, 2009).

8 PhDs currently in progress.

Supervised Research

M.Tech.s

1. *Nonlinear interfacial instability and chaos in flowing thin liquid films* (S. Hazra, 1991)
2. *Composites of alumina and ceria doped zirconia through a hybrid sol-gel route* (A.Saha, 1991; co-advisor: Prof. D. C. Agrawal).
3. *Characterization of the free energy and force (DLVO) diagrams by catastrophe theory: Application to aggregation of oxide particles in aqueous media* (R. Khanna, 1992).
4. *Nonlinear stability and dynamics of free flows in heat and mass transfer* (S. Sen, 1992).
5. *Global stability of gas-liquid reactors by Lyapunov's functionals* (B.S. Bhatia, 1992; co-advisor: Prof. S. Narasimhan).
6. *Solutal Marangoni effect in flowing thin liquid films* (N. Ravichandar, 1992)
7. *Role of contact-angle hysteresis in hold-up and interfacial area of capillary bridges between touching spherical particles* (B. Srinivasa Rao, 1992; co-advisor: Prof. D. P. Rao).
8. *Nonlinear stability of thin free films* (C.S. Kishore, 1994).
9. *Curvature induced capillary instability of thin flowing films* (K.R. Guruvayurappan, 1994).
10. *Some problems of thin film stability* (S. Salaniwal, 1995).
11. *Cell adhesion to solid substrate: Role of surface properties and receptor aggregation* (S. Majumdar, 1996).
12. *Nonlinear instabilities in thin films undergoing phase change* (Raman, 1996).
13. *Stability of the tear film and morphology of dewetting* (S. Tiwari, 1997).
14. *Stability and dewetting of evaporating thin water films* (A. S. Padmakar, 1998).
15. *Morphology and dynamics of hole growth in thin films* (Animansu Ghatak, 1998).
16. *Micellar enhanced ultrafiltration for removal of phenol and aniline from aqueous stream using cetyl pyridinium chloride* (S. R. Jadhav, 1998; co-advisor: Prof. P. K. Bhattacharya).
17. *Numerical solution of thin film flows using a finite element method* (Joydip Bagchi, 1999).
18. *Spontaneous pattern formation and dewetting in thin films of perfectly wettable macroscale systems* (Dinni Lingaraj, 1999).
19. *Role of physical and chemical heterogeneities in stability of thin films* (Rupanvita Choudhary, 2000).

20. *Morphology and dynamics of thin film on heterogeneous coated substrates* (Manoj Zope, 2000).
21. *A computational study of hole growth in thin liquid films* (A. Kumar, 2000).
22. *A numerical algorithm for thin film flows using nonuniform grids* (S. Srinivas, 2000).
23. *Kinetics of hole formation and coalescence in thin films* (A. Mandal, 2001).
24. *Stability and dynamics of bilayers* (Dipankar Bandyopadhyay, 2001).
25. *Instability of thin films induced by aggregation of insoluble surfactants* (Richa Shadangi, 2001).
26. *Instabilities of thin films due to density variations: a new mechanism of spinodal dewetting* (Jeetain Mittal, 2002).
27. *Stability and pattern formation in thin solid films* (Jayati Sarkar, 2002).
28. *Morphological and optical characterization of spin coated polymer films* (G. Devnani, 2002).
29. *Pattern formed by an evaporating droplet on a dissolving substrate* (J. Guha, 2002).
30. *Pattern formation during adhesion and debonding of thin elastic films* (Moniraj Ghosh, 2004).
31. *Solvent induced structures in thin polymer films* (Subasis Sarkar, 2004).
32. *Solvent induced dewetting and pattern formation in thin polymer films* (Kasturi Roy, 2005).
33. *Surface instability and patterning in soft elastomeric films* (S. Subramanian, 2005).
34. *Patterning of curved and flexible polymer surfaces and their characterization* (Patil Ganesh Krishna, 2006).
35. *Contact instability in bilayer films and pattern miniaturization on gel surfaces* (Ravindra C. Pangule, 2006).
36. *Some novel techniques for self-organized patterning of single and layered visco-elastic thin polymer films* (Danish Faruqui, 2006).
37. *Novel ways of patterning through self-assembly*, (Sharad Saurabh, 2007).
38. *Controlling the surface instability of viscoelastic films by electric field and substrate patterning* (Indrani Banerjee, 2007).
39. *Electric field and solvent induced meso-patterning in viscoelastic polymer film* (Partho Sarathi Gooh Pattader, 2007)

