



Wednesday
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3:30 pm
Room 1005 EECS

Prof. Bruce Locke

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Hydroxyl Radicals in Gas-Liquid Water Plasma Reactors

Electrical discharge plasmas formed in and in contact with liquid water are of interest for applications in chemical, biomedical, agricultural, electrical, and materials engineering. Analysis of plasmas interacting with liquids is challenging due to the complex relations among the important chemical and physical processes. In addition to the various ways (e.g., AC, DC, pulsed, RF, MW) and geometries to generate a plasma contacting a liquid, the formation of plasma at a gas-liquid interface also depends on the gas composition, liquid properties (e.g., conductivity), and the nature of the molecular transport processes (e.g., hydrodynamics of two-phase flow, energy transport, and mass transfer) at the interface. To address these challenges and focus on the specific case of filamentary plasma channels propagating along a gas-liquid water interface, we have constructed a gas-liquid plasma reactor that enables control of many of these variables. The plasma-liquid interactions have been characterized for chemical reactions including hydrogen peroxide formation, oxidation of hydrocarbons, combined plasma degradation of organic contaminants, nitrogen oxide formation, and hydroxyl radical generation. In this presentation, we will discuss some of the key findings. Comparison will be made of OH generation by gas-water plasma reactors with competing methods such as UV, radiation chemistry, ultrasound, and chemical oxidation methods.

About the Speaker: Dr. Bruce R. Locke earned his B.E. in Chemical Engr. and Environmental & Water Resources Engr. from Vanderbilt U. in 1980, MS. from the U. of Houston in 1982, and PhD in Chemical Engr. from North Carolina State U. in 1989. During 1982-86 he was at the Research Triangle Institute working on analysis of submicron aerosol particles in microelectronics manufacturing. He has been a professor in the Dept. of Chemical and Biomedical Engr. at Florida State University (FSU) since 1989 where he was department chair during 2005-12. He was an Associate Provost at FSU during 2012-18 responsible for international programs, and was interim dean of the FAMU-FSU College of Engineering in 2015-16. He was named FSU Distinguished University Research Professor in 2010. Dr. Locke has published 137 journal papers, 8 book chapters and holds 6 patents. He has been visiting professor in Japan, France, and China, and was a Fulbright Research Scholar at the Czech Academy of Sciences in 2017-18. He is Fellow of the American Inst. of Chemical Engineers and is co-Editor-in-Chief of Plasma Chemistry and Plasma Processing. His research interests include plasma reaction engineering for chemical synthesis and environmental pollution control, emphasizing gas-liquid plasma reactor development.