

Fundamental radiation-matter interactions probed by soft X-ray spectroscopies in the gas phase

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While 2015 has been declared by UNESCO to be the International Year of Light, novel related research directions are currently launched in several laboratories around the world, synchrotron, laser, free electron laser, or combinations of such radiations being used to explore new key aspects of radiation-matter interaction. Synchrotron radiation based soft X-ray spectroscopies of isolated species are powerful investigation tools of their properties, in particular of the ultrafast dynamics initiated by inner-shell excitation [1]. Ultrahigh resolution electron spectroscopy and electron – ion momentum correlation measurements have been implemented and are now being routinely performed at the PLEIADES beamline, in operation since 2010 at Synchrotron SOLEIL in France.

As recent results, we confirm the original theoretical prediction by Gel'mukhanov's group [2] of a rotational Doppler broadening in molecular electron spectra [3], unraveling a site-selective [4] and orbital [5] dependent character. Auger electron – ion coincidence measurements investigating fundamental quantum phenomena have been performed on O₂, where nature has provided us with an ideal toolbox to materialize at the quantum level one of the most debated thought experiments of quantum physics: the Einstein-Bohr recoiling slit *gedanken* experiment [6]. Finally, we have shown that core ionization is able to provide an ideal tool for structural characterization of molecules, clusters and nanoparticles (see Ref. [7] for a review). After discussing some of these examples I will conclude the seminar with the fascinating perspectives offered by alternative sources, such as the Extreme Light Infrastructure, capitalizing on the recent advances of high-power laser technologies thus opening a new era in a variety of fields related to extreme radiation-matter interaction.

References

- [1] C. Miron & P. Morin, "High-Resolution Inner-Shell Photoionization, Photoelectron and Coincidence Spectroscopy", in Handbook of High-Resolution Spectroscopy, Ed. M. Quack and F. Merkt, 1655-1690 (2011).
- [2] Y.-P. Sun *et al.*, *Phys. Rev. A* **82**, 052506 (2010).
- [3] T.D. Thomas *et al.*, *Phys. Rev. Lett.* **106**, 193009 (2011).
- [4] C. Miron *et al.*, *Nature Commun.* **5**, 3816 (2014).
- [5] Q. Miao *et al.*, *J. Phys. Chem. Lett.* **6**, 1568–1572 (2015).
- [6] X.-J. Liu *et al.*, *Nature Photon.* **9**, 120-125 (2015).
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Ce séminaire sera suivi d'une pause café

Formalités d'entrée : accès libre dans l'amphi du pavillon d'Accueil.

Si la manifestation a lieu dans le Grand Amphi SOLEIL du Bâtiment Central merci de vous munir d'une pièce d'identité

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