Research Funding (US \$ ~ Rs. 40)

- Coordinator and PI, DST Unit/Centre on Nanoscience, Department of Science and Technology, 2005--2009. Rs. 130 million.
- PI, Indo-US Center for Research Excellence in Fabronics, Indo-US Science and Technology Forum, 2008-2011. Rs. 50 million (Coordinator: Prof. Amitabha Ghosh).
- Coordinator & PI, Mesostructured Functional Thin Films and Interfaces of Soft Materials, Department of Science and Technology, 2007--2010. Rs. 49 million.
- Understanding adhesion of soft particles, Proctor & Gamble, 2008-2009. \$ 70,000.
- Creation of micro-nano particles with tailored morphologies by e-jetting co-current dissimilar liquid jets, Hindustan Unilever Research Centre, Bangalore, 2008-2009, Rs. 2.2 million.
- Driven capillary instabilities and self organized patterning of polymers, British Council (UKIERI), Rs. 2.4 millions (co-PI from UK: Prof. Ullrich Steiner, Cambridge University).
- ♦ Particulate Adhesion and Detachment, Hindustan Lever Research Centre, Bangalore, 2003-2006. Rs. 2.5 million.
- ♦ Co-Coordinator, Indo-US Center for Advanced and Futuristic Manufacturing, Indo-US Science and Technology Forum, 2006-2008. Rs. 6.4 million (Co-coordinator with Prof. Amitabha Ghosh).
- ♦ J. C. Bose Fellowship of the DST. 2006-2010. Rs. 3.7 million
- ♦ *Manufacturing Robust Nanostructures: Materials, Methods and Metrology*, Indo-US Science and Technology Forum, Frontiers of Engineering (FOE) Award for collaboration with NIST (co-PI: Christopher Soles). Rs. 2.5 million.
- ♦ Contact Line Motion in Immersion Lithography, IPTRADE, Boston, 2005. \$ 25,000.
- ♦ Nanoscale Forces in Thin Polymer Films (R & D), Ministry of Human Resources Development (MHRD), 2004-2006. Rs. 2.3 million.
- ♦ Engineering of Thin Polymer Films (Thrust Area). Ministry of Human Resources Development (MHRD), 2002-2004. Rs. 1.5 million.
- Nanoparticles, Nanowires and Nanofilms. Department of Science and Technology, 2002--2004. Rs. 4.3 million.
- Coordinator, FIST, Infrastructure in Interfacial Engineering. Department of Science and Technology, 2002--2003. Rs. 12.5 million.
- ♦ Interfacial Properties and Morphology of Micro-scale Systems. Ministry of Human Resources Development (MHRD), 2000-2002. Rs. 8,00,000.
- ♦ Equilibrium, Dynamics and Morphology of Thin Films. Indo--French Centre for the Promotion of Advanced Research (IFCPAR), 1997-2000. Rs. 7.3 million. (co-PI: Dr. Guenter Reiter, CNRS, Mulhouse)

- ♦ Adhesion and Fusion of Biomaterials. All India Council of Technical Education (AICTE), 95-98. Rs. 9,00,000
- Corneal epithelial cell migration and wound healing. The Research Foundation of State University of New York, 1988-89. \$ 30,000.
- Hydrodynamics and mass transfer in a high gravity gas-liquid contactor. Department of Science and Technology, 1992--1995. (Co-investigator, Principal Investigator: Dr. D.P.Rao). Rs. 5,00,000.
- Influence of liquid flow texture on trickle bed reactor performance. Department of Science and Technology (Co-investigator, Principal Investigator: Dr. M.S.Rao). Rs.5,00,000.
- Member, Mission Oriented Project (MOP) in Material Science (Particle sizer development). Rs. 20,00,000.
- Development of PC software for Hazard Analysis. Ministry of Environment and Forests, June 1993 - May 1995. (Co-principal Investigator, Principal investigator: Dr. J.P. Gupta). Rs. 4,00,000.
- Ultrafiltration: Surface Chemical Aspects. All India Council of Technical Education (AICTE), 96-99. (Co-investigator, Principal investigator: Dr. P. K. Bhattacharya). Rs. 11,00,000.

