Exact study of strongly correlated linear chain with localized Ising spins and mobile electrons.

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Exact solution of a hybrid model on linear chain with localized Ising spins and mobile electrons is provided. With the use of the generalized decoration-iteration transformation the studied hybrid model is mapped onto an effective spin-1/2 Ising model on a linear chain, which is then solved exactly using the transfer-matrix method. The ground-state phase diagram is obtained as a function of chemical potential and kinetic energy of the mobile electrons. In addition, the temperature dependences of several thermodynamic properties (electronic density, compressibility and specific heat) are discussed for various values of the chemical potential. The ground state phase diagram reveals existence of five phases with different number of mobile electrons per unit cell, two of which are ferromagnetic, two are paramagnetic and one is antiferromagnetic. For the parameters from the vicinity of the ground-state boundaries the specific heat curves with up to four peaks are observed.

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