SPIN-ORBITAL PHYSICS AND DEFECT STATES IN DOPED VANADATES: $Y_{1-x}Ca_xVO_3$

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Recent experimental and theoretical investigations of RVO_3 perovskites, with R= Lu, Y,...,La , have revealed the interplay between spin, charge and orbital degrees of freedom, displaying remarkable changes of magnetic and spectral properties. The t_{2g} valence electrons in these transition metal oxides lead to strong spin-orbital superexchange interactions relative to weak orbital-lattice coupling [1]. Thus the spin-orbital dynamics and the different phases of these compounds are naturally described in the frame of spin-orbital superexchange models. Focus in the talk is on the effect of doping. After a brief discussion of some of the experimental challenges, the hole-motion in a spin-orbital t-J model and the formation of spin-orbital polarons is addressed [2,3]. Next we introduce a model for generic charge defects in doped perovskites like $Y_{1-x}Ca_xVO_3$ [4]. The influence of these defects on the relative stability of the different magnetic phases will be discussed, as well as the effect of defects on optical spectra and photoemission.

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