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Electromagnetic Interactions between Electrons moving in the Layered Conductors with a Dielectric Interlayer KENJI TANAHASHI, Hokkaido Institute of Technology — Electromagnetic interactions between two electrons moving in the two layered conductors separated with a dielectric interlayer have been estimated. We assume a simple situation in which the two electrons in the layered conductors move with the constant velocity in the same direction. The electric and magnetic fields of a moving electron are derived from the scalar and the vector potentials in the non-relativistic frame. The total electromagnetic force exerted between two electrons is obtained by the Lorentz expression, and the force depends on the velocity of the moving electrons. With increasing the velocity of the electrons, the magnetic force increases and the magnetic attractive force exceeds the electric repulsive force, when $v/c \geq 1/\sqrt{\varepsilon_r \mu_r}$, where v is the velocity of the two electrons moving parallel in the same direction, c is the speed of light, andε_r is the relative dielectric constant in the direction of the perpendicular to the plane of the layers, andμ_r is the in-plane permittivity of the conduction layers. In vacuum the magnetic interaction between moving electrons never surpasses the electric interaction. However, in the highly anisotropic structures in conductivity, the magnetic interaction between moving electrons should be taken into consideration to investigate the behavior of the electrons.

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