



Prof. C. V. Seshadri Memorial Distinguished Lecture

Department of Chemical Engineering

Indian Institute of Technology Kanpur

Speaker: Rajdip Bandyopadhyaya

Title: Functional Nanoparticles by the Colloidal

Route: Experiments, Mechanism, Modeling

Day and Date: Wednesday, November 16, 2011

Place: L-16

Time: 4:00 p.m.

Abstract

Technological requirements of advanced materials can be diverse, but principles of self-assembly and surface chemistry can help us in designing materials with different geometry and functionality. For example, solid nanoparticles in general are required to be monodisperse and of controlled morphology. This has been achieved through confinement of reaction and resulting particle nucleation and growth within self-assembled reverse micelle cores, whereby we are able to synthesize and mathematically model nanoparticles. In contrast, simple switching of the reaction zone from inside to the external surface of the micelles eventually leads to synthesis of nanoporous materials. The latter can be further impregnated with different dispersed constituents (like nanoparticles, enzymes), or functionalized with chemical moieties. The resulting nanocomposite is tailored for selective access of a guest species to the dispersed or functionalized component, enhancing overall performance. This will be illustrated by our results in separation, catalysis, water treatment and enzyme activity. Such complex multiphase systems are dominated by the presence of a large solid-liquid interfacial area. In this talk, I will highlight both our experiments and models in trying to delineate the role of different microscopic interaction parameters and process variables, which in turn determine the mechanism of formation and structure. Such an understanding of physicochemical phenomena over diverse length and time scales may eventually give us a complete description from molecular templates to nanomaterial synthesis, structure and functionality.

About the Speaker



Rajdip Bandyopadhyaya is presently an Associate Professor in the Chemical Engineering Department of IIT Bombay. Earlier, he was an Assistant Professor at IIT Kanpur. He did his PhD from the Indian Institute of Science, Bangalore, with post doctoral research in Israel (Ben-Gurion Univ.) and USA (Univ. of Utah and Univ. of California at Los Angeles). His current research is focused on using the principles of colloidal and interfacial science to link the synthesis, structure, dynamics and properties of nanomaterials, uncovering the interplay of multiple length and time scales. He is an elected Member of The National Academy of Sciences, India (NASI).

About Prof. Seshadri



The late Prof. C. V. Seshadri (CVS) was a distinguished Chemical Engineer. He did his Ph.D. with Professor Herbert L. Toor of Carnegie Mellon University, Pittsburgh, followed by a Research Associateship at MIT. He joined IIT Kanpur as an Assistant Professor in 1965, and later became a Professor and Head of the Chemical Engineering Department. Finally he became the Dean of Students Affairs, IITK. While here, he wrote the famous best-selling textbook: C. V. Seshadri and S. V. Patankar, *Elements of Fluid Mechanics*, Prentice Hall of India, New Delhi, 1971.

CVS left IITK in 1974 to join Kasturi Paper Food and Chemicals Ltd., Bangalore, where he set up India's first fodder-yeast plant. In 1976, he joined the Shri A. M. M. Murugappa Chettiar Research Center in Chennai as its founder Director, an institute emphasizing appropriate technology, the forte of CVS. It was here that CVS really blossomed and helped develop several appropriate technologies, including Spirulina Algae. For his efforts in this direction, CVS received the prestigious *Jamnalal Bajaj award for S&T for rural development* (1981). As Rajni Bakshi sums up¹ "CVS's youthful zest and enormous energy made it easy to forget the linear dimension of this mortal frame. Yet this is all the sea snatched away. The man's bequest remains, awaiting the nurturing care of fellow-travellers in this and other times." CVS received enormous support and encouragement for his efforts from Mr. M. V. Murugappan, with whose vision the Research Center was set up.

1.) C. V. Seshadri: Gandhi as the Century's Greatest Inventor, chapter in *Bapu Kuti*, Rajni Bakshi, Penguin India, New Delhi, 1998.

Previous Speakers

- Dr. Ashish Lele, NCL Pune, 2011

About the donors

The corpus of the Professor C. V. Seshadri (CVS) Memorial Distinguished Lecture in the Department of Chemical Engineering, IITK has been set up by several students, family members and friends of CVS. This lecture is to be delivered by a promising young Chemical Engineering researcher (below about 45 years) working in India.

All are welcome