Magnetism and doping effects in spin-orbit coupled Mott insulators

Giniyat Khaliullin

Max Planck Institute for Solid State Research, Stuttgart, Germany

When relativistic spin-orbit coupling dominates over the exchange and orbital-lattice interactions, the spin and orbital degrees of freedom are no longer separated, and it is more convenient to formulate the problem in terms of pseudospin Hamiltonians. This greatly reduces the (initially) large spin-orbital Hilbert space; however, the resulting low-energy Hamiltonians may obtain highly nontrivial structure, because the pseudospins inherit bond-directional and frustrated nature of orbital interactions [1].
After a brief introduction to transition metal compounds with strong spin-orbit coupling, I will discuss (*i*) magnetic order and excitations in iridium oxides [2,3], and (*ii*) excitonic magnetism and doping effects in Van Vleck-type d^4 Mott insulators such as ruthenates [4].

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