band by means of the same measuring device, their relative errors $\Delta L_1/L_1$ and $\Delta L_2/L_2$ are of the same order and according to given equations will not have an appreciable effect on the value of 1–K².

For coils with cores whose permeability varies with frequency, the ratio $n = f_2/f_1$ should be selected such that in the measured frequency range the permeability would remain practically unchanged. For coils with cores whose permeability does not vary with frequency, n can be chosen so as to obtain values of L_1 and L_2 suitable for measuring purposes.

The new method requires only one additional measurement of the coil inductance and is simpler than any other method. Providing all the forementioned conditions are observed and a measuring generator whose $\Delta f_1/f_1 \approx \Delta f_2/f_2$ is used, this method can provide a far more precise determination of L_c, R_c, and Q_c.

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Volume 3, Number 7, January 1962

Influence of Electric Field on Electron Temperature, Electrical Conductivity, and Thermionic Emission of Semiconductors. IV. Low Lattice Temperatures, I. M. Dykman and P. M. Tomchuk, pp. 1393–1399.

The method developed in another paper is extended to the case of low lattice temperatures. It is shown that in the region of impurity scattering the electron-electron interactions substantially influence not only the symmetric but also the asymmetric part of the scattering function. More general formulas are obtained for the determination of electron temperature and conduction current by taking into account the forementioned variation of the asymmetric part of the distribution function.

Approximate Calculation of the Average Group Velocity of Phonons in Cubic Lattices, B. Ya. Moizhes, R. V. Parfen'ev, F. A. Chudnovskii, and A. L. Efros, pp. 1409–1414.

In order to calculate, from thermal conductivity, the mean free path and the cross section of phonon scattering by impurity according to the Debye formula, one must know the average phonon group velocity, which can differ by several factors from the longitudinal acoustic velocity, customarily used in similar calculations. In this paper the mean phonon velocity is calculated for germanium and NaCl crystals by a method analogous to that of Houston from the spectrum obtained by neutron diffraction for a direction of high symmetry. A numerical check of the method is carried out in a case when the spectrum (calculated) is known in the entire Brillouin zone.

Conclusion: Comparison of the average group velocities calculated from the method of points with the results of methods of averaging in which the dispersion relations are given only in directions of high symmetry (a Houston-type method) gives good agreement in the case of germanium, and agreement accurate to a factor of 1.5 for potassium chloride. The latter, evidently, is related to the fact that the branches of the vibrational spectrum differ greatly in different directions. The agreement of the average and the root mean square value of the group velocity may be regarded as good.

The average group velocities calculated by Houston-type methods from neutron diffraction spectra were found to be less than the average longitudinal velocities (by a factor of 4.5 for germanium and 2.5 for sodium iodide). Thus the mean free path was found to be several times (2–5) greater than that calculated.

These calculations enable us to guess the contribution of the individual vibrational branches to the average group velocity. If germanium has an average velocity of the optical branches which is less than that of the acoustical, in sodium iodide they are almost identical.

When calculating the group velocities of phonons, the Houston method for two directions gives satisfactory results.

The temperature variations of θ_D calculated by the Houston method, by the way, for two and three given directions of high system are in good agreement; therefore this method in two directions can be proposed for the calculation of heat capacity.

Optical Absorption of Germanium and Silicon beyond the Main Absorption Edge at High Temperatures, Yu. I. Ukhanov, pp. 1529–1532.

The temperature dependence of absorption in germanium and silicon beyond the main edge (from 1.5 to 13μ) was investigated in the temperature interval from 77° to 740°K for germanium and up to 1000°K for silicon. It was found that the absorption coefficient α in this wavelength region increases on heating of the samples according to the law $\alpha = B_1 \exp(-B_2/T)$, where B_1 and B_2 are certain constants for each semiconductor. The temperature dependence of absorption obtained is explained by the interaction of photons with free charge carriers.

Some Questions on the Photoconductivity of Polycrystalline Samples of Cadmium Selenide, V. V. Serdyuk and T. Ya. Sëra, pp. 1571–1573.

The effect of heat treatment and the introduction of silver and copper impurities on the spectral distribution of photocurrent in pressed samples of cadmium selenide was studied in this work.

