

d^4 iridates in different geometries giving rise to widely different magnetic responses

Sugata Ray

School of Materials Science

Indian Association for the Cultivation of Science

Jadavpur Kolkata 700 032 India

Strong spin-orbit coupling (SOC) has often lead to exotic properties in otherwise banal pool of 'paramagnetic' heavy ion oxides¹. Although, elementary excitations emerging from interplay of electronic correlations, crystal field, and strong SOC are being probed for d^5 Iridium oxides like Sr_2IrO_4 recently², d^4 systems have been largely ignored leading to confusing explanations of their properties³. For a $5d^4$ system a $J=0$ total angular momentum ground state should be realised in a jj coupling scheme⁴, which has not been realized till today. I shall be discussing few test cases with different Ir environments with a serious focus on $\text{Sr}_3\text{NaIrO}_6$, a $5d_{2g}^4 \text{Ir}^{5+}$ oxide under strong SOC, which is expected to have all its electrons nominally confined to a singlet $J=0$ ground state with no net magnetic moment. However, stabilization of such an unusual electronic state appears subtle as this state at moderate SOC is exceptionally fragile to minute external perturbation and enhanced magnetic responses appear. The strength of SOC would expectedly be an important factor as it can refine the ground and excited states of a system. Moreover, the magnetic interaction between these tiny magnetic moments becomes another important point. In this talk, I shall discuss such issues from some of the iridates, especially $\text{Sr}_3\text{NaIrO}_6$.

[1] Y. Singh and P. Gegenwart, Phys. Rev. B **82**, 064412 (2010); W. Witczak-Krempa and Y.B. Kim, Phys. Rev. B **85**, 045124 (2012); G. Cao, J. Bolivar, S. McCall, J. E. Crow, and R. P. Guertin, Phys. Rev. B **57**, R11039 (1998).

[2] Jun-ichi Igarashi and Tatsuya Nagao, Phys. Rev. B **89**, 064410 (2014).

[3] G. Cao, T. F. Qi, L. Li, J. Terzic, S. J. Yuan, L. E. DeLong, G. Murthy, and R. K. Kaul, Phys. Rev. Lett. **112**, 056402 (2014).

[4] J. Rubio and J. J. Perez, J. Chem. Education **63**, 476 (1986).