served in thiophene, benzene, chloroform, and in a score of other substances, in which they are nicely explained by the Mandel'shtam-Leontovich phenomenological theory. The molecular mechanism of absorption and of the dispersion of the sonic velocity is explained by relaxation of the vibrational heat capacity in full agreement with the theoretical notions of Knezer, Gertsfel'd, and others.

Relaxation effects were observed in the high-frequency range in studies of a large group of aqueous solutions of electrolytes, including cadmium halides and sulfates of di- and trivalent metals. The behavior of the relaxation time as a function of concentration and temperature was ascertained.

In cadmium halides, relaxation is explained by violation of the equilibrium between the complexes and free ions. In sulfates, chemical relaxation and, to an insignificant degree, relaxation of the ionic atmospheres are responsible for the high-frequency relaxation.

In many viscous substances, the temperature dependence of sound absorption passes through a maximum whose magnitude decreases with increasing frequency. Examination of the results within the framework of relaxation theory with a single relaxation time indicates that it cannot satisfactorily explain the experimental data. The results of a broad range of experiments in highly viscous substances agree well with the nonlocal theory of Isakovich and Chaban. Interestingly, the behavior of a viscous substance in acoustic experiments resembles, in many cases, the behavior of a solution whose component concentrations are strongly influenced by temperature.

The propagation of transverse sound waves was studied in low-viscosity liquids, in which Fabelinskiĭ had observed fine structure in the wing of the Rayleigh line. Acoustic information on liquids was obtained by the impedance method: the transverse sound was artificially generated by quartz and lithium niobate crystals. Comparison of the optical and acoustic results provides a basis for certain hypotheses pertaining to the "anomalous" branch of the temperature curve of the distance between the doublet components in liquid salol and benzophenone. This branch is probably not a continuation of the temperature dependence of transverse-wave velocity at high viscosities, but essentially a manifestation of some new, not yet understood effect. This is suggested by our experiments in which the velocity of the transverse sound diminished with increasing temperature at low viscosities and, so to speak, continued the "normal" branch into the high-temperature region.

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Ya. A. Agaev. Research in the Field of Semiconductor Physics at the Physico-technical Institute of the Turkmenian Academy of Sciences.

Over the past decade, the Physico-technical Institute of the Turkmenian Academy of Sciences has been engaged in work toward the development of new semiconductor materials of the types A^3B^5, $A^2B^4C^5_2$, and $A^1_2B^4C^6_3$ and solid solutions based on them.

Both p- and n-type $CdSnAs_2$ single crystals have been prepared (n, p ~ 10^{17} cm^{-3}, $\mu_n \sim$ 22 000 cm^2/V-sec).

The gas-transport reaction method was used to prepare single-crystals based on $2GaAs-ZnGeAs_2$ and $2GaAs-ZnSiAs_2$ in a broad range of GaAs concentrations (n ~ 10^{18} cm^{-3}, $\mu_n \approx$ 2500 cm^2/V-sec).

Work was done in the preparation of the compounds Cu_2GeSe_3, Cu_2SnSe_3, Cu_2GeTe_3, Cu_2SnTe_3, Ag_2GeSe_3, Ag_2SnSe_3 and others, and some of their properties were investigated.

A coordinated study was made of the electrical, thermoelectric, galvanothermomagnetic, optical, and photoelectric properties of GaP, InP, AlSb, InSb crystals and InSb—AlSb and InP—InAs solid solutions.

An impurity photo-emf was detected in single-crystal acicular specimens of GaP; it is a result of direct electron transitions from the valence band to the 0.1- and 0.4-eV levels or of double optical transitions.

The Keldysh-Franz effect, which is related to indirect transitions in GaP with

$$\Gamma^v_{15} \rightarrow X_3. \quad \text{and} \quad \Gamma^v_{15} \rightarrow X_1$$

was observed.

Investigation of the Keldysh-Franz effect and the spectral photosensitivity in the shortwave region made it possible to propose a possible structure of the fundamental bands.

Mechanisms of carrier scattering were established in InP crystals on the basis of an analysis of the temperature dependence of mobility, the transverse Nernst-Ettingshausen effect, and the thermal emf: mobility is limited basically by Raman scattering on impurity ions and neutral atoms at low temperatures and by Raman scattering on optical and acoustic lattice vibrations at high temperatures.

High-resistance InP crystals (n ~ $10^{11}-10^{12}$ cm^{-3}) were prepared by diffusion of copper and were used to make p-n junctions, and the electrical and photoelectric properties were studied in a broad range of temperatures. In the impurity-conductivity range of the high-resistance InP crystals, negative photoconductivity was observed at low temperatures with $h\nu \approx 0.9-0.55$ eV and can be explained on the basis of the energy spectrum of the impurities. At room temperatures, impurity photosensitivity was observed in the same region of the spectrum with external intrinsic illumination.

