

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

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The He-HCN cluster is a weakly bound cluster with a binding energy of only  $9 \text{ cm}^{-1}$ .<sup>a,b</sup> Previously, two van der Waals transitions were reported by electric resonance spectroscopy.<sup>a</sup> In the present study, a number of new  $j=1-0$  van der Waals bending transitions predicted below the dissociation limit<sup>b</sup> 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 an 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  $\text{cm}^{-1}$  units) and shows a large anisotropy with respect to the angle  $\theta$  between the HCN and the intermolecular cluster axis.

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<sup>a</sup>S. Drucker, Fu-Ming Tao, W. Klemperer, *J. Phys. Chem.* 99, 2646 (1995).

<sup>b</sup>K. M. Atkins, J. M. Hutson, *J. Chem. Phys.* 105, 440 (1996).