Review of Papers (over 120 papers in the last ten years)

- Reviewer to: NSF (USA), DST, MHRD and many other funding agencies.
 - Applied Physics Letters
 - Langmuir
 - Journal of Colloid and Interface Science
 - Physics of Fluids
 - Physical Review Letters
 - Physical Review B; Physical Review E
 - Journal of Physical Chemistry
 - Journal of Fluid Mechanics
 - Journal of Adhesion Sci. and Tech.
 - Chemical Engineering Science
 - Industrial & Engineering Chemistry Research
 - Chemical Engineering Communications
 - Advanced Materials
 - Colloids & Surfaces A
 - Current Eye Research.
 - Journal de Physique
 - Journal of Applied Mechanics
 - Indian Chemical Engineer
 - Indian Journal of Pure and Appl. Math.
 - Chemical Engn. Research & Design
 - Macromolecules
 - Canadian J. of Chemical Engineering

Professional Associations

- Fellow, Indian National Science Academy (elected 2003).
- Fellow, Indian National Academy of Engineering (elected 2003).
- Fellow, Indian Academy of Sciences (elected 1999).
- Fellow, National Academy of Sciences, India (elected 2006).
- Indian Society of Nonlinear Analysts (Life member; Executive member, north zone)
- Indian Institute of Chemical Engineers (Life member)
- Indian Society for Technical Education (Life member)
- Indian Society for Surface Science and Technology (Life member)
- Association for Research in Vision and Ophthalmology (1988 -91)
- American Institute of Chemical Engineers (1987- 91, 2006)
- American Chemical Society (1987 -91)

PATENTS

1. Title: “**Process for Synthesis of Sonicated Hierarchal Web of Carbon Micro-nano Fiber and applications Thereof**” Filed for protection in India, Application File Number: DEL/1157/2009 Inventors: N. Verma and A. Sharma
2. Title: “**Generation of Submicron to Macroscopic Patterns and Objects by Successive Miniaturization Using Shrinkable Materials and Articles Formed Thereby**” Filed for protection in India. Application File Number: DEL/0522/2007 (IN200700522–I1). Inventors: A. Ghatak, A. Sharma, R. Mukherjee, A. L. Das, V. Katiyar and M. Kulkarni.
3. Title: “**Creation of Complex micropatterns with flexible stamp**” Filed for protection in India, Application File Number: DEL/1519/2006 (IN200601519–I1). Inventors: A. Sharma, R. Mukherjee, D. Faruqui and G. Patil
4. Title: “**Micro- and sub-micro patterning of soft solids and articles formed thereby**” Application File Number: DEL/2787/2005 (IN200502787-I1). Inventors: A. Sharma, M. Gonuguntla, S. Subramanian and R. Mukherjee

PUBLICATIONS

Edited Books

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Journal Publications (refereed)

Statistics: citations of most cited 10 papers > 1100;
Total cites > 3000; Average citation per paper for all papers > 23;
Citations/year in 2005-2009 ~ 350/year; H-index = 30
Key publications are highlighted.

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2. R. Mukherjee and A. Sharma, Self-organized meso-patterning of thin polymer films, In *Encyclopedia of Nanoscience and Nanotechnology*, Eds. H. S. Nalwa, (in press, 2009).

