INFRARED SPECTROSCOPY OF CH$_3$F-(ORTHO-H$_2$)$_n$ CLUSTERS IN SOLID PARAHYDROGEN

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Infrared spectroscopic studies of CH$_3$F isolated in solid parahydrogen (99.99% purity) revealed multiple peaks in the $\nu_3$ C-F stretch region. While the observed fine structure was first thought to be due to rotational motion of the CH$_3$F, further studies of samples with elevated orthohydrogen (o-H$_2$) concentrations clearly indicate the observed peaks are due to CH$_3$F-(o-H$_2$)$_n$ clustering. This has enabled infrared studies of CH$_3$F-(o-H$_2$)$_n$ (with n=1 to 12) clusters in solid parahydrogen. The observed shifts in the $\nu_3$ 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 $\nu_3$ and CD$_3$F studies.