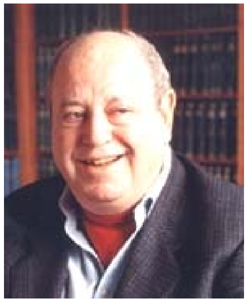
2005 William G. Lowrie Lecturer
Charles A. Eckert
J. Erskine Love, Jr. Institute Professor of Chemical Engineering and Physical Chemistry; Director, Specialty Separations Center
Georgia Institute of Technology



Dr. Charles A. Eckert has been a teacher and a scholar for more than thirty years. For the last sixteen he has been the J. Erskine Love, Jr., Institute Professor in the School of Chemical and Biomolecular Engineering and Director of the Center for Specialty Separations at Georgia Tech. He holds also a joint appointment in Chemistry. Previously, he was a faculty member and Department Head at the University of Illinois at Urbana-Champaign. Prof. Eckert is a leader in research linking fundamental chemistry to important applications in such diverse areas as separations, reactions, energy, environmental control, and advanced materials. He has been called the "Father of Supercritical Fluids" for his pioneering work in exploring and applying the novel properties of these unique solvents. Eckert has authored or coauthored over 250 research papers, books, and monographs on these subjects, and he has presented more than 400 invited lectures. He has directed more than 75 PhD Theses and about two dozen of his former students have entered academia, as faculty, chaired professors, department heads, and deans. Three of these have been on the faculty at Ohio State – David Tomasko, Ken Cox, and Mike Paulaitis. Major awards to Professor Eckert include a N.A.T.O. Postdoctoral Fellowship in 1964 and a Guggenheim Foundation Fellowship in 1971. In 1973, he received the Alan P. Colburn Award of the American Institute of Chemical Engineers for his applications of molecular thermodynamics to chemical kinetics. The American Chemical Society selected him for the 1977 Ipatieff Award for his studies in high pressure and catalysis. He was elected to the National Academy of Engineering in 1983. At the University of Illinois he won the Excellence in Teaching Award in 1987, the Burlington Northern Foundation Faculty Achievement Award in 1988, and the Halliburton Engineering Education Leadership Award in 1989. At Georgia Tech he was made an Institute Professor in 1994, and he won the Institute's Distinguished Professor Award in 1997. In 1995 he received the E. V. Murphree Award for his work in solution chemistry and separations from the American Chemical Society, and in 1999 the William H. Walker Award for his leadership in supercritical fluids, from the American Institute of Chemical Engineers. In 2000 he was selected by the Regents of the State of Georgia for their inaugural Research in Undergraduate Education Award. And in 2004 he and his longtime research partner Chemist Charles Liotta received jointly the Presidential Green Chemistry Challenge Award.

William G. Lowrie Lectures
OSU Department of Chemical Engineering
Lecturer: Charles A. Eckert

Lecture I: April 21, 2005
Room 207, Koffolt Lab, 11:30 AM
Reception: Room 306 Koffolt Lab, 11:00 AM

LECTURE I: Tunable Solvents for Sustainable Technology

For any chemical process there must be both a reaction and a separation. Conventionally these are often designed separately, but we have combined them with a series of novel, benign, tunable solvents to create a paradigm for sustainable development – benign solvents and improved performance. Tunable solvent systems offer distinct advantages for coupling reaction and separation processes for sustainable technology. We have taken a systems approach to the synthesis problem, using novel solvent systems to achieve homogeneous reactions and heterogeneous separations, with the goal of developing more benign processes with economic advantages. Our group is a synergistic combination of chemistry and engineering, and we have used primarily water and carbon dioxide to alter reaction conditions to increase selectivity, eliminate waste, recycle catalysts, and to achieve facile separations.

Supercritical fluids are a classic tunable solvent, where the use of benign CO_2 permits both improved mass transfer and facile recycle of catalysts. Examples are shown of tuning both rates and selectivity, as well as for recycling catalysts. Another example is nearcritical (250-300ºC) water, which dissolves both ions and nonpolar organics, and which dissociates readily to promote both acid and base catalysis. Further, we use gas-expanded liquids, where the addition of CO_2 to an organic is used to tune or alter phase behavior. We show techniques of making biphasic reactions monophasic for reaction and biphasic for catalyst recycle. Further we demonstrate the application of gas-expanded liquids to recycle phase transfer catalysts by CO_2 assisted aqueous extraction. Finally we show the use of organic-aqueous tunable solvents for biocatalyzed reactions.

Lecture II: April 22, 2005
Room 2015, McPherson, 9:30 AM

LECTURE II: The Chalk Dot: Creativity and Science

Although creativity is an essential component of research, many researchers are far less creative that they were when they were children. We shall discuss the creative process and its relation to science and engineering. We shall discuss what creativity is, some of the common barriers to overcome to be creative, emotional, perceptual, and cultural. And we shall offer some ways that people can turn on the creative faucet for their life as well as for their work. A variety of technical and nontechnical examples will illustrate the points being discussed.