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Charge and magnetic order induced by local Coulomb and Hund interactions

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We analyze charge and magnetically ordered phases in a system described by a generalized Falicov-Kimball model, with spin-dependent interactions representing Hund's rule and an external magnetic field. We rigorously study the ground state properties on the infinite 2D square lattice, but within a restricted configurational space. Complex charge and magnetic structures appear. A strong tendency towards antiferromagnetic coupling between spins of localized electrons is observed close to half-filling, despite of the assumption of ferromagnetic on-site coupling. Ferromagnetic coupling between localized spins is predominant for small band filling.

Keywords : lattice fermion models, charge ordering, magnetic ordering