Mechanical Engineering Department Seminar

3:35pm April 9, 2014
1130 Mechanical Engineering
111 Church Street SE, Minneapolis, MN 55455

Optical Diagnostics to Measure Reactive Species in Non-Equilibrium Atmospheric Pressure Plasmas and Their Involvement in Plasma Bio-Interactions

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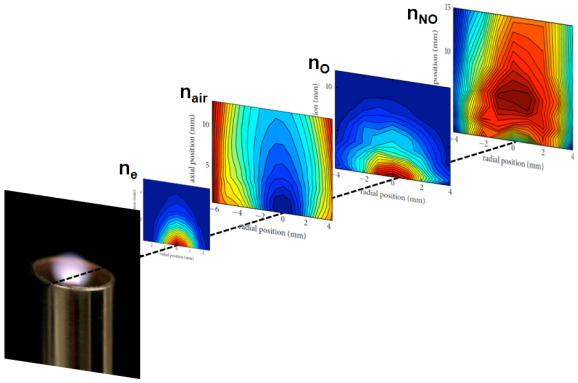
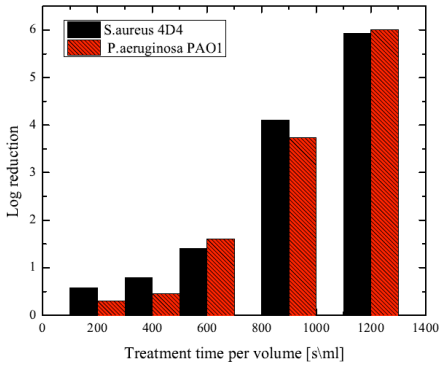
Non-equilibrium atmospheric pressure plasmas offer a unique source of highly reactive chemistry. The key difference between conventional chemistry and non-equilibrium plasma chemistry is that the plasma chemistry is driven by energetic electrons instead of thermal energy. As a consequence highly reactive chemistry occurs close to ambient temperatures with promising applications in medicine, material synthesis and functionalization, energy and pollution control.

To obtain a detailed knowledge of the reactive chemistry there is a strong need for advanced optical diagnostics. This is particular challenging for non-equilibrium plasmas and the multitude of short lived and reactive species including OH, O, O3, NO ... . Our group performed a large variety of plasma diagnostics including laser induced fluorescence, optical emission spectroscopy, laser scattering, absorption spectroscopy and mass spectrometry to measure plasma properties and reactive species densities. These species are the responsible for all plasma driven applications. Many of these diagnostics and species are relevant in different fields including combustion and reactive flows.

The seminar will highlight some examples recently studied by the speaker and his co-workers on the characterization of non-equilibrium plasmas developed for biomedical applications. Several examples of laser induced fluorescence, absorption spectroscopy and laser scattering diagnostics used to investigate the reactive chemistry of plasmas will be discussed. The outcomes of these studies allow shedding light on the mechanisms of plasma-bio interactions in the framework of disinfection applications and wound healing.





Bio: Dr. Bruggeman is the Richard and Barbara Associate Professor of Mechanical Engineering at the University of Minnesota. He obtained his PhD from the University of Ghent, Belgium and was an assistant professor of applied physics at Eindhoven University of Technology, the Netherlands between 2009-2013. His primary research interests are plasma-liquid interaction and non-equilibrium plasma chemistry applied to plasma processes for environmental, biomedical and renewable energy technologies. Professor Bruggeman received several awards including the 2012 Hershkowitz Early Career Award and the 2013 IUPAP Young Scientist Medal and Prize in Plasma Physics. He is a member of the editorial board of Plasma Sources Science and Technology, Journal of Physics D: Applied Physics and Plasma Chemistry and Plasma Processes and a review editor of Frontiers in Plasma Physics. He is an elected member of the board of directors of the International Society of Plasma Chemistry and a guest editor of the special issue on “Diagnostics of Microplasmas” in the Journal of Physics D. Professor Bruggeman chaired the Frontiers in Low Temperature Plasma Diagnostics X held in Kerkrade, the Netherlands in 2013 and was the organizing session chair of the non-equilibrium plasma application section at the IEEE International Conference of Plasma Science held in San Francisco, USA in 2013.