INFRARED SPECTROSCOPY OF CH_3F-(ORTHO-$H_2)_n$ CLUSTERS IN SOLID PARAHYDROGEN

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Infrared spectroscopic studies of CH_3F isolated in solid parahydrogen (99.99% purity) revaled multiple peaks in the ν_3 C-F stretch region. While the observed fine structure was first thought to be due to rotational motion of the CH_3F, further studies of samples with elevated orthohydrogen (o-H_2) concentrations clearly indicate the observed peaks are due to CH_3F-(o-$H_2)_n$ clustering. This has enabled infrared studies of CH_3F-(o-$H_2)_n$ (with n=1 to 12) clusters in solid parahydrogen. The observed shifts in the ν_3 vibration with the number of o-H_2 molecules clustering is similar to the shifts measured in $(Ar)_n$-HF clusters synthesized in helium nanodroplets [a]. Experimental results in support of this interpretation will be presented including 2 ν_3 and CD_3F studies.

[a] K. Nauta, R E. Miller, J. Chem. Phys. 115, 10138 (2001).