

University of Vermont  
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Plasma Processing, What's Next?  
Atmospheric-Pressure Microplasmas and Self-Organization

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Atmospheric-pressure microplasmas (AMPs) have seen an increasing research interest in the last decade and a few devices based on AMP technology are attempting to appear in the consumer market under very different application umbrellas. AMPs have with no doubt shown to possess characteristic and promising features that can have a positive impact in many application fields, providing benefits not available with previous technologies. Examples are represented by low-power light sources, effective sterilization for medical applications and even hydrogen production. The focus of this talk will be on AMP-assisted synthesis of nanomaterials, which has shown to be very promising and contribute to achieve engineered nanoscale objects, complex nanoarchitectures and leading to functional nanodevices.

The technological drive has, however, left behind the scientific understanding of AMPs, and although it is recognized that AMP represent a new realm for plasma physics, there is very little evidence on how and why AMP are diverse from other plasma processes. Results that clearly show the transition to a different regime when the electrodes of a rf atmospheric plasma are brought to a sub-millimeter gap distance will be discussed here. The plasma sheath, that is generally independent of the electrode gap for large scale plasmas, is observed to shrink with consequences on the overall structure and plasma behavior. Is this the evidence of the transition into the 'microplasma regime'? Our progress in the understanding of AMP fundamental processes will be essential to exploit further the characteristic of AMP environments. One of the aims is the possibility of tailored plasma chemistry through the control of reaction kinetic.

Finally, results that relate to plasma-driven self-organization mechanisms will also be presented. In this case, both low-pressure and atmospheric-pressure plasmas have been used to produce self-organized nanoscale structures. Theoretical models and computer-based simulations have been developed to interpret the physical processes that promote and enhanced self-organization under plasma exposure.

Wednesday, October 28, 2009

4:00 p.m.

Jost Foundation Room 422, Davis Center

Refreshments will be available at 3:30 p.m.