

**LIDyL**

LABORATOIRE INTERACTIONS, DYNAMIQUE ET LASERS

LIDyL- LFP URA 2453

SEMINAIRE LIDyL-LFP

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Le Vendredi 29 Mai à 10H30
Bâtiment 522 - Salle 138

« Ultrafast Dynamics of 5-Halouracils Induced by XUV Radiation »

5-Halouracils (5XU) are formed by substituting the H atom at position 5 of the uracil ring with a halogen atom. It was found out that tumor cells are more sensitive to the lethal effects of the UV, X-ray, proton and α radiation when their DNA is modified by replacing the thymine with such molecules. Thus 5FU is a drug routinely used in combined chemo- and radiotherapy treatments for its radio-sensitising properties.

In order to understand at the molecular level, the 5XU interaction with XUV radiation, we have investigated the ionisation and fragmentation of 5FU and 5BrU induced by high order harmonics, HH, (9-35 eV) and synchrotron radiation (9-26 eV). The ensuing dynamics was detected by recording Time-of-Flight (TOF) spectra of the photofragments as a function of the delay between the XUV pump (with fs or attosecond pulse duration) and the probe pulse (fs IR/UV) and as a function of the excitation energy. For the time-resolved measurements, the kinetic energy of the main fragments was recorded by velocity map imaging, while for the energy-resolved ones, both the fragment and the (correlated) photoelectron kinetic energies were measured by using the photoelectron-photoion coincidence 3D momentum imaging.

The mass spectra can be explained only by considering that the parent ionisation is followed by complex dynamics involving ring opening reactions, proton/hydrogen transfer, multichannel and sequential dissociations. Measuring at various photon energies in the 9-26 eV range, the mass spectra and the photoemission spectra of the electrons coincident with the parent ion and with different fragment ions enabled us to identify the parent cation states involved in the ionisation and fragmentation. In addition, the energy-

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Sans autorisation, vous ne pourrez entrer sur le Centre de Saclay. Tél. : 33.1.69.08.30.95 - Fax : 33. 1.69.08.76.39 - email : caroline.lebe@cea.fr ou veronique.gerecny@cea.fr

Dans TOUS LES CAS, se munir d'une pièce d'identité (passeport et carte d'identité - pas de permis de conduire)

resolved measurements reveal that most of the energy is taken by the photoelectron. All fragments bear very little kinetic energy, maximum 1 eV and typically, less than 0.5 eV. These results are consistent with those obtained in the fragmentation induced by HH. For both, FU and BrU, we have recorded ultrafast dynamics (<10 fs) manifested as delayed signal appearances and sharp rising/decaying signals. An ultrafast decay of about 40 fs was observed for the fragment 43 signal (HNCO or FCCH), while the complementary behaviour (rising) on the same timescale was observed for fragment 44, which can be only formed by H/H⁺ transfer, most probably via tautomerisation. Similar behaviours, although slower, were measured for the fragments 31 (FC) and 32 and for the equivalent BrU fragments. These dynamics may be associated with H/H⁺ transfer processes where the difference in the timescales is determined by the initial and final sites of the transfer and, in particular, to the involvement of the halogen atom.

