

The Gregory Botsaris Lecture



April 12, 2017

Alumnae Lounge
Tufts University
Medford, MA

Dr. Bruce C. Gates

Distinguished Professor
Department of Chemical Engineering
University of California, Davis

About The Gregory Botsaris Endowed Lecture

Gregory Botsaris completed his undergraduate studies at the National University of Athens, Greece, and received three graduate degrees from MIT, including a Ph.D. in chemical engineering. After completing his doctorate in 1965, he joined the Department of Chemical Engineering at Tufts University School of Engineering as an assistant professor. He was promoted to associate professor in 1969 and to professor in 1975. From 1983 to 1993, he served as the department chair. Upon his retirement in 2004, he was named professor emeritus of Chemical and Biological Engineering. Professor Botsaris' research work centered around two fields: crystallization and stability of colloidal dispersions.



His research in dispersions involved the stabilization of coal-water slurries and their use as alternative fuels in the power industry. In 1981, he was a member of a U.S. Department of Energy delegation that visited China at the invitation of the Chinese government for exchanging technical information on coal utilization in the form of slurries in water. In 1989, Professor Botsaris co-edited a book, *Interfacial Phenomena in Coal Technology*, which focused on clean-coal technologies.

The heart of his crystallization research involved the investigation of secondary nucleation and the effect of additives on crystal growth. His first Ph.D. student used chiral crystals in 1970 as a probe of the mechanism of secondary nucleation. This work was revisited and refined in the late 1990s and early 2000s and led to a novel model for secondary nucleation. This model has important implications for the separation of chiral drugs by crystallization in the pharmaceutical industry. In the 1990s, Professor Botsaris also studied environmental applications of crystallization—namely, the freeze concentration of the bleaching effluents of paper pulp plants and the production of a road deicer, calcium magnesium acetate, by a process involving crystallization. Professor Botsaris passed away in 2014.

The Gregory Botsaris Lectureship was established in 2006 in recognition of Professor Botsaris's outstanding leadership and invaluable contributions to the Department of Chemical and Biological Engineering. Colleagues, friends, alumni, and current faculty members have contributed to the lectureship fund, which provides a biannual chemical engineering lectureship series.

Past Speakers

2006—Dr. Michael F. Doherty

2008—Dr. Yih-An Liu

2011—Dr. Thomas W. Peterson

2013—Dr. T. Alan Hatton

2015—Botsaris Memorial Symposium

Molecular Metal Complex and Metal Cluster Catalysts on Supports:

Organometallic Chemistry Meets Surface Science
By Dr. Bruce C. Gates

April 12, 2017

12:00 pm

Reception and lunch to follow

Alumnae Lounge

40 Talbot Avenue

Medford, MA



Abstract:

Industrial catalysts range from the simple—molecules in solution—to the complex—the heterogeneous surfaces of robust solids. The underlying sciences, organometallic chemistry and surface chemistry, are now merging as researchers succeed in synthesizing and characterizing molecular species on surfaces. The best understood of these supported catalysts are highly uniform, being isolated on regular (crystalline) supports such as zeolites. Spectra, atomic-resolution electron microscopy images, and calculations at the level of density functional theory characterize the supported species and demonstrate their high degrees of uniformity. Hence, it is becoming evident how to design these site-isolated catalysts—the design variables are the metal, the number of metal atoms in a catalytic site, the support, and other ligands bonded to the metal. This talk will illustrate some supported molecular catalysts with appealing properties, such as stability at high temperatures and high selectivity for challenging reactions such as hydrogenation of 1, 3-butadiene to give butenes.

About Dr. Gates:

Bruce C. Gates is a Distinguished Professor at the University of California, Davis, where he teaches in the Department of Chemical Engineering. His research group is active in catalysis, focusing on supported metal complex and metal cluster catalysts that are essentially molecular and lend themselves to design and in-depth characterization by spectroscopy and atomic-resolution microscopy. His group also works on catalysis of biomass conversion, with a focus on hydroprocessing. Gates wrote the textbook *Catalytic Chemistry* and coauthored the textbook *Chemistry of Catalytic Processes*. Until recently, he edited *Advances in Catalysis*. He serves on the U.S. Department of Energy's Basic Energy Sciences Advisory Committee and the North American Catalysis Society's Board of Directors. His work has been recognized by numerous awards from the American Institute of Chemical Engineers, the American Chemical Society, the Council for Chemical Research, and the North American Catalysis Society. He is a member of the National Academy of Engineering.

Register and learn more about the lecture at:
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