FAR-INFRARED EMISSION SPECTROSCOPY OF ROVIBRATIONALY EXCITED WATER VAPOR

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Water vapor transitions involving excited rovibrational levels have been identified in many high temperature space sources. Extensive experimental and theoretical efforts are still needed to provide more accurate databases concerning highly excited rovibrational levels. In this context, the high resolution emission spectrum of water vapor has been recorded between 50 and 600 cm^{-1} using a Bruker IFS 125HR Fourier transform interferometer and a continuous flow of water vapor rovibrationaly excited by an electrodless radio-frequency discharge.[a] More than 1500 pure rotational lines were assigned within the fundamental (000) and first excited (010) vibrational states up to $J = 35$. Rotational as well as rovibrational lines were identified for the higher lying states up to the first hexad. About 1000 pure rotational transitions within the vibrational states of the first hexad were assigned for the first time.

The new data, along with a large body of high-resolution data,[b] was fitted using the bending-rotation theoretical approach[c] to compute line positions. In a preliminary analysis, the wavenumbers of 1511 new transitions involving the ground and (010) states were accounted for up to $J = 27$ with a root mean square value of 0.8×10^{-3} cm^{-1}. Work is still in progress and we are hoping to account for the new data at least up to the second triad.

In the paper the new data will be presented and the results of the line position analysis will be given.

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[a] Pirali and Vervloet, *Chem. Phys. Letters* **423** (2006) 376.

[b] Coudert, Wagner, Birk, Baranov, Lafferty, and Flaud, *J. Mol. Spec.* **251** (2008) 339.

[c] Coudert, *J. Mol. Spec.* **181** (1997) 246.