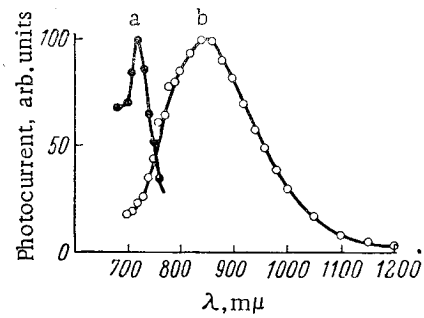

Fig. 1. Spectral distribution of photocurrent for two polycrystalline CdSe samples. a) Deposited layer; b) pressed sample.

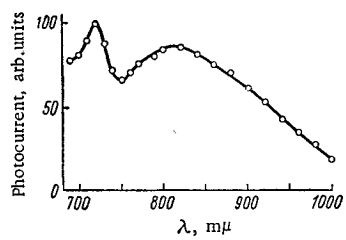

Fig. 2. Spectral distribution of photocurrent for a pressed CdSe sample after brief heating.

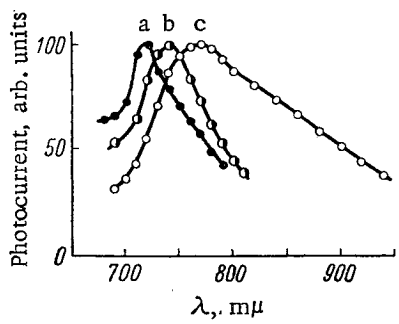

Fig. 3. Spectral distribution of photocurrent in polycrystalline (pressed) CdSe samples with metal impurities. a) "Pure" cadmium selenide; b) cadmium selenide with Ag impurity; c) cadmium selenide with Cu impurity.

Application of the Method of Electric Transport to the Study of Metals and Alloys, M. D. Smolin and I. N. Frantsevich, pp. 1536–1541.

Using an approximate ion theory of electric transport (or transference) and a two-zone model of metals, methods have been developed in this paper for determining the true charges of ions of an alloy's component, the concentration of electrons and

ions responsible for the conductivity, the cross sections of electron—and hole—scattering by diffusing ions, and the magnitude of electron and hole conductivities. These determinations are made by examining the temperature and concentration dependence of electrical transference in metals and alloys. Test results are given which were obtained in the study of temperature dependence of the electric transference in Mo—W alloys and of its concentration dependence in Ni—Cr alloys.

Interpolation Equation of State and Its Application to Experimental Data on Impact Compression of Metals, S. B. Kormer, V. D. Urlin, and L. T. Popova, pp. 1547–1553.

For the isotherm at $T = 0°K$ we propose an interpolation equation which, without resorting to experiments, describes impact compression quite satisfactorily. By correcting the interpolation equation on the basis of one experimental point, the remaining data can be described with the same accuracy as the experiment itself. The dependence of the Grüneisen constant on the density is investigated. Particular attention is given to the anomalous behavior of lead at pressures higher than about $2 \cdot 10^6$ atm.

In this paper we propose an interpolation equation for the elastic curve in the form of a series in $\delta^{1/3}$ and a method for deriving the unknown parameters which appear in the equation. When this equation is corrected on the basis of one experimental point on the impact adiabatic curve, it can be used to describe quite accurately the elastic curve at pressures of up to 10^{14}–10^{15} dyne/cm^2. The equation of state with electronic components and the obtained elastic curve describe the impact adiabatic curve in the pressure range up to $5 \cdot 10^{12}$ dyne/cm^2 with an accuracy of $\pm 3\%$.

Summary:

1) By representing the elastic curve in the form of a series in density with parameters determined from the properties of metals under normal conditions and results of quantum mechanical calculations for pressures of the order of 10^{15} dyne/cm^2, we can obtain an interpolation equation of state for metals which agrees satisfactorily with experimental data on impact compression.

2) By correcting the interpolation equation of state on the basis of one experimental point at high pressure, we can describe the remaining experimental data with an accuracy approaching that of the experiment.

3) On the basis of the corrected interpolation equation of state, we can obtain a more accurate dependence of the Grüneisen constant on the density than by methods of analysis of experimental data, which are used at present in studies of impact compression of metals.

4) Using the corrected interpolation equation of state, we can extrapolate quite accurately p_x and experimental data on p_G into the region of pressures which has not been investigated as yet. When this equation is compared with experimental data, it indicates the possibility of existence of phase transitions or other phenomena connected with nonmonotonic variation of the properties of metals during their compression at high pressure.

Kinetics of Cooperative Processes, Temperature Dependence of Relaxation Properties of the Simplest Cooperative Systems (the Ising Model), Yu. Ya. Gotlib, pp. 1574–1582.

