

INVESTIGATION OF THE HYDANTOIN MONOMER AND ITS INTERACTION WITH WATER MOLECULES

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Hydantoin (Imidazolidine-2,4-dione, $C_3H_4N_2O_2$) is a five-membered heterocyclic compound of astrobiological interest. This molecule has been detected in carbonaceous chondrites [1], and its formation can rise from the presence of glycolic acid and urea, two prebiotic molecules [2]. The hydrolysis of hydantoin under acidic conditions can also produce glycine [3], an amino acid actively searched for in the interstellar medium.

Spectroscopic data of hydantoin is very limited and mostly dedicated to the solid phase. The high resolution study in gas phase is restricted to the work recently published by Ozeki et al. reporting the pure rotational spectra of the ground state and two vibrational states of the molecule in the millimeter-wave region (90-370 GHz)[4].

Using chirped-pulse Fourier-transform microwave (CP-FTMW) spectroscopy, we recorded the jet-cooled rotational spectra of hydantoin with water between 2 to 8 GHz. We observed the ground state of hydantoin monomer and several water complexes with one or two water molecules. All the observed species exhibit a hyperfine structure due to the two nitrogen atoms present in the molecule, which were fully resolved and analyzed. Additional experiments with a ^{18}O enriched water sample were realized to determine the oxygen-atom positions of the water monomers. These experiments yielded accurate structural information on the preferred water binding sites. The observed complexes and the interactions that hold them together, mainly strong directional hydrogen bonds, will be presented and discussed.

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[4] Ozeki, H., Miyahara R., Ihara H., Todaka S., Kobayashi K., and Ohishi M., *Astron. Astrophys.*, Forthcoming article (Accepted: 12 January 2017), DOI:10.1051/0004-6361/201629880.