ROTATIONAL SPECTRA OF THE H2-H2O AND H2-D2O CLUSTERS OBSERVED BY MILLIMETER-WAVE SPECTROSCOPY COMBINED WITH A PULSED SUPERSONIC JET TECHNIQUE

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Millimeter-wave absorption spectroscopy combined with a pulsed-jet expansion technique was applied to the measurement of the rotational transitions of of the(o)H_2-H_2O and (o)H_2-D_2O complexes in the frequency region up to 400 GHz. Rotational transitions of the complexes for two internal rotation states of the water part, $\Sigma(0_{00})$ and $\Pi(1_{01})$, were observed. The H_2 part was, however, limited to the $ortho$ species with nuclear spin of one and internal angular moment of j_{H2} = 1 and k_{H2} = 0. No spectral lines for the $para$-H_2 species have been detected.

The $\Pi(1_{01})$ state is split into doublet (e and f), due to the Coriolis interaction between the Π and Σ sublevels in the (1_{01}) state. Analysis of the Coriolis interaction give us the anistropy of potential energy surface around H_2O, and the Σ sublevel is estimated to be located about 10 cm^{-1} above the Π sublevel. The center of mass bond length between H_2 and water was derived to be 3.598 and 3.610 A, for (o)H_2-H_2O and (o)H_2-D_2O, respectively, from the observed rotational constants of the $\Sigma(0_{00})$ state. Simple potential fuction was determined by fitting to the observed rotational lines.