SIMPLE TOOLS TO UNDERSTAND CORRELATED SYSTEMS WITH ORBITAL DEGENERACY

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Correlated e_g electrons exhibit a series of fascinating properties, in particular in cuprates and nickelates. Here we present simple calculations meant to estimate the phase diagram of the two-band Hubbard model. It is known to be very rich, in particular for e_g electrons in the vicinity of quarter-filling [1,2]. Indeed, in mean-field theory, various orbitally polarized ferromagnetic and antiferromagnetic phases appear when the Hubbard U, the Hund's rule coupling J_H and the crystal field are varied. In particular ferromagnetism (antiferromagnetism) is favored for $J_H/U < (>)$ 0.2.

Here we show that the same tendency is reproduced when diagonalizing small clusters. Moreover the phase diagram is very sensitive to the type of considered orbitals, being e_g or t_{2g}. The limits of a hopping expansion are also discussed.

[1] L. F. Feiner, A. M. Oleś, and J. Zaanen, *Phys. Rev. Lett.* **78**, 2799 (1997).

[2] R. Frésard, M. Raczkowski, and A. M. Oleś, *Phys. Stat. Sol.* (b) **242**, 370 (2005).

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