VIBRATIONAL PREDISSOCIATION OF THE HF-HCl COMPLEXES AT ν_{HF} = 3 LEVEL

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The binary complex between HF and HCl at ν_{HF} = 3 level, which has two stable forms: HF-HCl and HCl-HF, is studied recently by molecular beam laser induced fluorescence with an intracavity Ti-sapphire ring laser[a] and the detection of HF $\Delta\nu = 2 \leftarrow 0$ emission. Similar to previously reported K = 0-0 (300000) $\leftarrow$ (000000) transition of HF-HCl[b], the K = 1-0 subband seen at 11353.2 cm^{-1} shows significant rotational dependence to the predissociation linewidths, varying from 1.3 to 2.4 GHz. The rotational A constant of 43.5 cm^{-1} clearly indicates that the vibration-averaged angle between the HF axis and a-axis decreases over valence excitation, compared to 40.1 cm^{-1} at ν_{HF} = 1 level. Another weaker Q-branch band observed at 11351.7 cm^{-1}, with slightly narrower linewidths and little apparent J dependence, is tentatively assigned to the K = 1-0 (301000) $\leftarrow$ (000000) combination transition of HCl-HF. The 2D vibration-averaged $ab\ initio$ interaction potential of the complex predicts the HCl-HF form becomes more stable than HF-HCl through the valence excitation. The isotopic variation[c] of predissociation lifetime for the observed transitions is still under investigation.

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