High-pressure Magnetic Collapse in Transition-metal Oxides

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Pressure plays a key role in transition-metal electronic properties, since it can alter the electron density and hybridization, thereby the localization of the d electrons and their magnetic properties. A satisfying description of d electron in correlated material constitutes in fact an ongoing challenge for theory. This henceforth applies to the magnetic collapse issue. We have studied the 3d magnetism in MnO and CoO under very high pressure using x-ray emission spectroscopy (XES). XES is known as a local probe of the metal magnetism [1]. More specifically, by monitoring changes in the Kbeta emission line as a function of pressure, we were able to identify the disappearance of the transition-metal spin-moment at pressures of 80 GPa and 140 GPa in MnO and CoO respectively [2].

The results were analyzed within a full multiplet approach including crystal field, correlation, charge transfer and O-metal hybridization energies. The pressure dependence of the emission line is well accounted for by changes of the crystal field and ligand bandwidth. This work proposes to reconcile in a unified picture both localized and delocalized aspects of the d-electron properties under pressure. We will discuss about the potentials and perspective of this novel technique for high pressure magnetism studies.

[1] Badro J., et al., *Science*, 2004, **305**, 383. [2] Rueff J.-P., et al., *J. Phys.: Condens. Matter*, 2005, **17,** 717.

Keywords: high-pressure physics, x-ray emission spectroscopy, cluster calculations