X-ray magnetic spectroscopies: recent advances

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Development of the third generation synchrotron radiation sources has boosted X-ray spectroscopy, as illustrated by the discovery of a variety of new experimental techniques associated with the exploitation of the polarization properties of x-rays. Firstly, it concerns x-ray magnetic circular dichroism (XMCD) that is now a workhorse technique in modern magnetism research, leading to a deeper understanding of the microscopic origin of the magnetic state of matter.

Particularly interesting are XMCD measurements under multiple extreme conditions of high magnetic field, low temperatures and high pressure. Secondly, x-ray magnetochiral dichroism (XMχD) recently measured on various magnetoelectric systems or chiral molecular magnets, is presented. Concomitant advances in X-ray instrumentation and theoretical approaches have metamorphosed X-ray magnetic spectroscopies from a scientific curiosity to a workhorse technique in modern magnetism research and have paved the way to further new applications in chemistry, earth science, biology and other field of science.

References

Bio

Prof. Andrei Rogalev is a senior scientist at the Electronic Structure, Magnetism and Dynamics (EMD) group, at the European Synchrotron Radiation Facility (ESRF). Received his PhD in Physics at Moscow State University in 1992. In 1993, he joined the European Synchrotron Radiation Facility to work in X-ray spectroscopy group. Since 1998, he has become responsible for ID12 beamline dedicated to polarization dependent x-ray spectroscopy. This beamline is a unique instrument on worldwide scale devoted to research at the ultimate limits of x-ray spectroscopy with polarised synchrotron radiation. Andrei Rogalev played an important role in spectacular progress observed in field of magnetism using x-ray magnetic circular dichroism technique. He has together with his co-workers discovered new x-ray dichroisms exploiting optical activity phenomena in non-centrosymmetric magnetic systems, e.g. chiral molecular magnets. His scientific production includes more than 300 papers in peer-reviewed journals and 7 book chapters.