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Invited Presentations

1. *Thin film hydrodynamics*, International Workshop on Interfacial Phenomena in Liquid-Liquid Dispersions, Bangalore, 1991.
2. *Adhesion failure and dewetting of thin polymer films on coated substrates*, International Congress on Adhesion Science and Technology, Amsterdam, 1995.
3. *Instability and dewetting of thin films on coated substrates*, Third National Symposium on Modeling and Simulation in Chemical Engineering, Bangalore, 1995.
4. *Surface chemical pathways of the tear film breakup*, Second International Conference on Lacrimal Gland, Tear Film and Dry Eye Syndromes, Bermuda, 1996.
5. *Two dimensional dispersions: Evolution of patterns in thin films*, International Conference on Disperse Systems, Calcutta, 1998.
6. *Pattern formation in thin liquid films: Effect of short and long range forces and surfactants*, 72nd American Chemical Society Colloid and Surface Science Symposium, Pennsylvania State University, 1998.
7. *Evolution of pattern in unstable thin liquid films: Effect of long range repulsion combined with shorter range attraction*, International Symposium on Apparent and Microscopic Contact Angles, 216th American Chemical Society Meeting, Boston, 1998.
8. *Surface physical analog of the tear film breakup on the cornea*, Royal Society Uniliver Indo - UK Forum 5th Meeting, Mysore, 1999.
9. *Self organization in thin liquid films under the influence of antagonistic short and long range interactions*, Indo - Israeli Conference on Current Issues of Condensed Matter and Materials Physics, New Delhi, 1999.
10. *To bead or not to bead? Knowledge and uncertainty in breakup and morphology of thin films*, The Chemical Engineering Symposium honoring Eli Ruckenstein on his 1998 National Medal of Science, Buffalo, 1999.
11. *Knowledge and uncertainty in breakup and morphology of thin films*, Annual Meeting of the Indian Academy of Sciences, Lucknow, 1999.
12. *Thin films: stability, dynamics and forces*, Conference on Soft Condensed Matter, Inter-University Consortium for DAE Facilities, Indore, 1999.
13. *Dynamics and morphology of thin fluid films on chemically heterogeneous surfaces*, Conference on Slow Dynamics and Freezing in Condensed Matter Systems, JNU, New Delhi, 2000.
14. *Instability, dewetting and morphology of thin liquid films on heterogeneous surfaces*, 74th American Chemical Society Colloid and Surface Science Symposium, Lehigh University, 2000. Also chairman of a session on *Thin Layers* in this symposium.
15. *Self organization in thin liquid films*, International Workshop on Surface Phenomena and Free Surface Flows, Technion, Haifa, Israel, 2001.
16. *Meso-scale patterning of soft materials by templating*, Indo-US Workshop on Nanotechnology, Santa Barbara, 2001.
17. *Self-organized patterns in confined films: from Newtonian liquids to soft solids*, International Conference on Statistical Physics, STATPHYS IV, Kolkata, 2002.

