

Experimental report 02-02-855

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Our comparative study of the magnetism in Sr_2IrO_4 as bulk and as a 65 nm-thick film relied on the measurement of magnetic superstructure reflections as a function of temperature and azimuth.

We successfully used Resonant Magnetic X-ray Diffraction to detect, in the bulk and in the film, the magnetic ordering. Figure 1 shows the L-scans (a) and the energy scan (b) of the bulk magnetic reflection (1 0 24), showing the huge enhancement provided by the resonance at the Ir L_3 edge. The similar reflection (0 1 20) was measured on the thin film with a 1000-fold decrease in counts (c).

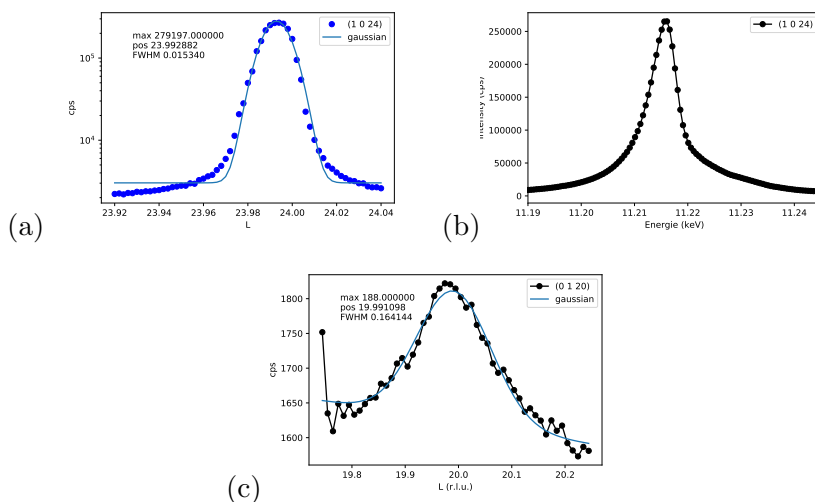


Figure 1: (a) Bulk magnetic (1024) reflection. (b) Energy scan of the (1024) reflection. (c) Film's (0 1 20) magnetic reflection, L-scan.

Thanks to the very precise Kappa diffractometer, the azimuthal dependence was measured to confirm magnetic moment directions. Many other reflections were measured, also with resonant enhancements, providing information on structural changes.

The temperature equipment was also precise enough to carefully follow the order parameters of the magnetic ordering in the two samples, which is shown in Fig.2

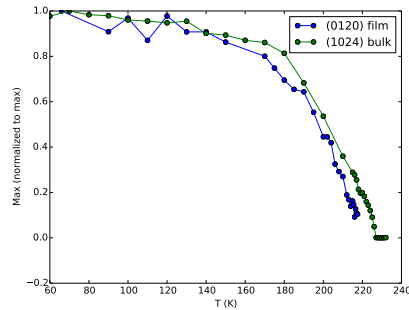


Figure 2: Temperature dependence of the bulk magnetic (1024) reflection and film's (0 1 20) magnetic reflection.

We are grateful to the D2AM beamline staff for their assistance to this very successful Resonant X-ray Diffraction experiment.