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ELECTRONS AND PHONONS IN DISORDERED MATTER

We obtain a cluster expansion for the two-time retarded Green's functions and the thermodynamic potential of a disordered crystal taking the electron-phonon and electron-electron interactions into account. The electron states of the system are described in the framework of *s-p-d*-multiband tight binding model. The calculations are based on the diagram techniques for the temperature Green's functions. The coherent potential approximation is chosen as a zeroth-order one-site approximation in this cluster expansion method. The calculation of electron structure and free energy for equiatomic *Fe-Co* alloy with a bcc-lattice is made. The equilibrium values of the localized magnetic moments, parameters of interatomic correlations $(\varepsilon_i^{\mathrm{a}},\eta^{\mathrm{a}})$ and correlations in orientation of magnetic moments $(\varepsilon_i^{\mathrm{m}},\eta^{\mathrm{m}})$ were determined from minimum condition of the free energy of alloy. The temperature dependence of magnetic moments and correlation parameters (for two coordination spheres) is presented in a figure. The positive sign of correlation parameters in orientation of magnetic moments corresponds to a ferromagnetic phase. The value of the localized magnetic moments and parameters of magnetic ordering decreases at increase of temperature up to Curie temperature T_C. The calculated values of temperature of phase order-disorder transition Tord = 1000 K and Curie temperature T_C = 1300 K are in the good consent with experimental data. Our results suggest possible ways to generalize the one-band Hubbard model, well-known in the theory of magnetism, to describe the influence of strong electron correlations on the electron structure and properties of disordered alloys of transition metals with narrow energy bands.