High resolution soft-RIXS: recent achievements and future challenges

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Resonant inelastic x-ray scattering (RIXS) in the 300-1500 eV energy range has become exceptionally popular with the advent of high-resolution instruments. A couple of gratings in the beam line monochromator and in the spectrometer can cover the full energy range, which includes the $L_{2,3}$ edges of 3*d* transition metals, the *K* edge of oxygen and the $M_{4,5}$ edges of lanthanides. The high absorption coefficient and the technical need for micrometric beam spots on the sample surface allow working on tiny volume of material, such as ultra-thin films, superlattices and nano-patterned layers. Therefore the initial scientific success of high resolution soft-RIXS, mainly obtained at the Cu L_3 edge, has motivated ambitious projects of beam lines devoted to this technique in a number of storage rings and x-ray free electron lasers. The aim is the advanced study of the electronic and magnetic properties of a variety of intriguing materials based on 3*d* transition metals and rare earths.

In my presentation, I will start from the most significant results in this field in the last period, including some of the very first spectra measured at ID32 of the ESRF using the ERIXS spectrometer, to discuss the new experimental challenges in the present and in the future of soft-RIXS: higher energy resolution, detection efficiency, sample manipulation and physical environment, polarimetry, time resolution and non-linear phenomena

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