18. *Self organization in thin liquid and solid elastic films*, Indo-Israeli Workshop on Current Issues in Condensed Matter Physics and Materials Science, Jerusalem, 2002.
19. *Self-organized patterns in confined thin films of liquids and soft solids*, 5th Liquid Matter Conference, European Physical Society, Konstanz, Germany, 2002.
20. *A new technique for meso-scale patterning of soft materials by templating*, National Symposium on Nanostructured Materials, Indian Institute of Technology, Delhi, 2002.
21. *Self-Organized patterning of soft materials*, National Seminar on Science and Technology of Nanomaterials, Central Glass and Ceramic Research Institute, Kolkata, 2003.
22. *Self-organization in thin films of soft materials*, Symposium on Some Novel Trends in Chemistry Teaching and Inorganic Chemistry Research, University of Rajasthan, Jaipur, 2003.
23. *Self-organized patterns in confined films*, JSPS-DST Symposium on Surfaces and Interfaces for Nanostructured Materials, University of Tokyo, 2003.
24. *Self-organized patterns in thin soft films*, Symposium on Surface Phenomena and Free Surface Flows, Tel Aviv, Israel, 2003.
25. *Debonding of a thin soft elastic film*, Nanobali 2: Nanotribology: The Liquid-Solid Interface, Bali, 2003.
26. *Self-organized patterns in thin soft films*, International Conference on Nano Science and Technology, ICONSAT 2003, Kolkata, 2003.
27. *Adhesion and debonding of elastic films: Patterns, forces and metastability*, India- Japan Workshop on Surfaces and Interfaces, Saha Institute, Kolkata, 2003.
28. *Self-organization in soft nanosystems*, 91st Indian Science Congress, Chandigarh, 2004.
29. *Patterns, forces and metastable pathways in debonding of elastic films*, 27th Adhesion Society meeting, Wilmington, North Carolina from February 15-18, 2004.
30. *Self-organized Meso-Scale Patterning of Soft Materials*, Indo-US Workshop on Futuristic Manufacturing, IIT Kanpur, 2004; also a co-coordinator of the workshop.
31. *Self-organized patterns in thin soft films*, Indo-US Workshop on Nanoscale Materials, Puri, April 2004.
32. *Adhesion and debonding of elastic films: patterns, forces and metastability*, STATPHYS-22 Satellite: Pattern Formation in Nonequilibrium Systems, Kolkata, July 11-13, 2004.
33. *Adhesion failure induced by interfacial instabilities in ultra-thin soft films*, Gordon Research Conference on Science of Adhesion, Tilton, NH, August 8-13, 2004.
34. *Adhesion, dewetting and debonding of soft elastic films: Patterns, forces and metastability*, Workshop on Pattern formation through instabilities in thin liquid films: from fundamental aspects to applications, Max-Planck Institute for the Physics of Complex Systems, Dresden (Germany), September 21-28, 2004. Also chairman of a session in this symposium.
35. *Self-organized meso-patterns in soft films*, First national Conference on Nanoscience & Technology, NCL Pune, March 7-8, 2005.

36. *Self-organized patterns in thin soft films*, The 1st India-Taiwan Workshop on Nanoscience, Taipei, March 9-12, 2005.
37. *Patterning of soft materials other than carbon*, Indo-EU workshop on Nanotechnology, S. N. Bose national Centre for Basic Sciences, Kolkata, March 21-22, 2005.
38. *Of small things and other stories*, National Symposium on Chemical Engineering: Journey Ahead, IISc, Bangalore, June 20-21, 2005.
39. *Self-organized patterning of soft materials*, JSPS-DST Symposium on Surfaces and Interfaces for Nanostructured Materials, University of Tokyo, November 2005.
40. *Self-organized patterning of soft materials*, UK-India Workshop on Nanotechnology, Cambridge University, October 2005.
41. *Paradigms of Meso-Fabrication: Beyond the "Top-down" and "Bottom-up"* National Frontiers of Engineering Conference, New Delhi, February 2006.
42. *Self-organized Nano-fabrication*, Indo-US Nanotechnology Conclave, New Delhi, February 2006.
43. *Physics of Self-organized patterning of soft materials*, Condensed matter Physics Workshop, IIT Kanpur, February 2006.
44. *Paradigms of Meso-Fabrication: Beyond the "Top-down" and "Bottom-up"*, Indo-US Frontiers of Engineering Conference, Agra, March 2006.
45. *Elastic Contact Lithography: A New Method for Self-organized Patterning of Soft Solids*, International Conference on Nanoscience and Technology (ICONSAT), New Delhi, March 2006.
46. *Elastic Contact Lithography*, 2nd India-Taiwan Workshop on Nanoscience, New Delhi, March 2006.
47. *Patterning of soft materials*, Indo-UK Workshop on Nanotechnology, New Delhi, March 2006.
48. *Self-organized Large Area Meso-patterning of Polymers*, BRNS-DAE Theme Meeting on Self-assembly Routes for Nanotech Materials, BARC, Mumbai, April 2006.
49. *Surface instability of thin films*, International Workshop on Wave Dynamics and Stability of Thin Film Flow Systems, IIT Madras, Chennai, September 2006.
50. *Fabrication by Elastic Contact Lithography*, RPG Life Science Professor M M Sharma Medal and CHEMCON Distinguished Lecture, CHEMCON, Annual Indian Chemical Engineering Congress, Ankleshwar, December 2006.
51. *Soft patterning for MEMS structures*, International workshop on MEMS and Micro/Nano Systems Technology, Kolkata, December 2006.
52. *Self-organized patterning by Elastic Contact Lithography*, Annual AIChE Meeting, Alpha Chi Sigma Symposium honoring Darsh Wasan, San Francisco, November 2006.
53. *Self-organized patterning of soft solids*, National Workshop on Nanomaterials and Nanotechnology, University of Lucknow (Materials Research Society of India), Lucknow, March 2007.
54. *Self-organized materials and interfaces*, Recent Developments in Nanomaterials, Benaras Hindu University, March 2007.
55. *Soft nanosciences and patterning*, IITK-NUS Symposium, April 2007.

