

Diffusive Limit of the Two-Band k·p Model for Semiconductors

Luigi Barletti · Giovanni Frosali**Abstract** We derive semiclassical diffusive equations for the densities of electrons in the two energy bands of a semiconductor, as described by a k·p Hamiltonian. The derivation starts from a quantum kinetic (Wigner) description and resorts to the Chapman-Enskog method as well as to the quantum version of the minimum entropy principle. Four different regimes are investigated, according to different scalings of the k·p band-coupling and band-gap parameters with respect to the scaled Planck constant.

Keywords Quantum drift-diffusion · k·p model · Quantum entropy principle