THE HCN-Ca AND HCN-Sr COMPLEXES FORMED ON THE SURFACE OF HELIUM NANODROPLETS: SPECTROSCOPIC PROBES OF SOLVATION DYNAMICS

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Complexes of HCN with the heavy alkaline earth metals are formed on the surface of helium nanodroplets. Two bands are observed for the HCN-Ca binary complex, having vibrational band origins that are separated by 1 GHz. The ratio of the intesities of the two bands is found to be strongly droplet size dependent. The species corresponding to the higher frequency band is reminiscent of the HCN-X (X=Na, K, Rb, Cs) complexes, having a large moment of inertia that is droplet size dependent, indicative of a complex bound to the surface of the droplet. The other band is rotationally resolved and is assigned to the solvated complex. IR-IR double resonance spectroscopy of HCN-Ca clearly indicate that vibrational excitation results in a population transfer between the surface bound and solvated species, suggesting that there is a droplet size dependent barrier between the surface and solvated states. A solvated HCN-Sr complex is not observed upon pick-up. However, vibrational excitation results in the solvation of the complex, as observed in the double resonance spectra upon pumping the C-H stretch of the surface bound complex.