

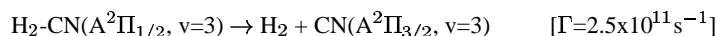
## SPECTROSCOPY AND DYNAMICS OF THE H<sub>2</sub>-CN VAN DER WAALS COMPLEX

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The reaction  $\text{H}_2 + \text{CN} \rightarrow \text{H} + \text{HCN}$  is of importance in the combustion of hydrocarbons in air. It is also a prototypical system for studies of polyatomic reaction dynamics. The reaction has a substantial entrance channel barrier ( $\approx 1000\text{cm}^{-1}$ ), which raises the possibility that pre-reactive H<sub>2</sub>-CN van der Waals complex may be stable at low temperatures.

We have recently detected H<sub>2</sub>-CN in a free-jet expansion, using laser excitation of the B-X and A-X transitions. The complex feature associated with the monomer B-X 0-0 transition consisted of a single broad peak. This corresponds to direct excitation to the H<sub>2</sub> + CN(B) dissociation continuum. From the onset of the continuum, the ground state well-depth is estimated to be  $40\text{cm}^{-1}$ .

Bands of H<sub>2</sub>-CN associated with the monomer  $\text{A}^2\Pi\text{-X}^2\Sigma^+$  3-0 transition were examined. Complex features associated with  $\text{A}^2\Pi_{1/2}$  were found to be homogeneously broadened by the spin-orbit predissociation process



Excitation of the complex to the  $\text{A}^2\Pi_{3/2}$  spin-orbit component yielded rotationally resolved bands. A preliminary analysis of the rotational structure yields an H<sub>2</sub> to CN separation of  $3.7\text{\AA}$ . The rotational lines are homogeneously broadened by the internal conversion predissociation process



Double resonance techniques have been used to examine the CN fragments produced by both predissociation channels.

Data for H<sub>2</sub>-CN and D<sub>2</sub>-CN (experiments in progress) will be presented and discussed.