

Time-resolved X-ray spectroscopic studies of solar materials and biological systems

Majed Chergui

*Laboratoire de Spectroscopie Ultrarapide and Lausanne Centre for Ultrafast Science
(LACUS), Ecole Polytechnique Fédérale de Lausanne
CH-1015 Lausanne, Switzerland
E-mail: Majed.Chergui@epfl.ch*

In this talk, I present our recent results, using pulsed x-rays from synchrotrons and X-ray free electron lasers (XFEL), on solar materials, such as transition metal oxides and perovskites. In particular, I will show how ultrafast X-ray absorption and emission spectroscopies can unravel both trapping of charge carriers in such materials, but also the behaviour of free carriers. Trapping of electrons will be discussed in the case of Titanium dioxide, while trapping of holes will be illustrated in the case of ZnO. Finally, in the case of Cs-based inorganic perovskites, I will show that while electrons remain delocalised in the conduction band, holes form small polarons in the valence band. I will also present our latest results on the NO ligand detachment and binding in photoexcited Myoglobin-NO using X-ray absorption, X-ray emission and X-ray scattering at XFELs.