RELATION OF MAGNETIC AND ELECTRIC PROPERTIES OF THIN FERROMAGNETIC FILMS

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9.7 cm

Thin conductive films, obtained by condensing vapour on dielectric substrates in the thicknesses in which their electric conductivity and grains magnitude depend on their thickness. Electric properties of such films are anisotropic. The values of their temperature resistance coefficient β and resistance R are $\beta(\gamma)$ and $R(\gamma), \gamma$ is the angle between the vector of electric field $\vec{E}$ and the anisotropic axis. When the electric current flows in these films, the transversal voltage $U_{\perp}(I_{||}, \gamma)$ appears on the boundaries perpendicular to $\vec{E}$. Here $I_{||}$ is current intensity. The axis of light magnetization (ALM) of ferromagnetic substances also is the anisotropic axis of electrical properties. $U_{\perp} \approx U_{\perp_m} \times \sin(2\gamma \pm \alpha)$, here $U_{\perp_m}$ is amplitude, α is initial angle between $\vec{E}$ and the anisotropic axis. While the films are remagnetised in a quasistationary way by changing the angle between the vector of magnetic field intensity and ALM axis, the $B(\vec{H})$ and $U_{\perp}(\vec{H})$ dependencies describe the corresponding longitudinal and transversal hysteresis loops. The magnitudes $U_{\perp}(\vec{H})$ of two-layered systems add when the current flows through the ferromagnetic layers in the magnetic field: $U_{\perp} = U_{\perp}(\vec{E}, \gamma) + \Delta U_{\perp}(\vec{H}, \vec{E}, \varphi, \gamma)$, $U_{||} = U_{||}(I_{||}, R_{\perp}) + \Delta U_{||}(\vec{H}, \vec{E}, \varphi, \gamma)$. $\Delta U_{||}(\vec{H}, \vec{E}, \varphi, \gamma)$ and $\Delta U_{\perp}(\vec{H}, \vec{E}, \varphi, \gamma)$ are the result of anisotropic magnetoresistance effect.
The grain sizes of the layers showing conduction anisotropy meet the conditions $D_x \neq D_y \neq D_z$.

13.4 cm

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