Invited Lectures A

August 30, Tuesday, 9:00 – 10:30

The Importance of High Resolution Molecular Spectroscopy in Astrophysics

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Molecules are unique tracers of interstellar cloud kinematics and physical-chemical conditions within large ranges of volume density and kinetic temperature. Astronomers rely on molecules to study the interstellar medium and the process of star formation in the Milky Way as well as in external galaxies, from nearby galaxies to those at the dawn of our Universe. Molecular observations also provide clues on the origin of organic molecules, and molecular complexity can be tracked down as a function of dynamical evolution of interstellar clouds, from diffuse to dense clouds, to star forming regions, to protoplanetary disks were habitable planets may form. High spectral resolution observations are crucial to carry out these studies. Thus, high resolution molecular spectroscopy is at the base of our understanding of astrophysical processes which regulate the evolution of the interstellar medium and the formation of stellar systems like our own.

Rotational Spectroscopy of Laser-Ablated Biomolecules

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Spectroscopic studies of biomolecules in gas phase are directed to the conformational and structural analysis of the building blocks of life, providing a picture of their intrinsic molecular properties free of intermolecular interactions imposed by the biological environment. The obvious difficulties for the experimental studies in gas phase are due to the high melting points and associated low vapor pressures of these compounds, preventing easy measurements of its gas-phase spectra in static thermally heated gas cells. Nowadays, advances in laser ablation of solid biomolecules have allowed to overcome vaporization problems. Particularly, the combination of laser ablation (LA) techniques with Fourier transform microwave spectroscopy techniques (MB-FTMW and CP-FTMW) conducted in a supersonic expansion [1] has provided a new approach to the structural studies of amino acids[2], nitrogen bases [3], monosaccharides [4], neurotransmitters [5], dipeptides [6] and other relevant building blocks. Even though larger molecules take these experimental techniques to their limits, we have demonstrated the ability of laser ablation combined with high-resolution microwave spectroscopy to extract relevant structural information on large solid biomolecules such as nucleoside uridine [7]. Last results on large naturally occurring systems are presented.

[1]J. L. Alonso and J. C. López, Microwave Spectroscopy of Biomolecular Building Blocks, *Top. Curr. Chem.*, 2014, Springer International Publishing .
[2]C.Bermudez, S.Mata, C.Cabezas, J. L.Alonso, *Angew. Chem. Int. Ed.* 53,11015 (2014) and ref. therein
[3] J.L.Alonso,V.Vaquero,I.Peña, J.C.López,S.Mata,W.Caminati, *Angew. Chem. Int. Ed.*,52, 2331 (2013).
[4]J. L.Alonso, M.A. Lozoya, I. Peña, J.C.López,C Cabezas, S.Mata,S. Blanco, *Chem. Sci.*, **5**, 515 (2014) and ref. therein
[5] C.Cabezas,I.Peña,J.C.López,J.L.Alonso, *J. Phys. Chem. Lett.*, 4, 486 (2013) and ref. therein
[6]C.Puzzarini,M.Biczysko,V.Barone,L.Largo,I.Peña,C.Cabezas,J.L.Alonso,*J.Phys.Chem.Lett.*5,534 (2014) and ref. therein
[7] I. Peña, C.Cabezas and J.L. Alonso, *Angew. Chem. Int. Ed*., 54, 2991 (2015)