Electron transport in strongly anisotropic structures in a magnetic field

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The linear response of electron system of a layered conductor to the presence of a temperature gradient and an electric field is investigated theoretically at temperature which is much below than the Debye temperature T_D. We consider thermoelectric effect in a Q2D conductor with several groups of charge carriers that are responsible for the electron transport. The Fermi surface in such conductor may consist of topologically different elements: weekly corrugated cylinders and planes. In the range of very low temperatures the relaxation in electron system of a degenerated conductor is realized mainly by charge carriers scattering at impurity centers and other crystal defects. This is the case when the momentum relaxation time τ_p and the energy relaxation time τ_ε are of the same order of magnitude. At higher temperatures an extra mechanism of charge carriers relaxation, connected with the electron scattering by crystal lattice vibrations, leads to decreasing of the relaxation times with T increasing, and τ_ε decreases more slowly than τ_p does. In the absence of a magnetic field the temperature dependence of the thermoemf has a maximum when both of the mechanisms of the electron relaxation are comparable. We have shown that in a strong magnetic field competition of different mechanisms of charge carriers relaxation gives rise to various T-dependencies of the thermoelectric field. The presence of the plane sheet of the Fermi surface affects essentially the behavior of the thermoemf and its T-dependence may have a minimum at certain orientation of the vectors $\mathbf{B}$ and ∇T. The experimental study of thermoelectric effect is shown to be a very convenient method for determining the structure of charge carriers energy spectrum and different relaxation mechanisms in the system of conduction electrons.