Edward Noble Kramer (1908-1992)

Edward Noble Kramer was born April 17, 1908 in Cambridge, Wisconsin but grew up in the small town of Oregon, Wisconsin, just south of Madison where his parents ran a printing business and published the weekly newspaper, the Oregon Observer. He received his BS and MS degrees in Chemistry from the University of Wisconsin, Madison and after one year as instructor in Chemistry at the University of Wisconsin - Extension at Milwaukee, returned to Madison and completed his PhD in Chemistry in 1933 at the age of 25. At UW-Madison he was coxswain of the freshman crew and a member of the marching band. He was hired by the DuPont Company at a time that DuPont had started to develop a new business to manufacture titanium dioxide white pigment. Over the span of his 40 year career at DuPont Dr. Kramer was intimately involved in the chemistry, chemical process engineering, physics and materials science of producing titanium dioxide nanoparticles of optimum size, crystal structure and surface characteristics to be effective paint additives. He had a major role in development of the chloride process for producing the rutile form of titanium dioxide, an exceptionally efficient and controllable process of which DuPont is still, after more than 50 years, the sole commercial practitioner. When he retired in 1973 Dr. Kramer was in charge of all technical aspects of the Pigments Department of the DuPont Company.

Since Dr. Kramer's career involved important aspects of the disciplines of chemistry, chemical engineering and materials science and engineering without regard to their sometimes arbitrary academic boundaries, the purpose of the **Edward Noble Kramer Distinguished Interdisciplinary Lecture** illustrates the opportunities for interdisciplinary research involving all three of these disciplines by inviting to campus a distinguished speaker who by his or her example typifies this interdisciplinary approach and whose lecture will excite and inspire students and faculty from all three departments.

Department of Materials Science & Engineering, College of Engineering, University of Wisconsin - Madison

Department of Chemical and Biological Engineering, College of Engineering, University of Wisconsin-Madison

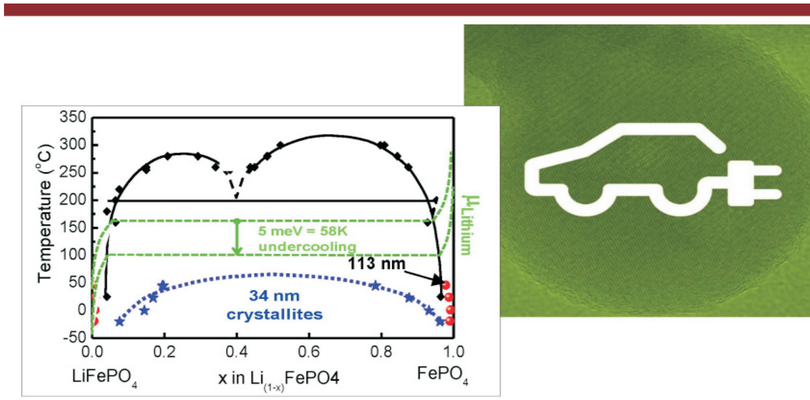
CHEMISTRY, University of Wisconsin - Madison

University of Wisconsin-Madison

Professor Yet-Ming Chiang is Kyocera Professor in the Department of Materials Science and Engineering at MIT. He holds S.B. and Sc.D. degrees from MIT, where he has been a faculty member since 1984. His research and teaching focuses on advanced materials and their role in technologies for energy storage and generation, medical devices, “smart” structures, and micro/nano electronics. Chiang’s academic and professional honors include election to the U.S. National Academy of Engineering, and Fellowship in the American Ceramic Society and the Materials Research Society. He is a recipient of the American Ceramic Society’s Ross Coffin Purdy, R. M. Fulrath, and F. H. Norton awards. He has published about 200 scholarly articles and one widely-used textbook on ceramic materials. His record of inventorship includes 20 issued patents and about 25 pending patent applications (excluding substantially identical foreign filings). Chiang is a co-founder of three companies: American Superconductor Corporation, A123 Systems, and Entra Pharmaceuticals. He received in 2006 (with others at A123 Systems) the R&D 100 Award, and the R&D 100 Editor’s Choice Award, for developing a new lithium battery technology. Chiang is a frequent speaker at international forums on materials science and battery technology, electric vehicles, energy, and entrepreneurship, and serves on government panels including the U.S. Department of Energy Basic Energy Sciences Advisory Board and the National Materials Advisory Board.

Electrochemistry-Materials Interactions in the Design and Development of Energy Storage Technologies for Transportation and the Electric Grid

The ability that electrochemistry provides for imparting extremely large driving forces to materials at ambient temperature (e.g., 4 eV per atom in a Li-ion battery) has numerous consequences for materials behavior, including the promotion of metastable phase formation, non-equilibrium phase transformation pathways, atomic-level disorder, and strong electrochemical-mechanical coupling. These phenomena in turn have significant impact on materials and device design in energy technologies such as batteries and fuel cells. Several examples will be presented where the understanding of electrochemistry-materials interactions has led to improved battery storage materials, electrode architectures, or even new device concepts. Cases where developments have reached commercialization and promise to play an important role in alleviating worldwide issues of energy supply and climate change will be highlighted.



Size and composition effects on the phase stability of lithium storage compounds coupled with large electrochemical driving forces influence the real-world performance of transportation batteries.