

DHUMAL SUNIL SHIVAJIRAO

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Education

Examination	University	Institute	Year	CPI / %
Specialization during post-graduation and graduation: <u>Chemical Engineering</u>				
Doctorate	IIT Bombay	IIT Bombay	2009	9.63
Post Graduation	IIT Kharagpur	IIT Kharagpur	2004	9.35
Graduation	Shivaji University	T.K.I.E.T., Warananagar, Maharashtra	2001	74.33
Intermediate/+2	Maharashtra Board	M.H.S. & J.C., Phaltan	1997	76.00
Matriculation	Maharashtra Board	New English School, Adarki Bk.	1995	85.57

Current project (January 2009 - till date):

“Reverse osmosis thin film composite membranes: Investigations into structure, property and function” funded by Dow Chemical Company, India.

Summary of Ph.D. work

Title: Experimental and theoretical studies in interfacial polycondensation (2005 - till date)

Interfacial polycondensation (IP) has been studied for many applications such as bulk polymer synthesis, micro/nano-encapsulation, thin film composite membrane preparation, polymer nanocomposite synthesis, fiber surface modification, in micro-unit operations and self healing materials, etc. IP offers the possibility of rapid production of polymer film with high and specific molecular weight ranges under normal conditions of temperature and pressure at/or near the interface of two immiscible phases. The formed polymer is insoluble in both the phases. The performance of this film depends upon its chemical composition and properties such as thickness, crystallinity, molecular weight, degree of crosslinking, mechanical and thermal properties etc. A systematic study of how membrane properties vary with preparation conditions will therefore be important for the rational design of process equipment and conditions for particular applications. Modeling of film formation by IP and prediction of film properties involves consideration of a complex array of interactions among several rate processes, and is rendered further difficulty by the need to unequivocally determine the values of the physicochemical parameters that arise. This need and challenge form the motivation for our *Experimental and theoretical studies in interfacial polycondensation*. Polyurea microcapsule formation through diisocyanate route is the model system chosen for experimental studies because of reaction simplicity. Various characterization techniques such as FTIR, XRD, TG-DSC, GPC, SEM, TEM, contact angle goniometer, surface tensiometer, viscometry, dynamic light scattering, etc. are used to get more details of the system. The IP reaction model is developed by considering all mechanistic aspects along with the polymer thermodynamics and diffusion reaction mechanism. It is believed that our fundamental research will provide sound information for further development of both the theory and practice of IP. Based on the insights gained from the microcapsule work, we have initiated experimental studies in two other areas: polyurea nanocapsule formation and polyamide thin film composite membranes for reverse osmosis.

Project/research work done till post-graduation

- “Kinetic study on pyrolysis of coal and modeling of pulverized fuel (PF) flame in a cylindrical furnace” – Masters dissertation (2002-2004)
- “Membrane distillation of milk” (supervised by Mr. Sanjay Nene, Biochemical Engineering Department, National Chemical Laboratory, Pune) – Bachelors project (2000-2001)

Publications

- S. J. Wagh, S. S. Dhumal and A. K. Suresh, “An experimental study of polyurea membrane formation by interfacial polycondensation,” *J. of Mem. Sci.*, 328, 246-256, 2009.
- S. S. Dhumal, S. J. Wagh and A. K. Suresh, “Interfacial polycondensation: Modeling of film formation kinetics and film properties,” *J. of Memb. Sci.*, 325(2), 758-771, 2008.
- S. S. Dhumal and R. K. Saha, “A one dimensional model of pulverized coal combustion in a cylindrical furnace and its experimental validation,” *J. of Energy & Envi.* (ISSN:1563-1362), 6, 72-86, 2007
- S. S. Dhumal and R. K. Saha, “Application of genetic algorithm for evaluation of kinetic parameters of coal pyrolysis,” *J. of Energy & Envi.* (ISSN:1563-1362), 5, 112-124, 2006
- S. S. Dhumal and A. K. Suresh, “Experimental aspects of the interfacial polycondensation reaction: Polyurea formation and effect of experimental variables on film properties,” in preparation
- S. S. Dhumal and A. K. Suresh, “Interfacial polycondensation: New insights into the modeling of film formation kinetics and film properties,” in preparation

