NITRIC ACID-WATER INTERACTION AND AMMONIA-WATER INTERACTION PROBED VIA ISOLATION IN CARBON TETRACHLORIDE

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The structure and properties of water, one of the most important hydrogen bonding substances, has been studied extensively. However, opacity due to the large oscillator strength of hydrogen bonds in the liquid makes infrared spectroscopy difficult in the 3000-3500 cm^{-1} region. In the study of aqueous nanodrops, near-room temperature water nanoclusters were generated in a hydrophobic solvent to probe the infrared spectroscopy of dynamically interchanging structures. The solvent for these studies is carbon tetrachloride (CCl_4). Carbon tetrachloride is an excellent solvent for these studies since the solubility of water is low, on the order of tens of millimolar. It is found that water forms only monomers in carbon tetrachloride at temperatures greater than 0°C. Addition of nitric acid shows features due to molecular nitric acid and its hydrates. Addition of ammonia shows features due to small of ammonia clusters as well as water monomers. A great deal of information of interactions of water with solute molecules such nitric acid and ammonia can be deduced by analyzing the hydrogen bonding region of the infrared spectra in carbon tetrachloride.