CHARGE, SPIN AND ORBITAL ORDER IN LAYERED NICKELATES

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9.7 cm

The phenomenon of stripes in strongly correlated transition metal oxides in not fully understood. Here we study an effective model for e_g electrons and describe stripe order observed in doped, quasi-two-dimensional $La_{2-x}Sr_xNiO_4$ nickelates. The Hamiltonian contains the kinetic energy, electron interactions, crystal-field splitting and the coupling between e_g electrons and Jahn-Teller distortions. (This model was successfully used in the past to describe cuprates and, more recently, layered [1,2] and perovskite [3] manganites). We determined its ground states on 6×6 clusters using unrestricted Hartree-Fock and correlated wave functions. The experimental non-conducting ground state phases with diagonal stripes for the doping $x = 1/3$ and two-sublattice checkerboard phase for the doping $x = 1/2$ are both reproduced by the model. We show that Jahn-Teller distortions stabilize the above phase and are responsible for the coexisting charge, spin and orbital order; in their absence the charge order melts and the ground states become conducting.

[1] K. Rościszewski and A. M. Oleś, J. Phys.: Condensed Matter **19**, 186223 (2007).
[2] K. Rościszewski and A. M. Oleś, J. Phys.: Condensed Matter **20**, 365212 (2008).
[3] K. Rościszewski and A. M. Oleś, J. Phys.: Condensed Matter **22**, 425601 (2010).

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