

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 the (o)H₂-H₂O and (o)H₂-D₂O 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 H₂ part was, however, limited to the *ortho* species with nuclear spin of one and internal angular momentum of $j_{H_2} = 1$ and $k_{H_2} = 0$. No spectral lines for the *para*-H₂ 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 (1₀₁) state. Analysis of the Coriolis interaction give us the anisotropy of potential energy surface around H₂O, and the Σ sublevel is estimated to be located about 10 cm⁻¹ above the Π sublevel. The center of mass bond length between H₂ and water was derived to be 3.598 and 3.610 Å, for (o)H₂-H₂O and (o)H₂-D₂O, respectively, from the observed rotational constants of the $\Sigma(0_{00})$ state. Simple potential function was determined by fitting to the observed rotational lines.