Molecular Species of Atmospheric Interest Studied by Cryogenic Matrix Isolation

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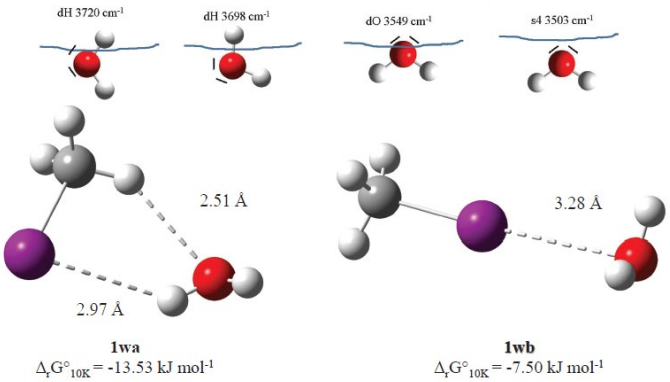
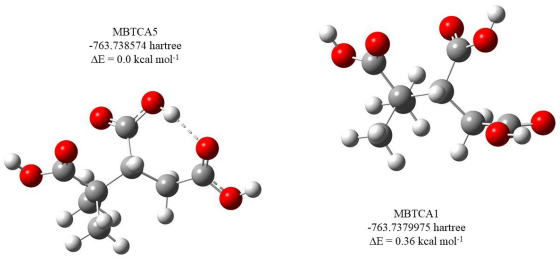
Organic molecules in the atmosphere are often prone to hydration and solvation. Interactions between water and organic molecules may influence the formation and ageing processes of secondary organic aerosol (SOA) which are formed from organic volatile compounds. The SOA particles can act as condensation cloud nuclei (CCN) depending on their hygroscopic properties and thus, can contribute to the global change. However, experimental studies at the molecular level are rather scare. Instead, most studies range from the nanoparticle scale (a few hundred nm to a few microns) to volumes of several m^3. To better understand the mechanisms of hydration, solvation, ageing (by the action of solar irradiation) or capture by atmospheric water ice, it is essential to study the processes at molecular scale. For this purpose, cryogenic matrices are the hosts of choice, particularly suitable for studying water-organic interactions. We illustrate these properties using two examples of molecules of atmospheric interest: first, we studied the photodegradation of iodomethane, CH_3I, a typical halogen species involved in the ozone cycle, trapped in an argon matrix and on the surface of water ice[1]. Second, we investigated hydration process of 3-methyl-1,2,3-butanetricarboxylic acid (MBTCA), one of the most important marker of biogenic SOA formation, trapped in argon, nitrogen, neon and xenon matrices.



$CH_3I\ldots H_2O$



MBTCA

[1]Sobanska, S.; Custodio-Castro M.T.; Rosano, R. M.; Mascetti, J.; Coussan, S. Photochemistry of CH3I···(H2O)n Complexes: From CH3I···H2O to CH3I in Interaction with Water Ices and Atmospheric Implications, *Earth and Space Chemistry,* **2024,** asap**,** 10.1021/acsearthspacechem.3c00351.