

Kinetic equation of dynamical system interacting with phonon field with account of space inhomogeneity

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Construction of the kinetic equation for the dynamical system interacting with a phonon field with taking into account a space inhomogeneity is considered using the methods developed in Refs. [1,2]. It is shown that approaches of [1,2] can be generalized to the case of space inhomogeneity. The kinetic equation is derived using an arbitrary operator construction, which depends on the momentum, the space variable and a model parameter. We consider how to study the electron-phonon system and to eliminate the phonon operators from corresponding operator constructions. In particular, the kinetic equation for a polaron in the spatially inhomogeneous case is derived for electron interacting with the phonon field. At certain approximation, such an equation turns into the exact Boltzmann equation for a polaron with quantum corrections. Issues associated with quantum corrections to the Boltzmann equation for electron in the external electric field and kinetics of weakly imperfect states in many-particle systems are considered in Refs. [3,4]. It is also demonstrated that at the zeroth value of the model parameter our generalized model is reduced to the well-studied case of the homogeneous model.

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