Conferences

- S. S. Dhumal and A. K. Suresh, “Fundamental experimental studies on Polyurea formation by interfacial polycondensation,” selected in *Frontiers in Polymer Science (organized by ELSEVIER)*, Mainz, Germany, June 2009
- S. S. Dhumal and A. K. Suresh, “Modeling reaction and evolution of film structure in interfacial polycondensation,” selected in *Frontiers in Polymer Science (organized by ELSEVIER)*, Mainz, Germany, June 2009
- A. K. Suresh, S. S. Dhumal and K. P. Gawas, “Studies in thin film composite membranes using interfacial polycondensation,” presented in *PPS-25 (Polymer Processing Society)*, March 2009
- S. S. Dhumal and A. K. Suresh, “Experimental studies on polyurea film formation by interfacial polycondensation: Effect of process variables,” presented in *POLY-2008*, Asian Polymer Association, New Delhi, India
- S. S. Dhumal and R. K. Saha, “A one dimensional model of pulverized coal combustion in a furnace,” presented in *CHEMCON-2003*, Bhubaneswar, India
- S. S. Dhumal and R. K. Saha, “Application of Genetic Algorithm for the Evaluation of Kinetic Parameters of Coal Pyrolysis,” selected for *CHISA-2004*, Czech Republic

Academic Distinctions/Fellowships

- **Ambuja’s Young Researcher’s Award** for the year 2005, awarded by Indian Institute of Chemical Engineers (IChE), India
- Recipient of “**Dr. Shanker Dayal Sharma Gold Medal**” for the academic year 2003-2004 for the best *All-Rounder* among the graduating students from **IIT Kharagpur**
- Secured **All India Rank 36** in Graduate Aptitude test in Engineering (**GATE-2002**) with percentile score of **99.16**

- Recipient of Teaching Assistantship from IIT Bombay for Doctoral studies
- Secured 1st rank amongst 30 students during M. Tech. at IIT Kharagpur
- Recipient of Ministry of Human Resource Development scholarship during M. Tech.
- Secured 3rd rank amongst 120 students in third year of under-graduation

Experimental Skills

- Conversant with sophisticated instruments like HPLC, GPC, TG-DSC, Vapor pressure osmometry, Surface tensiometer, Contact angle goniometer, Zeta potential and particle size analyzer, Karl-Fischer titrator, Dynamic surface tensiometer, UV-VIS spectrophotometer etc.
- Designed experiments for undergraduate and postgraduate laboratory courses based on the sophisticated instruments and also assisted in conducting practical classes

Computing Skills

- Conversant with Fortran, Matlab, C and C++
- Conversant with operating systems: Windows and Linux

Extracurricular / Sports / Professional Activities

- Organizing committee member of the Research Scholar's Symposium (RSS)-2007 and advisory board member for RSS-2008 held at IIT Bombay.
- Won Bronze and Silver medal as a member of department Volleyball team in PG Sports 2007 and 2008, respectively.
- Won Silver medal as a member of department Cricket team in PG Sports 2007.
- Team member of Inter-hostel Volleyball Championship Winner for three consecutive years 2006, 2007 and 2008 and runner up in the year 2005.
- Awarded "Hostel Color" for the year 2006-07 in recognition of significant contributions in sports activities as a member of Hostel-1.
- Held position as Hostel Mess Secretary at IIT Bombay in the year 2005-2006.
- Contributed in cultural activities like "Illumination and Rangoli" during the stay at IIT Kharagpur (2002-2004).

Personal

- Indian citizen born on 11th January 1980, unmarried
- Permanent Address: Adarki Bk. (P.O.), Satara (District), Maharashtra, India – 415537
- Good communication skills with proficiency in English, Hindi and Marathi

References

- Prof. A. K. Suresh, Department of Chemical Engineering, Indian Institute of Technology, Powai, Mumbai - 400076. Email: aksuresh@iitb.ac.in, Tel: +91-22-25767240
- Prof. K. C. Khilar, Department of Chemical Engineering, Indian Institute of Technology, Powai, Mumbai - 400076. Email: kartic@iitb.ac.in, Tel: +91 (22) 2576 7230
- Prof. V. A. Juvekar, Department of Chemical Engineering, Indian Institute of Technology, Powai, Mumbai - 400076. Email: vaj@che.iitb.ac.in, Tel: +91-22-25767236
- Prof. R. K. Saha, Department of Chemical Engineering, Indian Institute of Technology, Kharagpur, West Bengal -721302. Email: rks_iit@yahoo.co.uk, Tel: +91-3222-283946

I would be happy to send you any additional information, if required.