

# Mechanical Engineering Department Seminar

3:35pm February 28, 2018  
1130 Mechanical Engineering  
111 Church Street SE, Minneapolis, MN 55455

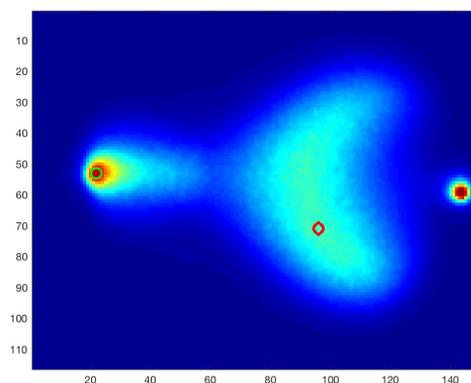
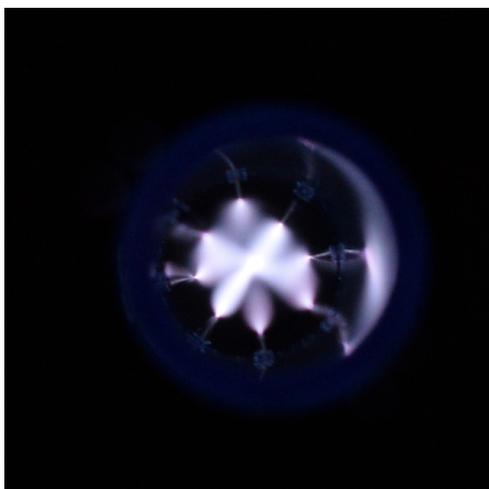
## Electrifying our Future: The Key Roles of Processing Plasmas

Sylvain Coulombe



Professor and Department Chair; Chemical Engineering – McGill University

The transition from a fossil fuel-powered linear economy to a greener and more circular economy through electrification with renewable sources and increased use of low-carbon or carbon-free fuels is firmly engaged. International organizations such as the World Economic Forum and the International Energy Agency report numerous examples of current initiatives and deployments aiming a more sustainable use of energy and material resources. Processing plasmas maintained by electrical discharges in gases or in multiphase environments provide unique chemical and thermal conditions for processing materials throughout their life cycle, and for more efficient and diverse energy utilizations. In this talk, I will present an overview of plasma technologies that are either emerging from research laboratories or being deployed at larger scale. Specifically, I will report on the underlying principles, challenges and some technologies for plasma-based resource recovery, the synthesis of advanced materials and fabrication of complex structures for energy harvesting, conversion, utilization and storage, and the conversion of electricity to dense chemical energy carriers. I will end the talk with a brief introduction of my ongoing work on novel plasma sources and processes for renewable electrical-to-chemical energy conversion and waste gas valorization.



**Bio:** Dr. Coulombe is an Engineering Physicist with graduate degrees in Chemical Engineering. He is Full Professor and Department Chair of Chemical Engineering at McGill University, Canada, and leader of the Plasma Processing Laboratory. Prior to joining McGill, he was a Senior Research Scientist with GE Global Research. He held the Canada Research Chair in Non-Thermal Plasma Processing from 2002 to 2012, and currently holds the Gerald Hatch Faculty Fellowship. He is an expert in plasma source and process development for applications in energy and environmental engineering. Current works focus on the development of pulsed nanosecond high-pressure plasma sources for electrical-to-chemical energy conversion, liquid activation, and in-flight particle functionalization; and low-pressure dual plasma sources for the synthesis of core-shell nanoparticles and complex nanostructures. He serves on the Editorial Boards of Plasma Chem. Plasma Process. and Plasma Process. Polym., and on the Advisory Panel of J. Phys. D: Appl. Phys. He is the Vice-President of the International Plasma Chemistry Society. He has published over 75 peer-reviewed articles and contributed more than 150 conference presentations and posters.