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Magnetic structure and dynamics of Rh-doped Sr_2IrO_4 probed by resonant x-ray scattering J.P. CLANCY, H. GRETARSSON, University of Toronto, JUNGHO KIM, M.H. UPTON, Argonne National Laboratory, G. CAO, University of Kentucky, YOUNG-JUNE KIM, University of Toronto — The physics of 5d iridates has recently attracted considerable attention due to the potential for novel electronic and magnetic ground states driven by strong spin-orbit coupling (SOC). One material which has attracted particular interest is the layered perovskite Sr_2IrO_4, which has been proposed as the first experimental realization of a spin-orbital Mott insulator with a $j_{eff} = 1/2$ ground state [1,2]. It has been shown that by substituting Ir^{4+} ($5d^5$) ions for Rh^{4+} ($4d^5$), the strength of the SOC in this system can be tuned through a series of electronic phase transitions [3]. We have performed resonant magnetic x-ray scattering (RMXS) and resonant inelastic x-ray scattering (RIXS) measurements to determine the effect of Rh-doping on the magnetic structure and excitation spectrum of $Sr_2Ir_{1-x}Rh_xO_4$. We find that increasing Rh concentration results in (i) suppression of the magnetic transition temperature, (ii) a doping-induced change in magnetic structure, (iii) alteration of the magnon dispersion relation, and (iv) significant reduction of magnon lifetimes. [1] B.J. Kim et al, PRL 101, 076402 (2008). [2] B.J. Kim et al, Science 323, 1329 (2009). [3] T.F. Qi et al, PRB 86, 125105 (2012).

J. Patrick Clancy
University of Toronto

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