MW SPECTROSCOPY COUPLED WITH ULTRAFAST UV LASER VAPORIZATION: RIBOSE FOUND IN THE GAS PHASE

EMILIO J. COCINERO, PATRICIA ECIJA, FRANCISCO J. BASTERRETXEA, JOSÉ A. FERNÁNDEZ, FERNANDO CASTANO, *Departamento de Química Física, Facultad de Ciencia y Tecnología, Universidad del País Vasco (UPV-EHU), Ap. 644, E-48080 Bilbao, Spain*; ALBERTO LESARRI, *Departamento de Química-Física y Química Inorgánica, Facultad de Ciencias, Universidad de Valladolid, E-47011 Spain*; JENS-UWE GRABOW, *Institut für Physikalische Chemie, Lehrgebiet A, Universität Hannover, Callinstraße. 3A, D-30167 Hannover, Germany*.

Sugars are aldoses or ketoses with multiple hydroxy groups which have been elusive to spectroscopic studies. Here we report a rotational study of the aldopentose ribose. According to any standard textbook aldopentoses can exhibit either linear forms, cyclic five-membered (furanose) structures or six-membered (pyranose) rings, occurring either as $\alpha$- or $\beta$- anomers depending on the orientation of the hydroxy group at C-1 (anomeric carbon). $\beta$-Furanose is predominant in ribonucleosides, RNA, ATP and other biochemically relevant derivatives, but is $\beta$-furanose the native form also of free ribose? Recent condensed-phase X-ray[a] and older NMR[b] studies delivered conflicting results. In order to solve this question we conducted a microwave study on D-ribose that, owing to ultrafast UV laser vaporization[c], has become the first C-5 sugar observed with rotational resolution. The spectrum revealed six conformations of free ribose, preferentially adopting $\beta$-pyranose chairs as well as higher-energy $\alpha$-pyranose forms. The method also allowed for unambiguous distinction between different orientations of the hydroxy groups, which stabilize the structures by cooperative hydrogen-bond networks. No evidence was observed of the $\alpha$-/$\beta$-furanoses or linear forms found in the biochemical derivatives.

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[b] i) M. Rudrum, and D. F. Shaw, *J. Chem. Soc.* **52**, 1965. ii) R. U. Lemieux and J. D. Stevens *Can. J. Chem.* **44**, 249, 1966. iii) E. Breitmaier and U. Hollstein *Org. Magn. Reson.* **8**, 573, 1976.

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