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Editorial

This special issue of *Adsorption* is in honor of Dr. Shivaji Sircar, in recognition of his distinguished contributions to the field of adsorption science and technology.

Shivaji has left his mark on nearly every aspect of adsorption: from thermodynamics, diffusion, and the dynamics of adsorbers, to adsorption cycles and processes, to membranes and hybrid processes. His contributions range from fundamental scientific and engineering studies to the development of practical adsorptive processes for separating gaseous and liquid mixtures.

Today Shivaji—author of 155 papers and several book chapters—is Professor of Practice in the Chemical Engineering Department of Lehigh University. His pathway to that position began at Jadavpur University in India, where he received his B.Ch.E. degrree in 1964. Shivaji completed his post-graduate studies at the University of Pennsylvania (a M.S.E. in 1968 and a Ph.D. in 1970, followed by two years as a post-doctoral fellow). For the next 29 years Shivaji worked at Air Products and Chemicals in Allentown, Pennsylvania, retiring in 2002 as Chief Scientist.

Shivaji has been an active contributor to the dissemination of adsorption research. He co chaired the 4th International Conference on Fundamentals of Adsorption (Kyoto, 1992), chaired the Adsorption and Ion Exchange Area of the Separations Division of AIChE (1992–93) and directed the International Adsorption Society (1995–97). He is also a member of the advisory boards of the journals *Adsorption*, *Adsorption Science and Technology*, and *Industrial and Engineering Chemistry Research*.

Shivaji has an extensive personal record in the commercial applications of adsorption. To name just one accomplishment, he was a leader in the development of processes for separating gas mixtures by pressure, concentration and temperature swing adsorption, using a variety of adsorbents. Specifically, he developed several pressure swing adsorption processes that produce two pure products from a multicomponent gas mixture. He holds 58 patents on processes ranging from rapid pressure-swing-adsorption to novel combinations of adsorption and membrane separation operations.

A selection of Shivaji's seminal contributions to the scientific literature of adsorption and to the patent literature are given at the end of this introduction.

Shivaji has received several honors for his achievements. Among these are the AIChE Professional Progress Award in 1988 and the AICHE Institute Award for Excellence in Industrial Gases Technology in 2001. The latter award recognizes his contributions to bridging the theory and practice of adsorption as a separations tool, and for developing novel and hybrid applications of the technology.

Those of us who know Shivaji well are aware of his extensive and steadfast commitment to advancing the field of adsorption. But when free time occasionally becomes available, Shivaji has other avid interests to turn to. He has an extensive collection of Indian coins that span nearly 1000 years of history. He is passionate, too, about his photography and says he "will walk a mile to get a good shoot."

In this special issue of Adsorption we will walk through a diverse range of papers that represent the many areas to which Shivaji has contributed. The papers are based on a series of invited lectures presented at a symposium held in Shivaji's honor at the AIChE Annual Meeting in Reno in 2001.

The first two papers deal with thermodynamic aspects of adsorption. Myers presents an equation of state approach to adsorption thermodynamics based on integral desorption functions. The paper by Gumma and Talu deals with analysis of helium adsorption data and its impact on the determination of adsorption excess properties.

The next three papers deal with mass transfer in porous solids. Karger reviews the state of the art of diffusion measurement in zeolites. Sward and LeVan describe a frequency response method of measuring mass transfer rates in

adsorbents. The method also yields equilibrium adsorption behavior. Carta described a film-model approximation to represent the kinetics of multicomponent adsorption. It predicts quantitatively the effects of concentration-dependent diffusivity and adsorbate flux coupling.

The final four papers are concerned with applications of adsorption and membrane processes. Natarajan and Wankat describe a new adsorptive separation process and compare its performance with other thermal cycling processes via numerical simulations. The paper by Meunier et al. presents experimental results on a TSA process using indirect heating and cooling for the removal and recovery of VOCs from air. High heat transfer coefficients reduce the regeneration time and achieve good separation of CO2 and VOCs. Knaebel and Reinhold expand on work done by Sircar on the separation of methane and carbon dioxide from landfill gas. New processes that allow pipeline quality methane to be extracted are presented and design principles are discussed. Suzuki et al. present a new type of carbon membrane with improved fouling resistance. Carbon whiskers are grown on the membrane surface with the function of anti-attachment of particles that allows an easier membrane cleaning.

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Selected Journal Articles by Shivaji Sircar and Coworkers

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