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Spin-orbit excitons in transition metal oxides

Thursday, 23 March 2023 09:00 (45 minutes)

Transition metal ion compounds that have an orbital degree of freedom have recently been the focus of much attention owing to the importance that spin-orbit coupling plays in the creation of new phases and excitations. We will outline a series of scattering studies illustrating the role that neutrons have in characterizing spin-orbit physics in transition metal compounds. Particular focus will be given to third-row transition metal ions where spin-orbit coupling is of a similar energy scale to symmetric exchange coupling and distortion terms in the magnetic Hamiltonian. We will outline a formalism to understand these excitations based on single-ion physics which, due to the spatially diffuse nature of orbitals, we term spin-orbit excitons. This approach treats single-ion physics, exchange, and distortion terms equally and we will discuss examples applied to compounds containing V^{3+} , Fe^{2+} , and Co^{2+} containing materials.

References: Phys. Rev. B 98, 024415 (2018); Phys. Rev. B 100, 075143 (2019); Phys. Rev. B 102, 245119 (2020); Phys. Rev. B 104, L020411 (2021); Phys. Rev. B 106, 054431 (2022)

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