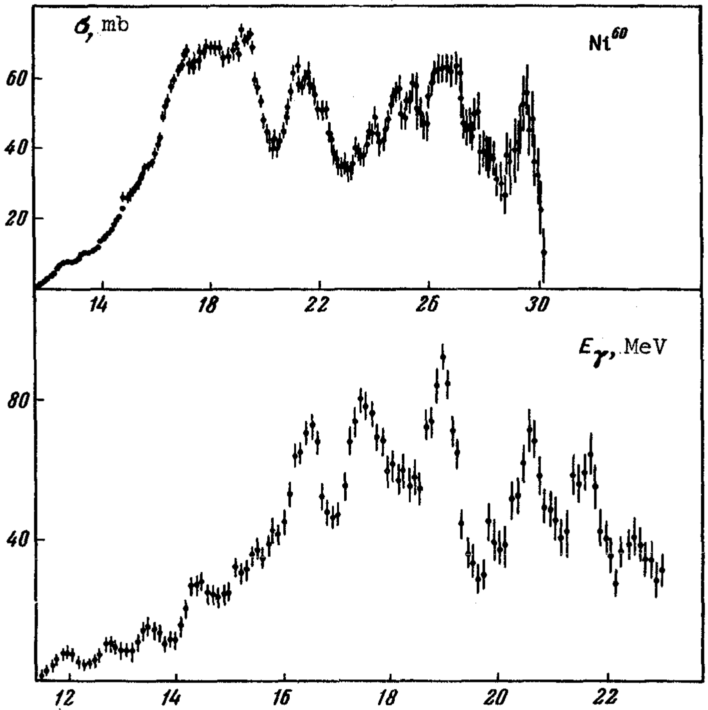

Fig. 2. Effective cross section of the reaction $Ni^{60}(\gamma, Tn)$. Upper figure - analysis in steps of 1 MeV, lower - in steps of 0.5 MeV

on the formula for the dipole sum rule σ_{dip} - 60 NZ/A mb-MeV yields for both nuclei approximately the same value ∿ 870 mb-MeV. The integral cross sections in the 23 - 30 MeV region were 180 ± 10 mb-MeV and 330 ± 17 mb-MeV, respectively.

The appreciable value of the cross section in the region E_γ > 23 MeV is due the the contribution of the (γ, 2n) reaction. The lack of reliable information concerning this reaction for Ni^{58} and Ni^{60} makes it difficult to estimate the integral cross section of the reaction (γ, n) + (γ, np) + (γ, 2n).

The fact that the cross sections for Ni^{58} and Ni^{60} are quite close in form indicates that an important role is played by excitation of the internal nucleons in processes involving the emission of photoneutrons from either nucleus.

There are as yet no calculations capable of adequately explaining the obtained structure.

CONCERNING THE SHUBNIKOV - DE HAAS EFFECT IN TELLURIUM

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It is known that the Shubnikov - de Haas (SH) effect makes it possible to determine the form of the Fermi surface of the carriers in a conductor. This effect was investigated in [1 - 3] at helium temperatures for the valence band of tellurium. Owing to the anisotropy of the hole effective mass, the period of the quantum oscillations in the reciprocal field

$\Delta(1/H)$ depends in tellurium on the orientation of the magnetic field H relative to the principal axis C_3 of the crystal.

In [1, 2] they investigated, in pulsed fields, samples having concentrations 1×10^{17} - 6×10^{18} cm^{-3}, and a value $\Delta_{\parallel}/\Delta_{\perp} = 2.5$ was obtained for the ratio of the periods at field orientations along ($\parallel$) and across ($\perp$) the principal axis C_3 of the crystal. The angular dependence of the positions of the maxima of the oscillation curves revealed cylindrical symmetry as the field H was rotated in the basal plane, but the dependence obtained upon ratation in the perpendicular plane at the aforementioned concentrations was so complicated, that no concrete form of the Fermi surface was proposed in [1]. The interval of lower concentrations $(4 - 10) \times 10^{16}$ cm^{-3} was investigated in [3] in stationary fields, and the value $\Delta_{\parallel}/\Delta_{\perp} = 1.45$ was obtained for the ratio of the periods; the angular dependence of the periods and of the positions of the maxima turned out to be simple and to corresponds to the sections of an ellipsoid of revolution, and a value close to two was obtained for the number of ellipsoids (without account of the spin).

We considered it of interest to broaden the concentration range and, in particular, to cover the intervals in which the SH effect was investigated in pulsed and stationary fields, to compare the results of all the investigations, and to ascertain the ensuing conclusions concerning the valence band of tellurium.