56. *Self-organized manufacturing*, National Review and Coordination Meeting on Nanoscience and Nanotechnology, Hyderabad, February 2007.
57. *Meso-fabrication and functionalities in soft materials*, Bangalore Nano 2007, Bangalore, December 2007.
58. *Novel self-organized meso-fabrication and functionalities on small scales in soft materials*. Indo-US Workshop on Advanced Manufacturing, IIT Kanpur, October 2007.
59. *Novel self-organized meso-fabrication*, Indo-Australia Symposium MNNA, New Delhi, December 2007.
60. *Self-organizing soft materials: Wetting, adhesion and surface interactions*, Symposium on Chemical Engineering-an evolving arena, Bangalore, December 2007.
61. *Self-organized meso-fabrication and functionalities on small scales in soft materials*, Indo-US Advanced Studies Institute on Nanoscale Science and Engineering, Chennai, January 2008.
62. *Self-organized meso-fabrication and functionalities on small scales*, International Conference on Nano Science and Technology (ICONSAT 2008), Chennai, February 2008.
63. *Novel meso-fabrication and functionalities in soft materials*, Future Directions of Advanced Materials Research (FDAMR), Shimla, April, 2008.
64. *Bio-inspired structural adhesion and adhesives*, 2nd International Conference on Multi-Scale Structures and Dynamics of Complex Systems: Processes and Forces for Creation of Designer Materials with Multi-Scale Structures, Bangalore, September 2008.
65. *Self-organized adhesion and pattern formation in elastic solid films*, Polyfilm: Confined Polymer Films, Sheffield, UK, September 2008.
66. *Synthesis and fabrication of soft meso-structures*, Fourth JNC Conference on Chemistry of Materials, Alleppey, Kerala, September 2008.
67. *Scientific Innovation & Creativity: Some Case Studies in New Process and Product Development*, N. R. Kamath Memorial Lecture, CHEMCON 2008, Chandigarh, December 2008.
68. *Soft meso-fabrication and functionalities*, India-Singapore Joint Physics Symposium, S. N. Bose National Center for Basic sciences, January 2009.
69. *Bio-inspired structural adhesion and adhesives*, Prof. S. R. Kal Memorial Lecture, Indo-US Workshop on Microfluidics and Fabronics/Microfabrication, IIT Kharagpur January 2009.
70. *Lithography and micro/nano fabrication*, 4th Advanced School on Nanoscience and Technology, S.N. Bose National Centre for Basic Sciences, Kolkata, January 2009.
71. *Bio-inspired structural adhesion and adhesives*, International Symposium on Surface Protective Coatings, Goa, February 2009. **Key Note Lecture**
72. *Meso-Fabrication and Functionalities in Soft Materials: Review of the DST Unit on Nanosciences at IITK*, National Review and Coordination Meeting on Nanoscience and Nanotechnology (NSNT-2009), Kolkata, March 2009
73. *Synthesis, Fabrication and Functionalities of Carbon Structures on Small Scales with Applications in Environment, Energy and MEMS*, Recent Advances in Nano Materials and their applications, BHU, Varanasi, March 2009.

