MILLIMETER WAVE SPECTROSCOPY OF THE VAN DER WAALS BENDING BAND OF He-HCN WITH A MULTI-REFLECTION JET CELL

KENSUKE HARADA, CHRISTOPHER JAMES WHITHAM, AND KEIICHI TANAKA, *Institute for Molecular Science, Okazaki, 444-8585, Japan*.

The He-HCN cluster is a weakly bound cluster with a binding energy of only 9 cm^{-1}.[a,b] Previously, two van der Waals transitions were reported by electric resonance spectroscopy.[a] In the present study, a number of new j=1-0 van der Waals bending transitions predicted below the dissociation limit[b] have been observed in 95-125 GHz region with a high sensitivity multi-reflection millimeter wave jet cell. 10 round trip optical paths were used in the measurement. We used a pulsed jet nozzle and the jet cell was evacuated by a diffusion pump. We have measured 13 Q-branch lines up to *l*=4 with j=1-0 where *l* and j are the rotational quantum number of the cluster and the HCN subunit. The lines were fitted to a Hamiltonian expanded using a anisotropic intermolecular potential. The potential function was determined to be V = - 2.2530(43) $P_1(cos\theta)$ - 0.665(62) $P_2(cos\theta)$ - 0.45(17) $P_3(cos\theta)$ (in cm^{-1} units) and shows a large anisotropy with respect to the angle θ between the HCN and the intermolecular cluster axis.

[a] S. Drucker, Fu-Ming Tao, W. Klemperer, J. Phys. Chem. 99, 2646 (1995).
[b] K. M. Atkins, J. M. Hutson, J. Chem. Phys. 105, 440 (1996).