As the electron moves in the trap, the values of ρ_L, R, and ρ_L/R change with changing coordinate z. The decisive factor in the motion of the electron is the maximum value of ρ_L/R. We obtained the coordinate z (the oz axis coincides with the symmetry axis of the system) at which the parameter ρ_L/R reaches a maximum value, equal to

$$\left(\frac{\rho_L}{R}\right)_{1max} = \frac{3,4\sqrt{W}}{H_{01}} \frac{\sqrt{\gamma-1}}{z_0} \sqrt{1-\sin^2\bar{\theta}_0\left[1+\frac{f(\bar{\theta}_0)}{4}\right]} \frac{\sqrt{f(\bar{\theta}_0)}}{\left[1+\frac{f(\bar{\theta}_0)}{4}\right]^2},$$

where

$$f(\bar{\theta}_0) = \frac{3-\sin^2\bar{\theta}_0-\sqrt{9(1-\sin^2\bar{\theta}_0)^2+4\sin^2\bar{\theta}_0}}{\sin^2\bar{\theta}_0},$$

H_{01} is the value of H_0 at $\rho_L/R = (\rho_L/R)_1$, γ is the mirror ratio, $2z_0$ is the distance between mirrors, and $\bar{\theta}_0$ is the angle between the velocity vector and the field H in the median plane.

We took account here of the fact that, in accord with the measurements, the magnetic field on the system axis varied like $H = H_0 + \lambda z^2$. The value of $(\rho_L/R)_{1max}$, calculated from curves plotted in accord with the foregoing formula, was found to be $\cong 4 \times 10^{-2}$. If the geometry of the magnetic field and the injection conditions are maintained constant, then the Larmor radius ρ_L also remains practically constant when the electron energy is varied.

In conclusion, the authors are deeply grateful to B. V. Chirikov for suggesting the topic, for interest, and for valuable advice that contributed to the performance of the work.

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TEMPERATURE DEPENDENCE OF THE MAGNETOSTRICTION CONSTANTS OF SINGLE-CRYSTAL LITHIUM FERRITE

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The nature of the magnetostriction of ferrites with magnetic ions in S-states is still unclear at present [1]. It is therefore important to investigate experimentally in detail the magnetostriction of such ferrites. Lithium ferrite is of special interest in this respect, being a material capable of existing in different ionic-ordering states, depending on the heat treatment [2]. In addition, this material is promising from the point of view of technical applications.

We measured the temperature dependence of the magnetostriction constants λ_{100} and λ_{111} of partially-ordered single-crystal lithium ferrite in the temperature interval from -180 to +370°C. The measurements were made on a spherical sample of 1.2 mm diameter by the ferromagnetic resonance method [3]. The constants λ_{100} and λ_{111} were determined from the measured shifts δH_{100} and δH_{110} of the resonance field when the sample was magnetized in the crystallographic directions [100] and [110] respectively and compressed in the direction [100] perpendicular to the (100) plane in which the external magnetic field was applied. It is easy to see that in this case

$$\lambda_{100} = 2M\delta H_{100}/3\sigma,$$
$$\lambda_{111} = \frac{4M}{9\sigma}\left(\delta H_{110} + \frac{1}{2}\delta H_{100} - \frac{3H_a\,\delta H_{100}}{8H_0}\right)\left(1 + \frac{H_a}{4H_0}\right)^{-1}, \qquad (1)$$

where $H_a = 2K_1/M$ and $H_0 = \omega/|\gamma|$. An increase in the resonance field corresponds here to negative shifts δH.

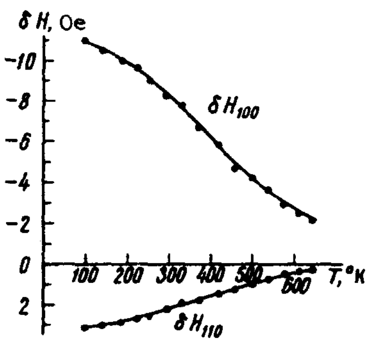

Fig. 1

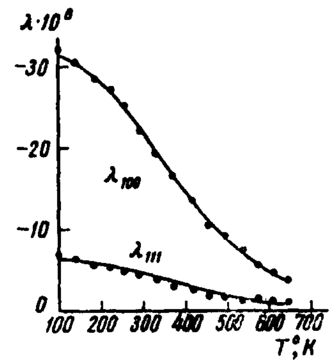

Fig. 2

Figure 1 shows the measured shifts δH_{100} and δH_{110} obtained by uniaxial compression of the sample, with a stress $\sigma = 75 \times 10^6$ dyne/cm^2. The measurements were made at 9100 MHz. The temperature dependence of the constants λ_{100} and λ_{111} is represented by the points in Fig. 2. It is easy to see that both constants decrease monotonically with increasing temperature in the investigated temperature interval. The values of the constants at room temperature are in fair agreement with the data of static measurements [4].

To interpret the obtained temperature dependences of the magnetostriction constants of lithium ferrite, we used the single-ion theory of magnetostriction of cubic ferromagnets [5]. According to [5], this dependence is given by

$$\lambda_{100} = \frac{1}{C_{11}-C_{12}}\,\frac{5}{\sqrt{4\pi}}\sum_n B^{\gamma}_{0,2}(n)\,I_{5/2}[L^{-1}(m_n)],$$
$$\lambda_{111} = \frac{1}{3C_{44}}\left(\frac{15}{4\pi}\right)^{1/2}\sum_n B^{\epsilon}_{0,2}(n)\,I_{5/2}[L^{-1}(m_n)], \qquad (2)$$

where $B^{i}_{0,2}(n)$ are the coefficients of magnetoelastic coupling of the n-th sublattice, $I_{5/2}$ the hyperbolic Bessel function, L^{-1} the inverse Langevin function, and m_n the temperature dependence of magnetization of the n-th sublattice.

The temperature dependence of the magnetization of the octahedral and tetrahedral sublattices of the lithium ferrite were measured by the neutron diffraction method between 4 and 904°K in [6], and used by us for the calculations. In the calculations we assumed that the elastic constants C_{11}, C_{12}, and C_{44} do not depend on the temperature. The coefficients of the magnetoelastic coupling were calculated from the values of the magnetostriction constants at two different temperatures. The obtained calculated dependences of λ_{100} and λ_{111} on the temperature are represented by the solid lines of Fig. 2. The agreement between calculation and experiment is good.

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NEGATIVE CONDUCTIVITY PRODUCED UNDER THE INFLUENCE OF HYPERSONIC FLUX

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1. We wish to call attention in this note to the fact that negative differential conductivity is possible when a semiconductor is simultaneously under the influence of an electric field and a sound wave whose length lies in the quantum region ($q \gtrsim 1/\hbar\sqrt{mT}$, q - sound wave vector, m - electron effective mass, T - crystal temperature in energy units). Moreover, in the case of a sufficiently strong hypersound flux, the voltage-current characteristic can cross the abscissa axis when the electric field is increased, corresponding to a reversal in the sign of the current density.

From the energy and momentum conservation laws it follows that only electrons with momenta $p > \hbar q/2$ interact with the phonons. If the sound flux through the sample has a frequency so high that $\hbar q \gg \sqrt{mT}$, then there will be practically no sound absorption and the acoustoelectric current will be equal to zero. Let us apply to the crystal an electric field E such that the vectors eE and q are antiparallel. So long as the field is weak, it affects only the antisymmetrical part of the electron distribution function, so that the