INFRARED SPECTROSCOPY OF HYDROGEN CYANIDE IN SOLID PARAHYDROGEN

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Infrared spectroscopy is used to study the ro-vibrational dynamics and cluster formation of HCN embedded in solid parahydrogen. Parahydrogen matrices containing 10-100 ppm HCN are produced using the Rapid Vapor Deposition technique and probed with a high resolution absorption FTIR spectrometer. In spite of its Van der Waals radius with H_2 (3.7-4.1 Å[a]) being larger than the H_2 nearest neighbor distance (3.783 Å,[b]), HCN is found to undergo a hindered rotation within the matrix. In addition to its large size, HCN has a large dipole moment (3.0 Debye) which facilitiates cluster formation and induces strong infrared activity near the hydrogen vibrational band origins. Analysis of the HCN spectra at multiple concentrations will be presented with comparisons to studies of HCN and its clusters in superfluid helium droplets.

[a]D. T. Moore, M. Ishiguro, L Oudejans, and R. E. Miller, *J. Chem. Phys.*, 115, 5137 (2001).
[b]P. C. Souers, *Hydrogen Properties for Fusion Energy* (Univ. California Press, Berkeley, CA 1986).