Kinetic equations have been derived for unary and binary functions of distribution in the case of simplest cooperative systems described by the Ising model (the "ferro- and antiferromagnetic" model). In the derivation it is assumed that the frequency of the reorientation depends on the state of orientation of the nearest neighbors. A spatially homogeneous solution is considered. Two approximations are used to solve the system of kinetic equations: the "multiplicative" approximation in which the partial functions of the high orders are represented in the form of the product of unary functions and the modified superpositional approximation of Bogolyubov-Kirkwood. The kinetic equations are solved for the case of small deviations from equilibrium at a given temperature. In the considered approximation one of the times of relaxation for a "ferromagnetic" model at the point of transition "order-disorder" reverts to infinity. At a temperature somewhat less than T_c, the "singular" time of relaxation has a minimum. Both approximations lead to a similar temperature dependence of the time of relaxation for a unary function. With the approximation of T to T_c the times of relaxation for the unary and binary functions for the "ferromagnetic" model are characterized by temperature dependences which differ sharply from one another. The temperature dependence of the time of ordering in binary alloys is considered below the temperature of transition "order-disorder" for a simple mechanism of an elementary act (neighboring atoms exchanging places).

Volume 3, Number 8, February 1962

Theoretical Aspects of Photoelectrets, M. L. Chetkarov, pp. 1594–1597.

On the basis of our previous conclusions, a theory of photoelectrets is developed. The theoretical relationships between the photocurrent density and the photodepolarization current, on one hand, and the illumination of the sample, on the other, are in good agreement with experiments on single rhombic crystals of sulfur. An energy level of 0.386 ev is found to be characteristic for the traps. A calculated curve, expressing the dependence of the residual polarization of the photoelectret on the time during which it was kept in darkness, is also in good agreement with experimental results when parameters have reasonable values.

"Nonlinear" Photoconductive Relaxation Processes in the Presence of Trapping Levels, L. G. Paritskii and S. M. Ryvkin, pp. 1631–1639.

This paper deals with the calculation of monopolar photoconductivity relaxation with arbitrary ("nonlinear") filling of the trapping levels. It is shown that, under these conditions, the relaxation curves possess characteristic regions and points from which the parameters of the levels can be determined. Photoconductivity kinetics in CdS single crystals were investigated experimentally for the case of strongly filled trapping levels. The results obtained agree with the developed theory. A new method is proposed for investigating electron states in the forbidden zone and the kinetics of electron transitions in semiconductors. This method consists of a long-wave optical probe investigation of local levels, giving the carrier densities at local centers and simultaneously providing relaxation curves both for the free carriers in the forbidden zone and the carriers trapped at the levels.

Effect of Gamma Radiation on the Electrical Conductivity of Insulators, B. M. Vul, pp. 1644–1650.

Under ordinary conditions, dielectrics which are used as electrical insulators have a very small electrical conductivity. But, when they are exposed to ionizing radiation, the free carrier concentration can increase by a considerable amount, thus producing an increase in electrical conductivity. It was of interest to study this effect in selected electrical insulator materials irradiated by gamma radiation.

Some Properties of Gold-Doped CdS Monocrystals, A. I. Marchenko, E. A. Sal'kov, G. A. Fedorus, and V. D. Fursenko, pp. 1658–1662.

The effect of gold impurity on the photoelectric properties of CdS monocrystals is investigated. It is shown that the gold impurity increases sensitivity of the crystal to light, x rays, and γ rays. The increase in optical sensitivity is associated with an increase in photocurrent carrier lifetime. It is shown also that the gold impurity does not appreciably influence the energy level of infrared extinction and does not create new capture levels for electrons in the energy interval from 0.005 to 0.5 ev.

Conclusions:

1) Gold impurity injected into the CdS lattice increases its sensitivity to light, x rays, and γ rays.

2) Increase in sensitivity of the CdS crystals to light is connected with an increase in the photocurrent carrier lifetime.

3) The gold impurity stimulates the entire spectral region of the photosensitivity of CdS monocrystals, without changing the general shape of the spectral characteristics.

4) In CdS crystals the gold impurity atoms do not create new electron capture levels in the energy interval 0.005–0.5 ev; the area contained under the thermostimulation curve increases due to an increase in the photoelectron lifetime in the free state.

5) The gold impurity does not affect the energy position of the photocurrent infrared extinction bands in the crystals.