CAN LAYERED-STRUCTURE EFFECTS BE OBSERVED, IF THE FERMI SURFACE IS CLOSED?

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S u m m a r y

By analyzing the longitudinal conductivity in a quantizing magnetic field directed perpendicularly to the crystal lattice layers, it has been demonstrated that the layered-structure effects can be observed not only in crystals with highly open Fermi surfaces, as was conventionally believed earlier, but also in crystals with closed ones. The calculations were carried out in the constant-relaxation-time approximation. In weak magnetic fields, layered-structure effects manifest themselves as a phase retardation of Shubnikov–de Haas oscillations and a certain increase of the relative contribution made by the latter. In the range of high magnetic fields, there exists an optimal interval, in which the layered-structure effects reveal themselves in the form of a sharp non-monotonous dependence of conductivity on the magnetic field. In addition, it has been shown that the layered-structure effects result in a decrease of the proportionality factor between the magnetoresistance and the magnetic induction in the longitudinal Kapitsa effect. The longitudinal conductivity of layered crystals in ultra-quantum magnetic fields has also been analyzed. It is shown that the following dependences of the magnetoresistance on the magnetic field can be obtained, depending on the model used for the filling of the single Landau subband and on whether the longitudinal conductivity is considered to be of either the drift or diffusion type: $\rho_{zz} \propto TB^2$, $\rho_{zz} \propto B^3$, and $\rho_{zz} \propto B^4$.