

Construction and First Results of the ADDRESS beamline for Resonant Inelastic X-Ray Scattering and Angular Resolved Photoemission Experiments at the Swiss Light Source

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Invité par Nicolas JAOUEN

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Petit Amphi Soleil – Bat. Accueil

Resonant inelastic X-ray scattering (RIXS) is a powerful bulk-sensitive probe of the electronic structure of condensed matter with atomic and orbital sensitivity. It is a unique tool for determining the energy and symmetry of charge neutral electronic excitations (e.g. crystal field or spin-flip excitations) in strongly correlated materials. A complementary technique, Angle-Resolved Photoelectron Spectroscopy (ARPES) allows *k*-resolved investigations of the electronic band structure, correlation and resonance effects. Promoting ARPES into the soft X-ray range offers enhanced bulk sensitivity and better control over 3-dimensional *k*. Instrumentation for both, soft X-ray RIXS and ARPES, are available for users at the ADvanced RESonant Spectroscopies (ADDRESS) beamline at the Swiss Light Source (SLS).

We report on construction and capabilities of the ADDRESS beamline at the SLS. Its optical scheme is based on a Plane Grating Monochromator operated in collimated light. The beamline is calculated to deliver soft X-rays with variable polarization (circular and linear) between 0.4 and 1.8 keV at high resolving power up to 28000 near 1 keV. The expected flux of 1 keV photons on the sample ranges from 3×10^{11} to 1×10^{13} photons/s/0.01%BW for a resolving power of 28000 and 7000, respectively. The undulator for this beamline adopts an Apple-type scheme with 4 arrays of permanent magnets with a fixed magnetic gap. In this design horizontal movements of the magnetic arrays are used to adjust polarization (opposite arrays) and photon energy (two adjacent arrays). Ellipsoidal refocusing optics in front of the experimental station for the RIXS investigations reduces the vertical beam dimension on the sample to 8 μm as required for high detection efficiency of the inelastically scattered X-rays.

The SAXES (Super Advanced X-ray Emission Spectrograph) RIXS spectrometer of the ADDRESS beamline is based on a variable line spacing spherical grating and has a resolving power of ca. 12000 for 1 keV. It is installed on a rotating platform in order to study low-energy excitations as a function of momentum transfer, thereby enabling characterization of localized vs. delocalized character of electronic excitations. We report on first results obtained with this station at the SLS on transition metal monoxides (NiO, MnO and CuO) as reference compounds for strongly correlated materials. These results demonstrate the capability of this set-up for RIXS studies with unprecedented ultra-high resolution. Investigations on the spin-ladder / spin-chain system $\text{Sr}_{14}\text{Cu}_{24}\text{O}_{41}$ illustrate the new opportunities of RIXS as a tool for the detailed analysis of the magnetic exchange interactions in such materials.

Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi Soleil du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).

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