SRI2024

Contribution ID: **250** Type: **Contributed talk**

Tender X-Ray RIXS at PETRA-III

Wednesday 28 August 2024 17:45 (15 minutes)

Resonant inelastic x-ray scattering (RIXS) [1] is a momentum resolved x-ray spectroscopy technique that requires high energy resolution around specific atomic absorption edges. This usually means the L2,3-edges of the transition metals (3d, 4d, and 5d TMs) and a resolution on the order of ΔE~50 meV, making it possible to measure spin-waves and atomic multiplets in d-electron systems. However, the L2,3-edges of the 4d TMs compounds –located in the tender x-ray regime (2-4 keV) –are not easily accessible or compatible with operating soft and hard x-ray RIXS instruments. In light of this problem, the Max-Planck Institute in Stuttgart and beamline P01 at Petra III DESY constructed in 2017 a new RIXS instrument dedicated solely to tender x-rays [2]. The instrument, dubbed IRIXS (intermediate x-ray energy RIXS), was originally intended for the Ru L3-edge (2840 eV) [3,4] but has since then been expanded to other 4d edges, including Rh L2,3-edge (3004 and 3146 eV) and Ag L2,3-edge (3351 and 3523 eV), as well as edges beyond the TMs such as U M4,5-edge (3550 and 3725 eV) [5] and S K-edge (2470 eV). Here I will argue that all of this is now possible thanks to our renewed interest in developing and making spherically bent and diced x-ray analysers (quartz [6] and LiNbO3), a work that has been partially carried out in collaboration with the Advanced Photon Source at Argonne [7]. Finally, I will present the IRIXS Spectrograph [8], a concept based on a flat silicon crystal analyser, and show how such a detection scheme can profit from the PETRA-IV project.

[1] Luuk J. P. Ament et al., Rev. Mod. Phys. 83 705 (2011)
[2] H. Gretarsson et al., J. Synchrotron Rad. 27 538-544 (2020)
[3] H. Gretarsson et al., Phys. Rev. B 100 045123 (2019)
[4] H. Suzuki et al., Nat. Commun. 14, 7042 (2023)
[5] A. Marino et al., Phys. Rev. B 108, 045142 (2023)
[6] D. Ketenoglu et al., J. Synchrotron Rad. 25 537-542 (2018)
[7] A. H. Said et al., J. Synchrotron Rad. 25 373-377 (2018)
[8] J. Bertinshaw et al., J. Synchrotron Rad. 28 1184 (2021)

I plan to submit also conference proceedings

No

Primary author: GRETARSSON, Hlynur (FS-PETRA-S (FS-PET-S Fachgruppe P01))

Co-authors: Prof. KEIMER, Bernhard (Max-Planck Institute Stuttgart); KETENOGLU, Didem (Ankara University (AU)); DILL, Frank-Uwe (FS-PETRA-S (FS-PET-S Fachgruppe P01)); HARDER, Manuel (European XFEL); SUNDERMANN, Martin (FS-PETRA-S (FS-PET-S Fachgruppe P01)); MAYER, Simon (FS-PETRA-S (FS-PET-S Fachgruppe P01))

Presenter: GRETARSSON, Hlynur (FS-PETRA-S (FS-PET-S Fachgruppe P01))

Session Classification: Mikrosymposium 2/4: Beamline Innovations

Track Classification: 2. Beamline Innovations