DAMOP18-2018-020054

Abstract for an Invited Paper
for the DAMOP18 Meeting of
the American Physical Society

**Attosecond dispersive soft X-ray absorption fine structure spectroscopy**

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Phase transitions of solids and structural transformations of molecules are canonical examples of important photo-induced processes, whose underlying mechanisms largely elude our comprehension due to our inability to correlate electronic excitation with atomic position in real time. Here, we present a decisive step towards such new methodology based on water-window-covering (284 eV to 543 eV) attosecond soft X-ray pulses that can simultaneously access electronic and lattice parameters via dispersive X-Ray absorption fine-structure (XAFS) spectroscopy. We validate attoXAFS with an identification of the $\sigma^*$ and $\pi^*$ orbital contributions to the density of states in graphite simultaneously with its lattice's four characteristic bonding distances. Moreover, we will show that this method can provide a real-time view on the light-field- driven inter- and intra-band carrier dynamics of the quasi-two-dimensional transition-metal dichalcogenide TiS2, exploiting the element specificity of X—ray transitions at the L edges of the titanium atoms at 460 eV. This work demonstrates the concept of attoXAFS as a powerful real-time investigative tool which is equally applicable to gas-, liquid- and condensed phase.