

IRTG-Seminar



Wolfgang Jäger

Department of Chemistry, University of Alberta, Canada

“Atmospheric Chemistry: Spectroscopic and Photo-Reaction Chamber Studies”

Atmospheric aerosols can severely affect human health and cause allergies, asthma, and cardiovascular and respiratory diseases. Aerosols have also significant effects on Earth's climate. They have direct effects of Earth's energy balance by scattering of, for example, incoming solar radiation and indirect effects by serving as cloud condensation nuclei.

The first part of the presentation will be about photo-reaction ('smog') chamber experiments to study ageing of soot aerosol particles. Soot particles consist of many primary particles and have complex morphologies. If soot particles are coated with volatile organic compounds or secondary organic aerosol, they undergo structural changes. Our systematic studies show that the extent of restructuring depends on the surface tension of the coating material. Using soot particles as probes, we have then determined the surface tension of aerosol, and important parameter which provides essential constraints on both direct and indirect effects of aerosols in global climate models.

In the second part of the talk, spectroscopic studies of clusters of organic acids with water will be described. Such clusters are thought to play a critical role in the initial steps of secondary organic aerosol particle formation. A case in point is the oxalic acid – water complex. We identified two isomers of this complex using rotational, microwave spectroscopy. Ab initio calculations show that the lower energy isomer lowers the barrier to decarboxylation of oxalic acid. This lower energy isomer is potentially a pathway to an important sink of dicarboxylic acids, which occur in significant abundances in the atmosphere.