

# Mechanical Engineering Department Seminar

3:35pm September 21, 2016

1130 Mechanical Engineering

111 Church Street SE, Minneapolis, MN 55455



## Non-Equilibrium Atmospheric Pressure Plasmas in Medicine, Disinfection, Material Synthesis and Water Treatment

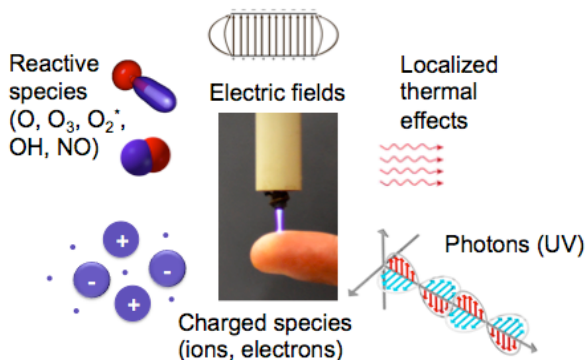
Peter Bruggeman

Associate Professor; Department of Mechanical Engineering, University of Minnesota

Non-equilibrium atmospheric pressure plasmas offer a unique source of highly reactive chemistry. Non-equilibrium plasma-induced chemistry is driven by energetic electrons without the requirement of thermal energy as in traditional chemistry. As a consequence highly reactive chemistry at ambient gas temperatures can be produced with promising applications in medicine, energy, pollution control and material synthesis and functionalization. Our research group has been strongly involved in the study of plasma-liquid interactions and plasma kinetics in the context of biomedical applications, disinfection and water treatment. We focus on the study of the underlying mechanisms of plasma processes to enable new applications.

The seminar will provide an overview of the emerging applications of non-equilibrium atmospheric pressure plasmas. I will focus on the increasing interest in medical applications including wound healing, disinfection, nanoparticle processing and environmental remediation. These applications are motivated by the increasing societal needs in food safety, infection control, chronic wound treatment and advanced materials for bio and energy related processes.

The underlying mechanisms of the interaction of plasma with living matter and plasma material synthesis and surface engineering will be discussed. Several examples of diagnostics used to investigate the underlying mechanisms of these plasma processes and how they contribute to the development or improvement of plasma technologies will be discussed.



**Bio:** Dr. Bruggeman is the Richard and Barbara Nelson Associate Professor of Mechanical Engineering at the University of Minnesota. He obtained his PhD in Applied Physics from Ghent University, Belgium and was an Assistant Professor of Applied Physics at Eindhoven University of Technology (the Netherlands) till 2013. His primary research interests are plasma-liquid interaction and non-equilibrium plasma kinetics applied to plasma processes for environmental, biomedical and renewable energy technologies. He is strongly engaged in collaborative interdisciplinary research to exploit these exciting applications.

Professor Bruggeman received several awards for his research including the 2012 Hershkowitz Early Career Award, the 2013 IUPAP Young Scientist Medal and Prize in Plasma Physics and the 2016 US Department of Energy Early Career Award. He is section editor for Plasmas and Plasma-Surface Interactions of Journal of Physics D: Applied Physics and also a member of five other editorial boards including Plasma Sources Science and Technology and Plasma Chemistry and Plasma Processes.

Professor Bruggeman advised 15 graduate students and published 80 papers in peer-reviewed journals of which 10 have been selected as journal highlights. He has co-authored five invited review papers, delivered invited keynote lectures at over 50 international meetings and is an elected member of the board of directors of the International Society of Plasma Chemistry. He is also the elected chair of the 2018 Gordon Research Conference on Plasma Processing Science.