9.7 cm

SPIN-ORBITAL PHYSICS IN TRANSITION METAL OXIDES

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Spin-orbital superexchange models provide a theoretical framework for describing magnetic properties and optical spectra of Mott (charge-transfer) insulators with orbital degrees of freedom [1]. Here we review recent results obtained for perovskite vanadates with t_{2g} orbital degrees of freedom. Although finite Hund's exchange suppresses spin-orbital entanglement [2] at $T = 0$, joint spin-orbital fluctuations are important at finite temperature. Recently we have shown that the spin-orbital superexchange model provides a satisfactory description of both orbital and magnetic transition observed in the RVO$_3$ perovskites [3]. Thereby the orbital-lattice coupling due to the GdFeO$_3$-like rotations of the VO$_6$ octahedra and the orthorhombic lattice distortion u which increase with decreasing ionic radius r_R suppress orbital fluctuations and thus modify the magnetic properties. Finally, we demonstrate that an unexpected quasi-one-dimensional hole propagation occurs in the orbital t–J model with Ising-like superexchange [4], suggesting that hole self-localization is excluded in models with purely electronic interactions.

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13.4 cm

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