Synchrotron Based Spectroscopic Studies of Magnetic Materials

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Synchrotron-based spectroscopic investigations of magnetic materials, using primarily soft x-rays, has emerged as very sensitive tools for element-specific characterizations of electronic and magnetic properties, something inaccessible with e.g. methods using visible light. I will provide some examples of our research performed at the Swedish synchrotron facility MAX-lab and at other sources. I will discuss the X-ray magnetic circular dichroism (XMCD) technique which allow direct determination of the spin and orbital moments with elemental specificity by means of the XMCD sum rules. In certain cases the method also provides chemical information on the valence state of the atoms responsible for the magnetic order. XMCD can thus also be used to reveal the nature of magnetic ions in the material.

I will also show some examples from our recent activity on characterizing interface properties in metallic multilayer systems using high kinetic energy photoemission. In particular, the much increased mean free path at higher kinetic energies in combination with the elemental selectivity of the core level spectroscopies has lead to a regained interest in the use of photoelectron spectroscopy in many areas, as it makes it possible to investigate the electronic structure of materials with a substantially reduced surface sensitivity.