Strong *K*-edge magnetic circular dichroism in 1*s*2*p* RIXS

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X-ray magnetic circular dichroism (XMCD) is a powerful tool for the element-specific study of the magnetic structure of complex systems [1]. The spin and orbital polarization of 3*d* valence orbitals is probed by dipole-allowed 2p→3d transitions, i.e. at the $L_{2,3}$ absorption edges. They are studied using soft X-rays whose short penetration depth limits the number of possible applications. Hard X-rays are used at the *K*-edge but the very weak XMCD signal and the absence of spin-orbit split edges do not allow for a detailed quantitative interpretation.

We have recently observed that XMCD combined with resonant inelastic scattering (RIXS) of hard X-rays at the *K* pre-edge of iron in magnetite yields a dichroic signal that is of the same order of magnitude as *L*-edge XMCD. Crystal field multiplet calculations reveal that the 1*s*2*p* RIXS-MCD signal arises from intraatomic 2*p*-3*d* Coulomb repulsions, 2*p* and 3*d* spin-orbit coupling [2].

An interesting aspect of RIXS is the possibility for site-selective measurements by tuning incident and emission energies to the spectral features characteristic for given oxidation state and/or local environment [3]. Thus RIXS-MCD could be used to probe the magnetism element- and site-selectively in mixed valence and multisite compounds with bulk sensitivity and under demanding environments. Possible applications will be discussed.

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