SEMINAIRE ISMO

Maria NOVELLA PIANCASTELLI
Laboratoire de Chimie Physique-Matière et Rayonnement,
Université Pierre et Marie Curie
UMR 7614, Paris, France

Time-resolved studies of molecular core-excitation dynamics

Molecular core excitation or ionization produces an intermediate state with a deep electron vacancy, which subsequently decays on a short time scale. The typical decay patterns for molecules consisting of light atoms involve Auger electron emission, leading to final states with valence holes. Such processes can be accompanied by a wealth of molecular dynamics, including nuclear motion or fragmentation. Depending on the depth of the core hole, typical decay times range from few femtoseconds to hundreds of attoseconds.

Studies of core excitation-decay processes are usually performed with tunable sources such as synchrotron radiation facilities. However, the time structure of such sources does not allow the access to the femtosecond-attosecond time scale.

I will discuss two methods to investigate complex decay dynamics on such a short time span, and provide some examples for each.

The first possibility is to use the so-called “core-hole clock”, meaning the possibility of using the core-hole lifetime as upper limit and of observing phenomena such as ultrafast dissociation taking place during the electron decay.

The second possibility is related to a new generation of tunable sources, namely the free-electron lasers. At some of the new facilities, the light can be provided very short pulses, down to a few femtoseconds, allowing the observation of phenomena such as sequential double-core-hole formation.

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Mardi 15 mai 2012 à 11 h 00
Bât. 210 – Amphi 1 (2ème étage)
Université Paris-Sud 91405 ORSAY Cedex