THE THERMODYNAMIC POTENTIAL FOR ELECTRONS AND PHONONS IN A DISORDERED CRYSTAL

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S u m m a r y

We obtain a cluster expression 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 a multiband tight-binding model. The calculations are based on the diagram techniques for temperature Green's functions. The coherent potential approximation is chosen as a zero-order one-site approximation in this cluster expansion method. We show that the contributions from the processes of scattering of elementary excitations by clusters decrease as the number of sites in the cluster increases in accordance with certain small parameters. Analytic estimates of the influence of the electron-phonon interaction on the energy spectrum of electrons of an ordered alloy are obtained in a one-band model. The applicability of these results to describing the influence of strong electron correlations on the electron structure and properties of alloys of transition metals with narrow energy bands is illustrated with the example of a Fe– Co alloy. 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.