



Jointly sponsored by MIPSE
and the Department of
Chemical and Biomolecular
Engineering

Tuesday
September 18, 2012
1:30 pm
Room 1017
H.H. Dow Building

Prof. David B. Graves

University of California at Berkeley

Biomedical Applications of

Ambient Gas Plasma:

**The Confluence of Redox Biology
and Plasma Science**

Ionized gas plasmas near room temperature are used in a remarkable number of technological applications mainly because they are extraordinarily efficient at exploiting electrical power for useful chemical and material transformations near room temperature. For example, plasma-assisted thin film deposition and etching applications in integrated circuit manufacture have evolved into technologies that allow control of features at the nanometer scale in commercial processes.

In this seminar, I will address the newest area of low temperature ionized gas plasmas, in this case operating under atmospheric pressure conditions, in which the temperature-sensitive material is living tissue. We use the term *ambient gas plasma* (AGP) to describe near-room temperature, atmospheric pressure partially ionized gas plasmas.

AGP research directed towards biomedical applications such as sterilization, surgery, wound healing and anti-cancer therapy has seen remarkable growth in the last 3-5 years, but the mechanisms responsible for the biomedical effects have remained mysterious. It is known that AGPs readily create reactive oxygen species (ROS) and reactive nitrogen species (RNS). ROS and RNS (or RONS), in addition to a suite of other radical and non-radical reactive species, are essential actors in an important sub-field of aerobic biology termed 'redox' (or oxidation-reduction) biology. I will review the evidence suggesting that RONS generated by plasmas are responsible for their observed therapeutic effects.

Finally, I will review recent research results from our and other research groups around the world, and suggest some of the more promising intellectual challenges and biomedical applications from our current perspective.

About the Speaker: David B. Graves joined the University of California at Berkeley in 1986 after receiving his PhD in Chemical Engineering from the University of Minnesota. He is currently Full Professor in the Department of Chemical and Biomolecular Engineering at UC Berkeley. Prof. Graves holds the *Lam Research Distinguished Chair in Semiconductor Processing* at UC Berkeley and currently holds a *Chair of Excellence* in the Nanoscience Foundation in Grenoble, France. He is author or co-author of over 150 publications. Prof. Graves is a fellow of the *American Vacuum Society* and the *Institute of Physics* and was the recipient of the *Electrochemical Society Young Author Award*, the *NSF Presidential Young Investigator Award*, the *Tegal Plasma Thinker Award*, and the *Plasma Prize* of the *Plasma Science and Technology Division of the AVS*.