New Perspectives of High Resolution X-ray Spectroscopy Applied to Bioinorganic Chemistry

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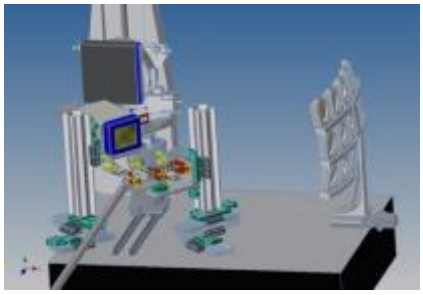
X-ray Emission Spectroscopy (XES) with improved energy resolution is an experimental technique that analyzes the details of the emitted photons after the excitation of a core level. This powerful technique is used in the study of several problems in physics, chemistry, geology, biology, and material's science, among others.[1-4] If the total experimental resolution is below that of the K- or L-lifetime broadening, an enhanced sensitivity on the measured XES (and the resonant derivations) spectral shape can be obtained.[4] Under special conditions it is possible to investigate the absorption edges of light elements (phosphor, sulfur, chlorine, potassium, calcium, etc.) without the use of vacuum and even study low-energy absorption edges using hard x-rays via the so-called X-ray Raman scattering (XRS). [3,5]

Here we describe the installation, commissioning and initial results of a dispersive-type X-ray spectrometer for high energy resolution XES (Figure 1). A few examples of how high energy resolution XAS and XES data aided in solving long-standing problems in bioinorganic chemistry and model systems will be presented. The current XES spectrometer can operate in the energy range between 5 keV and 15 keV, and will be installed permanently at the XDS beamline and made available to the user community starting from 2017. These experiments will also be available at Sirius.



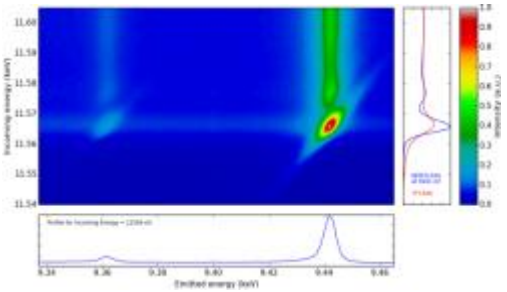


Figure 1 – (*left*) X-ray spectrometers that will be installed at XDS beamline in 2017. (*right*) Resonant Lα XES spectra of a $PtCl_6$ sample.

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