Photoelectron Diffraction: A local structural probe of advanced materials

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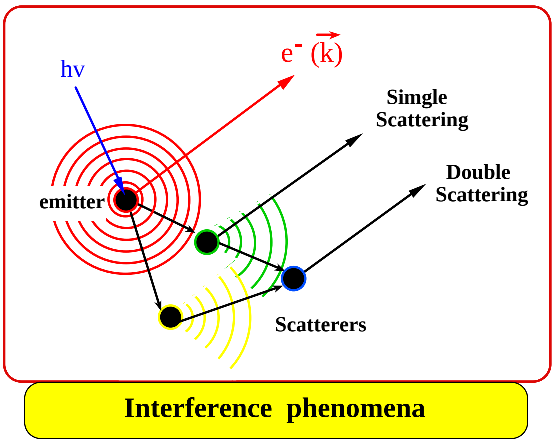
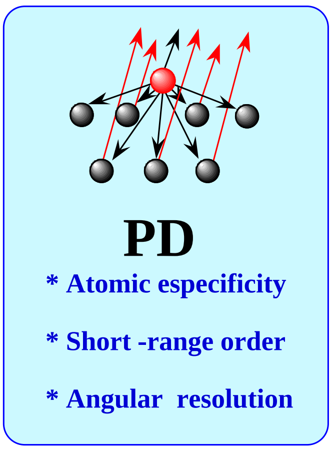
The essential physical processes involved in Diffraction of photoelectrons (PhD) is based on the fact that the components of the photoelectron wavefield emitted from an atom can be elastically scattered by the surrounding atoms and these scattered waves can interfere coherently with the directly emitted wave. The resulting interference depends on the relative phases of the directly emitted and scattered waves which turn on the photoelectron wavelength (energy), on the position of the emitter (relative to the scatters) and on the collection angle, the latter two parameters are directly influencing the scattering pathlengths. The result of this scattering process on the angle-resolved intensity of the photoelectron emitted may be monitored by measuring intensity changes, which occur when one of the non-structural parameters (energy or angle) is varied. Usually, a large data set of these intensity modulations constitute a solid base for deducing the local structure around the emitter atom, with a precision better than 0,05 Å.





In the theoretical lecture dedicated to PhD, we will describe the main mechanisms involved in a typical photoelectron diffraction experiment based in synchrotron radiation sources as well as the theoretical approaches commonly used in order to derive the valuable structural information of the systems studied by such method. In addition, a practical tutorial will be dedicated to the direct use of multiple scattering codes in order to resolve the structure of simple examples.