On the Impact of Molecular Structure on Aerosol Formation from the Oxidation of Hydrocarbons

Measurements indicate that a significant fraction of the mass of atmospheric aerosol particles is organic matter, the majority of which consists of oxidized compounds that are the products of gas-to-particle conversion (secondary organic aerosol, SOA). The chemical and physical processes involved in the formation of SOA are complex and can include reactions of volatile organic compounds (VOCs) with various atmospheric oxidants (primarily O₃, and OH and NO₃ radicals), as well as surface and condensed-phase reactions, homogeneous nucleation, and gas-particle partitioning. In this talk, I will focus specifically on the impact of VOC molecular structure on SOA chemistry. Using examples from laboratory studies I will demonstrate some of the ways in which changes in structure can alter SOA products and yields (which in turn can affect particle properties such as hygroscopicity, cloud nucleating activity, light scattering and absorption, and toxicity), and suggest explanations for these effects based on current understanding of chemical reaction mechanisms.