Resonant Auger Spectroscopy - a Tool to Study Dynamic Processes at Surfaces

Wilfried Wurth

Institut für Experimentalphysik, Universität Hamburg, 22761 Hamburg, GERMANY

Ultrafast dynamics at surfaces and interfaces plays a central role for the understanding of elementary chemical reactions, photochemical and biophysical processes as well as molecular electronics. It is well known that the timescales for these processes are often in the femtosecond regime. A possible approach to study ultrafast dynamics are stroboscopic investigations using ultrashort laser pulses. Recently it has been shown by several groups that complementary information on the femtosecond dynamics of free molecules and surface systems can be obtained using high resolution core hole spectroscopy at third generation synchrotron sources. In these experiments coherence effects in the excitation and decay of inner shell electronic states are used to investigate femtosecond dynamics in an element specific way. For this purpose the lifetime of intermediate core excited states is used as a time base ("core hole clock"). A necessary prerequisite to obtain dynamic information from resonant core hole decay spectra is sub-natural linewidth in the primary excitation channel. Hence such experiments are only possible at third generation synchrotron sources. Using this technique elementary electron transfer processes as well as nuclear dynamics at surfaces have been investigated in the time frame of (sub-)femtoseconds. In this contribution applications of the method, possible extensions, as well as limitations will be reviewed.