Phase separation in the ground state of the model 2D spin-pseudospin system

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Competition of charge and spin orders is a challenging problem for high-T_c cuprates. We addressed a simplified static 2D spin-pseudospin model [1] which takes into account both conventional Heisenberg spin exchange coupling and the on-site and intersite charge correlations. Classical Monte-Carlo calculations for large square lattices show that homogeneous ground-state solutions found in a mean-field approximation are unstable with respect to phase separation with the charge and spin subsystems behaving like immiscible quantum liquids. For instance, with lowering the temperature one can observe two sequential phase transitions: first, antiferromagnetic ordering in the spin subsystem diluted by randomly distributed charges, then, the charge condensation in the charge droplets. Thermodynamic properties and phase diagram of the 2D spin-pseudospin system are studied by Monte-Carlo simulation.

References:

[1] Yu. Panov, A. Moskvin, A. Chikov *et al.*, J. Supercond. Nov. Magn. **29**, 1077 (2016)