The absorption spectra of InP crystals showed a number of bands in the region $h\nu < E_g$, belonging in all probability to impurity levels; similar values were found for the impurity levels on the basis of the electrical and photoelectric properties.

Values were obtained from the diffuse-reflection spectra for the energies of transitions with $h\nu > E_g$, and were used to construct one possible version of the band structure.

A possible band structure of AlSb is obtained from investigation of the optical absorption, reflection, and photoconductivity of AlSb in InSb-AlSb solid solutions.

The basic mechanisms of scattering in AlSb were determined from the temperature dependence of the Hall mobility and the transverse Nernst-Ettingshausen effect. At low temperatures, scattering is by ionized impurities, and at high temperatures (300–1000°K), it is by acoustic vibrations of the lattice. Both of these scattering mechanisms are in operation in the intermediate range (125–300°K). The experimental mobility compares quantitatively with the theoretical value calculated with consideration of the various scattering mechanisms. Phonon dragging of carriers is found to influence the thermal emf, thermomagnetic Nernst-Ettingshausen effect, and thermal conductivity in the low-temperature range. An intraband transition with an energy ~ 0.27 eV is observed from measurements of the Hall effect and optical absorption in n-AlSb.

Studies of the electrical, galvanothermomagnetic, and photoelectric properties of n- and p-InSb in broad temperature, carrier-density, and magnetic-field ranges indicated the possibility of producing high-resistance p-InSb crystals by thermal diffusion, established the nature of the thermal acceptors in InSb, and resulted in determination of the lifetimes of majority and minority carriers in p-InSb and the preparation of long external-magnetic-field-sensitive diodes based on p-InSb by the fusion method. The magnetic sensitivity of the diodes $\gamma \approx 70$ mV/G.

A technology was elaborated for the production of highly sensitive InSb, InP–InAs, and InSb–NiSb Hall transducers and magnetoresistors. A whole series of instruments was designed on the basis of these galvanomagnetic transducers.

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M. Berkeliev, G. G. Dzhemilev, A. Muradov, O. Ovezgel'dyev, and M. Shirmamedov. Certain Results from Study of the Physics of the Ionosphere.

1. A combined experimental investigation of the space-time variation patterns of sporadic formations was carried out. It was shown that, in contrast to the regular layers of the ionosphere, the temporal variation of the sporadic formations is a random process. By way of example, Fig. 1 shows three continuous measurement sessions performed at the same time on different days. The circles correspond to f_0E_s, and the points to f_bE_s. It is seen that the temporal variations of the frequency parameters differ greatly between these sessions and that their values are random quantities for any fixed point in time. Moreover, the classification of E_s layers as opaque and semitransparent on the basis of the difference $\Delta f_bE_s = f_0E_s - f_bE_s$, as is usually done on the basis of standard ionospheric data, is arbitrary in nature, since the quantity Δf_bE_s varies in a very broad range for a given formation, which may be both opaque and semitransparent during the time of its existence.

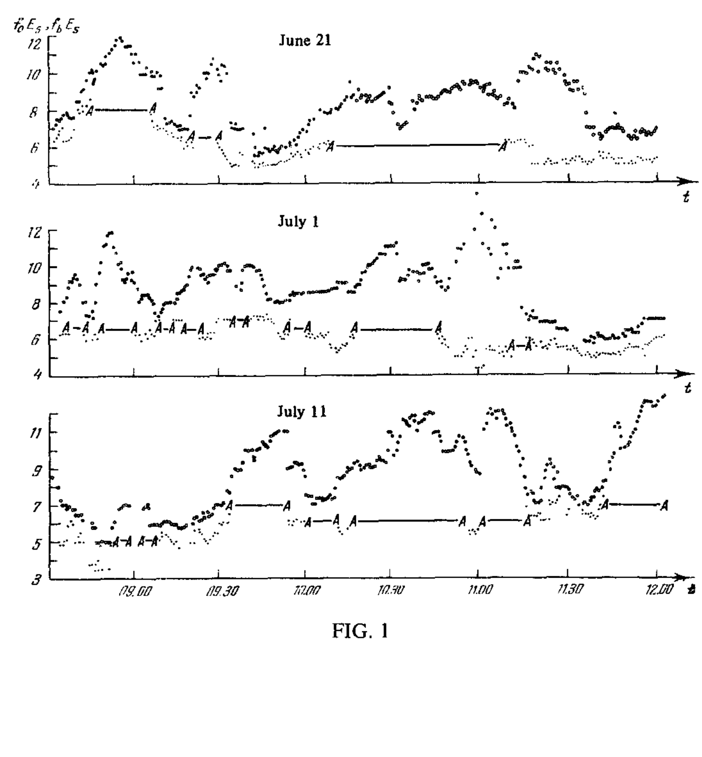

FIG. 1