STUDY OF He_N-HCN CLUSTERS USING ROTATIONAL SPECTROSCOPY

STEVE DEMPSTER, OLEKSANDR SUKHORUKOV, QI-YI LEI, and WOLFGANG JÄGER, *Department of Chemistry, University of Alberta, Edmonton, Canada T6G 2G2*.

In previous studies of He_N-molecule clusters it was observed that the rotational constants begin to increase with increasing number of helium atoms, *N*, at a certain critical cluster size. This non-classical behaviour is attributed to a decoupling of helium density from the rotational motion of the probe molecule and signifies the onset of microscopic superfluidity. It is still debated, however, how this trend can be correlated to, for example, the moment of inertia of the probe molecule or the anisotropy of the helium-molecule interaction potential energy surface. For this study, He_N-HCN clusters were chosen to investigate the phenomenon of microscopic superfluidity for a light rotor system, and to shed light on the relationship between quantum solvation and the molecular properties of the probe molecule. In this presentation, recent experimental results obtained for He_N-HCN clusters along with several of its isotopologues, i.e. He_N-DCN, He_N-$H^{13}CN$, He_N-$D^{13}CN$, He_N-$HC^{15}N$, with *N*=1 to 6 are highlighted. The experimental results, in particular the cluster rotational constants, *B*, are compared to several theoretical predictions.