UC RIVERSIDE UNIVERSITY OF CALIFORNIA | Mechanical Engineering

The Department of Mechanical Engineering Presents

Chris Hogan, Ph.D.

Professor and Director of Graduate Studies
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Title: Pushing the Envelope in Aerosol and Gas Phase Physics: Cluster, Particle, and Ion Collision Dynamics

Abstract: The ambient atmosphere, combustion engines, and flame and plasma synthesis systems can all be described as suspensions of particles in a dispersed phase background, i.e. they are aerosols. Aerosol behavior is strongly influenced by the size distribution evolution of the particles in the aerosol; size governs transport physics. This presentation discusses recent aspects of particle size distribution and particle charge distribution evolution that our group has examined in aerosols, with a particular emphasis on ~1 nm "clusters" composed of a handful (10-100) of atoms (the building blocks of nanoparticles). Specifically presented will be (1) trajectory calculations to examine cluster-cluster, ion-ion, and particle-ion collisions in aerosols and dusty plasma sheaths, (2) how growth processes lead to non-thermal equilibrium between nanometer scale particles and their surroundings, and how classical heat transfer models fail to capture the rate at which clusters re-equilibrate, and (3) novel measurement techniques for nanometer scale particle reactions. In concluding the talk, though quite distinct from most of the presentation ongoing aerosol research at the University of Minnesota related to the protection of health care workers from aerosol based nosocomial transmission will be discussed, as aerosol transport physics have taken on a newfound importance in understanding and mitigating the spread of SARS-CoV-2.

About the Speaker: Chris Hogan is a Professor and the Director of Graduate Studies in the Department of Mechanical Engineering at the University of Minnesota. He received his PhD from Washington University in Saint Louis in 2008 and was a Post-doctoral Associate at Yale University before joining the University of Minnesota in 2009. His research work focuses on gas phase chemical physics, aerosol science, and particle technology. He started studying aerosols in 2003, first involved in studies of understanding how to sample and study airborne virus transport, following which he focused on electrospray ionization, ion mobility-mass spectrometry, and more recently, fundamental aerosol transport physics. He has published more than 103 papers on these topics, and he is the recipient of the 2011 Sheldon K. Friedlander Award and 2018 Kenneth T. Whitby Award from the American Association for Aerosol Research and the 2013 Marian Smoluchowski Award from the Gesellschaft für Aerosolforschung (German Society for Aerosol Research). He is the Editor-in-Chief of the Journal of Aerosol Science.

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