We present in this paper new experimental data concerning the SH effect in tellurium, obtained in stationary fields with the temperature of the experiment lowered to 0.1°K (by the method of adiabatic demagnetization of a salt). This made it possible to perform the investigations at lower concentrations (down to 2×10^{16} cm^{-3}) and to obtain more reliable data on the oscillation period at densities to 3×10^{17} cm^{-3}, covering the interval investigated in pulsed fields. Figure 1 shows the increase of the amplitude of the SH oscillations when the

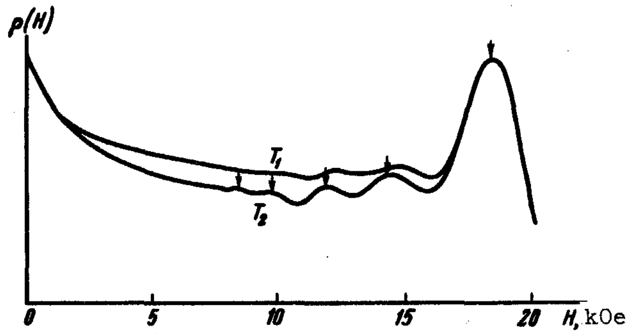

Fig. 1. Resistance of tellurium single crystal (in arbitrary units) vs. magnetic field intensity, $\rho = 3.1 \times 10^{17}$ cm^{-3}; $T_1 = 1.6$°K, $T_2 = 0.1$°K.

temperature is decreased from 1.6 to 0.1°K. Figure 2 compares all the data obtained to date on the SH effect in tellurium. As indicated in [3], the general picture of the quantum oscillations becomes more complicated when $\rho \geq 2 \times 10^{17}$ cm^{-3}. It is seen from Fig. 2 that when $\rho > 2 \times 10^{17}$ cm^{-3} the ratio $\Delta_{\parallel}/\Delta_{\perp}$ changes from 1.45 to 2.35. When $H \parallel C_3$, the period Δ follows the expected dependence on the concentration ρ (at a quadratic dispersion law), namely $\Delta_{\parallel} \sim \rho^{-2/3}$, in the entire investigated concentration range (2×10^{16} - 6×10^{18} cm^{-3}). When $H \perp C_3$ the period Δ also follows this dependence (in the range 2×10^{16} - 1.5×10^{18}), but changes greatly in magnitude when the concentration approaches $(2 - 3) \times 10^{17}$ cm^{-3}.

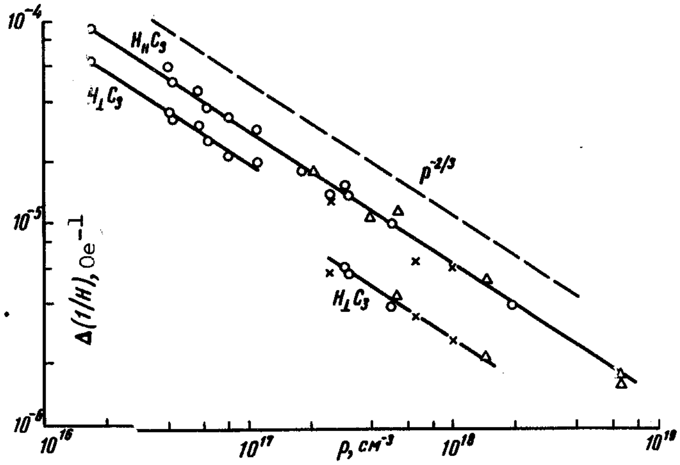

Fig. 2. Concentration dependence of the SH oscillation period at two basic field orientations: o - present results and results of [3]; Δ - results of [1]; × - results of [2] (obtained from several oscillation peaks).

A number of factors discussed in [3] indicate that the energy minimum of the valence band of tellurium is located at the vertex of a trihedral angle of the hexahedral prism constituting its Brilluoin zone. In view of the more complete data presented here on the SH effect, it seems to us that the energy minimum of the valence band is shifted from the trihedral vertex along the side edge of the prism, as follows from a recent theoretical paper [4]. This being the situation, the abrupt change of the period $\Delta_{\perp}$ at $\rho = (2 - 3) \times 10^{17}$ cm^{-3} can be attributed to the distortion of the Fermi surface as the latter approaches to the limiting basal plane of the Brillouin zone, and the increase of the ratio of the periods $\Delta_{\parallel}/\Delta_{\perp}$ at $\rho > 3 \times 10^{17}$ cm^{-3} can be regarded as a transition from the simple two-ellipsoid mode for the concnetration region $\rho < 10^{17}$ cm^{-3} to a more complicated singly-connected barrel-shaped surface when $\rho > 3 \times 10^{17}$ cm^{-3}.

We are grateful to G. E. Pikus for a discussion of the theoretical questions.

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REDUCTION OF THE BACKGROUND EFFECT IN MASS SPECTROSCOPY OF MOLECULAR BEAMS

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In mass sepctroscopy, the limiting measurement sensitivity is determined by the background due to the residual gases in the instrument. There are several known [1, 2] method of countering the harmful influence of this factor: improving the vacuum, different means of modulating the measured beam, statistical reduction of the mass spectra, increasing the resolution of the instrument, and others.