74. *Future directions in chemical engineering research*, NCL Diamond Jubilee Symposium on "Advances in Chemical Engineering and Process Technologies", National Chemical Laboratory, June 4-6, 2009.
75. *Self-organized meso-fabrication and functionalities in confined soft materials*, TWAS 11th General Conference & 20th General Meeting, Durban, South Africa, October 20-23, 2009,

Contributed Conference Presentations (*many others presented by students are not listed*)

1. Ruckenstein E., **Sharma A.**, *Mechanism of and factors affecting the tear film breakup: implications for tear substitutes and contact lens tolerance*. 2nd International Symposium on the Tear Film, Lubbock, Texas, 1984.
2. **Sharma A.**, Ruckenstein E., *Lifetimes of thin free and wetting films - a nonlinear approach*. 191st National American Chemical Society Meeting, New York City, 1986.
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4. **Sharma A.**, Coles W. H. and Ruckenstein E., *Morphological abnormalities and adhesion failure of corneal epithelial cells: A surface chemical hypothesis*. Annual AIChE meeting, Washington, D. C., 1988.
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8. **Sharma A.**, *Wettability of the corneal surface: in health and disease*. International Symposium on Ocular Pharmacology and Therapeutics, New Delhi (AIIMS), 1990.
9. **Sharma A.**, *Surface properties of the extracellular glycocalyx*. Polymers'91, NCL, Pune, 1991.
10. **Sharma A.**, *Determination of polymer surface properties by contact angle goniometry*. ACMS Research Symposium, IIT Kanpur, 1991.
11. **Jameel A. T.** and **Sharma A.**, *Nonlinear dynamics of thin liquid films*. CHEMCON-92, Manipal, 1992.
12. **Bhattacharjee S.**, **Sharma A.** and **Bhattacharya P. K.**, *Modeling of osmotic pressure and gel layer controlled flux decline in ultrafiltration*. CHEMCON-93, Bombay, 1993.

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14. **Sandilya P.**, Rao D. P. and Sharma A., *Analysis of flow of gas phase in a high gravity gas-liquid contactor*. CHEMCON-93, Bombay, 1993.
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19. **Bhattacharjee S.**, Sharma A. and Bhattacharya P. K., *Osmotic pressure and diffusivity of BSA in aqueous media: Role of acid-base interactions*. National Conference on Science and Technology of Self-Organizing Systems, Jadavpur University, Calcutta, 1995.
20. Khanna R. and **Sharma A.**, *Hydrophobic and hydrophilic acid-base interactions in coagulation and flotation*. International Conference on Mineral Processing, IIT Kanpur, 1995.
21. **Jameel A. T.** and Sharma A., *Finite amplitude instability in thin liquid films*. CHEMCON-95, Kalpakkam, 1995.
22. **Jameel A. T.** and Sharma A., *Relationship between lifetimes of thin films and macroscopic parameters of wetting*. International Congress on Adhesion Science and Technology, Amsterdam, 1995.
23. **Sharma A.** and Reiter G., *Adhesion failure and dewetting of thin polymer films on coated substrates*. International Congress on Adhesion Science and Technology, Amsterdam, 1995.
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Laboratory Resources

- Micro-Raman, Confocal, AFM and SNOM
- Maskless photolithography
- Two SPMs (AFM/STM) with electrochemistry, in-liquid imaging, environmental controls and heating/cooling capabilities.
- Imaging and spectroscopic Ellipsometry with X-Y resolution of 1 microns and 0.2 nm Z-resolution and surface plasmon.
- Langmuir-Blodgett deposition system
- Contact angle goniometer including high temperature measurements
- High speed camera (~ 10000 frames/s)
- Several optical microscopes with image capture and analysis
- Spin coaters
- Ultra pure water; vacuum ovens and furnace (~ 1500 centigrade); clean benches
- Access to the nanofabrication and characterization facilities in the DST Unit on Nanoscience & Technology at IIT Kanpur, which provides a wide array of tools such as dual beam FIB, SAX, WAX, SEM, AFM, Profilometers; Laser Ablation, etc.

