STARK SPECTROSCOPY OF CH_3F SOLVATED IN HELIUM NANODROPLETS

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Infrared spectra in the 2800-3150 cm^{-1} region are presented for CH_3F embedded in helium nanodroplets. We observe both the $\nu_1(a_1)$ symmetric C-H stretch and the ν_4(e) asymmetric C-H stretch. Transitions from K=0(A) and K=1(E) are observed due to nuclear spin statistics. The symmetric stretch is split due to a Fermi resonance between ν_1 and $2\nu_5$ (overtone of the asymmetric bend). The (ν_4,$2\nu_5$) Fermi resonance is an A_1-A_1 type parallel band and ν_4 is a E-A_1 type perpendicular transition. The upper diad of the (ν_1,$2\nu_5$) Fermi resonance, found around 2960 cm^{-1} is homogeneously broadened due to efficient vibrational relaxation to the lower diad. Furthermore, the J=2, K=2 $\leftarrow$ J=1, K=1 transition ($^rR_1(1)$) is significantly broadened due to rotational resonances with the phonon and roton modes of the helium droplet. Further attempts to observe broadening effects are studied by measuring the Stark Spectra of all three bands at many electric field strengths.