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The Department of Mechanical Engineering Presents

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Title: Utilizing Transient Pulsed Plasma and Plasmon Resonance Phenomena for Pollution Remediation and Energy Conversion Applications

Abstract: We review our recent results using high voltage nanosecond pulses to generate transient plasmas that drive a wide range of difficult chemical reactions including CO2 reduction, NOx and SOx remediation, volatile organic compounds (VOCs), and particulate matter (i.e., soot). The transient nature of the plasma gives rise to high energy electrons (i.e., non-thermal), which enable a rich set of chemical pathways not possible with standard equilibrium chemistry. These ultra-short high voltage pulses are also more energy efficient than conventional RF plasmas. We demonstrate enhancement in these plasma-driven processes by exploting local field enhancement on the surface of metal nanoparticles. In situ Raman scattering spectroscopy is used to provide further characterization of these plasma-driven processes by elucidating surface bound reaction intermediates.

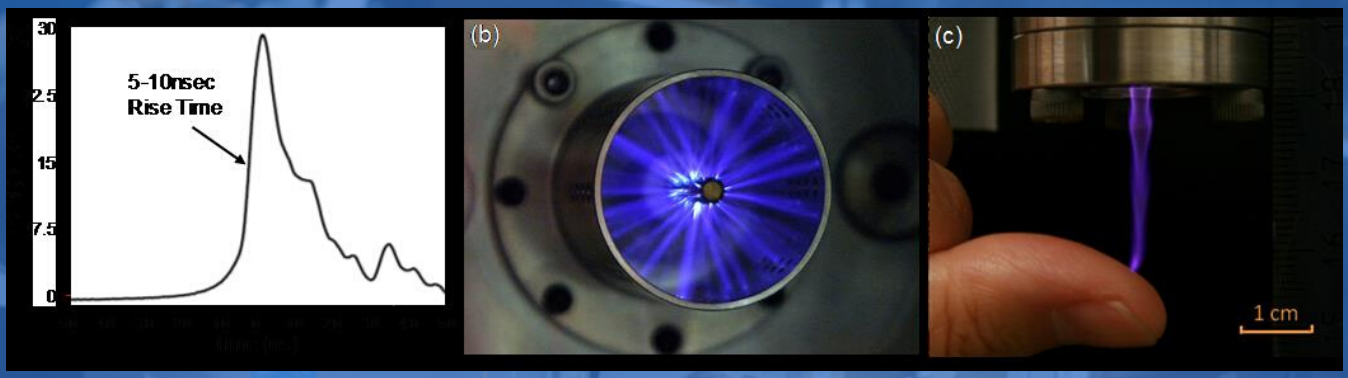

FIGURE 1. (A) TYPICAL OUTPUT CHARACTERISTICS OF NANOSECOND HIGH VOLTAGE PULSE GENERATOR. (B,C) PHOTOGRAPHS OF THE TRANSIENT PLASMA (HOT ELECTRON, LOW-TEMPERATURE PLASMA) FORMED BY THE HIGH VOLTAGE NANOSECOND PULSE APPROACH.

About the Speaker: Stephen B. Cronin received his B.S. in physics from NYU and PhD in physics from MIT in 2002 under supervision of Professor Mildred Dresselhaus followed by post-Doctoral research in Professor Michael Tinkham's lab at Harvard University. Professor Cronin joined the Ming Hsieh Department of Electrical Engineering-Electrophysics at the University of Southern California in August 2005 and has earned several awards for his research accomplishments, including the NSF CAREER Award in 2009, the AFOSR Young Investigator Award in 2008, the Charles Lee Powell Foundation Research Award in 2006, and the James H. Zumberge Research and Innovation Award. His research spans a broad range of interests including plasmon resonant photocatalysis, thermoelectrics, and transient plasma-based processes.

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11:00AM-11:50AM