MS103.O03

X-ray Natural Circular Dichroism

A. Rogalev[1], A. Bosak[1], F. Wilhelm[1], J. Goulon[1]
[1]*European Synchrotron Radiation Facility, Grenoble, France*

Natural Circular Dichroism was only recently discovered in the x-ray range[1]. This effect stems from the interference terms which mix multipole transition moments of opposite parity: the Electric Dipole-Electric Quadrupole (E1.E2) and the Electric Dipole-Magnetic Dipole (E1.M1) exist only in structures with broken space inversion symmetry. The scalar E1.M1 term known to be responsible for Circular Dichroism at optical wavelengths is usually considered to be vanishingly small for core level spectroscopies. The E1.E2 interference term, on the contrary, can be large in the X-ray region, but it is a parity odd second rank tensor and therefore observable only in 13 non-centrosymmetric crystal classes. X-ray Natural Circular Dichroism has now been detected in the XANES region for several uniaxial and biaxial crystals. It can give access to the absolute configuration of chiral absorbing centers. On the other hand, Chiral-EXAFS, i.e. the analog of Magnetic-EXAFS for Natural Circular Dichroism has also been measured recently using a uniaxial optically active crystal of paratellurite (TeO2). Chiral-EXAFS originates from symmetry allowed multiple scattering paths. In this presentation, we wish to report on recent advances in X-ray natural circular dichroism and its applications. Determination of absolute configuration is illustrated with measurements of both E1.E2 and E1.M1 terms in chiral alpha-Ni(H2O)6•SO4 single crystals. Manifestation of X-ray optical acitivity in magnetoelectric crystals will be illustrated with various dichroisms measured at the Fe K-edge in multiferroic GaFeO3 crystal. Finally, we will review briefly the perspectives open by our experiments.

[1] *Goulon J., Goulon-Ginet C., Rogalev A., et al., R J. Chem. Phys. 108, (1998), 6394-6403*

Keywords: Optical activity, noncentrosymmetric crystals, absolute configuration