Physical Chemistry Seminar

Probing the formation of carbon particles with laboratory and synchrotron experiments

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Abstract

Gas phase nanoparticle formation is a highly complex process that transforms small molecules and radicals into solids that impact many aspects of our lives. These impacts may be positive (high value materials, commodity chemicals etc.) or negative (pollutants). Developing robust chemical mechanisms describing the formation of nanoparticles is critical to controlling the formation of desired species and the optimization of processes. Production of carbonaceous particles proceeds via the formation of polycyclic aromatic hydrocarbons (PAH).

The mechanisms by which PAH are formed are uncertain, in part due to the large numbers of isomers that may contribute to the chemical soup that links reagents and particles. Furthermore, many apparently simple reactions that are important in early PAH formation are actually complex multichannel processes with pressure and temperature dependent branching ratios. These require detailed experimental and theoretical study spanning a broad range of conditions.

The seminar will present some recent advances utilizing novel laboratory and synchrotron experimental techniques that yield insights into conditions in which nanoparticles are formed and the mechanisms governing PAH formation and growth at temperatures and pressures relevant to practical systems.

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11:30 a.m.

STEM-II Auditorium

(Room 1218)

Robert Tranter is a Senor Chemist in the Chemical Sciences and Engineering Division at Argonne National Laboratory. He obtained a BSc in Chemistry and a PhD in Combustion Chemistry from the University of Hull, UK.

Dr. Tranter did a postdoc at the DLR, Stuttgart, Germany, which focused on the oxidation and recombination chemistry of phenyl radicals. He then moved to the University of Illinois at Chicago where he held several positions working with John Kiefer and Kenneth Brezinsky on high temperature gas phase chemical kinetics with a variety of shock tube methods. Tranter's research has explored the elementary chemical kinetics of species relevant to fuel efficiency, novel fuels pollution reduction, particle synthesis and pyrolysis. He has developed and refined a number of experimental methods particularly with respect to shock tubes and the application of synchrotron-based diagnostics.