

Hard XMCD under Extreme Conditions

F. Wilhelm and A. Rogalev

ESRF, 71 avenue des Martyrs, 38000 Grenoble, France, wilhelm@esrf.fr

ESRF ID12 is a beamline dedicated to polarization dependent X-ray absorption spectroscopy in the photon energy range from 2 to 15 keV. A large part of scientific program at ID12 concerns use of X-ray Magnetic Circular Dichroism to unravel the microscopic origin of magnetism in a large variety of materials: ferro- ferri- and paramagnets. Over the years many efforts have been devoted to develop specific instrumentation to perform XMCD under multiple extreme conditions of magnetic field, temperature and pressure. Nowadays, users can routinely perform XMCD studies on different samples like ultrathin films, nanoparticles or bulk crystals under magnetic field as high as 17T magnetic field and temperatures down to 2.1 K [1]. In the last 5 years, 8 Tesla solenoid with RT bore was equipped with a specially designed anvil cell allowing XMCD measurements under pressures up to 60 GPa and temperatures down to 2.7 K [2]. More recently, we have demonstrated that hard XMCD measurements on paramagnetic molecular systems can be performed at temperatures as low as 500mK [3]. The performance of the beamline will be illustrated with a selection of some prominent achievements in the field of hard XMCD under multiple extreme conditions. Finally, challenges and scientific opportunities open with the new EBS source will be discussed.

References

- [1] - A. Rogalev and F. Wilhelm, *The Physics of Metals and Metallography* 116, 1285 (2015).
- [2] - F. Wilhelm, G. Garbarino, J. Jacobs, H. Vitoux, R. Steinmann, F. Guillou, A. Snigirev, I. Snigireva, P. Voisin, D. Braithwaite, D. Aoki, J.P. Brison, I. Kantor, I. Lyatun, A. Rogalev, *High Pressure Research* 36, 445 (2016).
- [3] - A. Rogalev, J.P. Kappler, Ph. Sainctavit, F. Wilhelm, R. Clerac, K.S. Pedersen, L. Joly, W. Li, (2019), in preparation.