ROTATIONAL SPECTROSCOPIC INVESTIGATION OF A NITROUS OXIDE MOLECULE SOLVATED BY HELIUM ATOMS

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We have demonstrated recently that it is possible to investigate relatively large molecule-He_N clusters using high resolution spectroscopic techniques.[a] Such studies push the boundaries of high resolution spectroscopy into the intermediate cluster size regime and bridge the gap between isolated molecules and the helium nanodroplet environment.

In this report, we present the investigation of rotational spectra of a nitrous oxide molecule loosely attached to helium atoms using a Fourier transform microwave spectrometer and a microwave-microwave double resonance spectrometer. The obtained spectroscopic constants of the N_2O-He_N clusters are interpreted in terms of cluster structure and dynamics. The trend in the obtained rotational constants as a function of number of helium atoms will be compared to that of OCS-He_N clusters and to the limiting value in the helium nanodroplet. This may shed light on the cause of the significantly different reduction ratios of the rotational constants of OCS and of N_2O embedded in superfluid helium nanodroplets to their respective gas phase values.

[a] J. Tang, Y. Xu, A. R. W. McKellar, and W. Jäger, *Science* **297**, 2030 (2002).