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The Ukrainian Conference on the Theory of Metals and Alloys was held in Kiev June 1–5, 1959. This was the first conference at which a wide range of topics in metal and alloy theory was discussed rather than, as in the past, limited to specific problems in the physics of metals. The conference summed up the work thus far accomplished and pointed out the directions of further investigations concerning the fundamental problems of theoretical metal physics, which will play an important part in the technological progress of our country.

Ukrainian scientists and a large number of workers from other republics participated. A total of 70 reports and papers were heard and discussed at two plenary sessions and at the meetings of two sections concerned with the electron theory and with the molecular-kinetic theory of metals and alloys, respectively.

The plenary sessions heard interesting review papers presented by **I.M. Lifshitz** and **S.V. Vonsovskiĭ**. Lifshitz reported on the "Fundamental Problems and the Outlook for the Development of Metal Theory in Connection with the Fulfillment of the Seven-Year Plan." Vonsovskiĭ reported on the phenomenological theory of ferromagnetism. Both speakers pointed out the most urgent problems in metal theory and the directions of further investigations.

The report of **V.P. Silin** was concerned with the important influence that interactions between conduction electrons have on metal properties. He used Landau's theory of a Fermi Liquid, which was extended to include long-range electromagnetic interactions between electrons. Interelectronic interactions produce a qualitative change in the energy spectrum of an electron system. In addition to the Fermi-excitation branch that is characteristic of an electron gas, an electron fluid exhibits branches of Bose excitations which correspond to "zero sound" and to longitudinal and transverse plasma oscillations. Consequently, interelectronic interactions lead to additional energy loss by fast electrons traversing thin metal films, through a change in dielectric susceptibility for the infrared region as well as through the excitation of zero sound and plasma oscillations.

A large number of reports were concerned with different effects in metals which can be used to determine the shape of the Fermi surface of conduction electrons.

I.M. Lifshitz and **V.G. Peschanskiĭ** considered the galvanomagnetic properties of metals with open Fermi surfaces in strong magnetic fields. They analyzed the essential asymptotic dependence of these properties on the topology of the Fermi surface; this dependence had been established by Lifshitz, Azbel', and Kaganov. Specifically, when open electron trajectories are present on the Fermi surface the resistance approaches saturation for certain directions of the magnetic field but increases quadratically for other directions. This accounts for Kapitza's law of the linear rise of resistance in a magnetic field as a result of averaging. The suggested character of the Fermi surface for gold and copper has actually been observed by Pippard.

M. Ya. Azbel' reported on results of the quantum theory that he has constructed for high-frequency electrical resistance. He showed that quantum oscillations should be observed in the field-dependence of surface resistance. The amplitude of these oscillations increases sharply when the electromagnetic frequency coincides with the cyclotron resonance frequency. This resonant growth of amplitude should occur not only in fields parallel to the metal surface, as in the case of classical cyclotron resonance, but also in oblique fields. Investigation of the effect as the magnetic field direction is varied makes it possible to determine the shape of the Fermi surface and electron velocities on that surface. Analysis of the Fermi surface shape is facilitated by the use of thin films, in which case electron groups are separated.

M. Ya. Azbel' and **É. A. Kaner** discussed the theory of the cyclotron resonance which they had predicted in metals in the region of the anomalous skin effect within a magnetic field. The study of this effect also provides a means of establishing the topology of the Fermi surface and electron velocities on it. Recent studies of cyclotron resonance in Sn, Cu, Bi, In and Pb were analyzed. It was noted that the study of cylotron resonance in thin films provides one method for determining the maximum diameter of the Fermi surface. When the diameter of the electronic Larmor orbit equals the film thickness the curve of surface impedance versus field strength should exhibit a break.

M.I. Kaganov noted that for nonquadratic dependence of electron energy on momentum the electron orbital period in a magnetic field, and thus the resonance frequency, depends on the applied electric field. This effect can be used to analyze the shapes of constant energy surfaces in semiconductors.

Yu. A. Bychkov, L.E. Gurevich, and **G.M. Nedlin** discussed thermomagnetic effects in strong magnetic

fields. Such effects depend essentially on the shape of the Fermi surface, differing qualitatively for open and closed surfaces. When a temperature gradient exists the generated phonon current entrains electrons, thus producing a new mechanism for thermomagnetic effects when the ratio $(T/\theta)^2\ \xi/k\theta$ (where T is the temperature, θ is the Debye temperature and ξ is the chemical potential of the electrons) is not very small, as should occur if the temperature is not too low. The dependence of the thermomagnetic effects on temperature and field direction is then essentially modified.

A.A. Smirnov and **M.A. Krivoglaz** reported on a different method for determining the shape of the Fermi surface in metals, using the combined momentum of a photon pair resulting from the annihilation of a position with a conduction electron in the metal. The relation between this momentum and electron momentum makes it possible, by studying the angular distribution of photons for different orientations of a single crystal, to determine the electron-filled region in momentum space. Although the photon distribution may be smeared for various reasons, this method can be used to determine the general character of Fermi-surface anisotropy in some alloys as well as in pure metals.

A.M. Kosevich reported on the theory for the influence of elastic deformation on electron energy spectra in metals and on the oscillation of magnetic susceptibility in an external magnetic field. When a metal contains electron groups which are small in number of electrons, small deformations can change oscillation periods by some tens percent. In a constant magnetic field variation of external pressure also produces oscillations of thermodynamic quantities in a metal. The de Haas–van Alphen effect was also computed for the case of a pulsed magnetic field.

B.I. Verkin and **I.M. Dmitrenko** communicated the results of an experimental investigation of the way in which magnetic anisotropy and the de Haas–van Alphen effect were influenced in crystals of weakly magnetic metals (Zn, Bi, Be, Sn) which were subjected to hydrostatic pressures up to 1730 kg/cm^2. It was shown that magnetic anisotropy and the period of susceptibility oscillations depend in a complicated periodic manner on external pressure.

Three papers were concerned with ultrasound absorption in magnetic fields. The peak of the curve representing the absorption coefficient versus field strength corresponds to certain relations between the length of the sound wave and the diameter of the Larmor orbit and also depends strongly on the shape of the Fermi surface. **V.L. Gurevich**, who discussed the case of arbitrary dispersion, showed that the investigation of sound absorption in magnetic fields can be used to determine the shape of the Fermi surface. In addition to the usual deformation mechanism of sound absorption Gurevich suggested a new "induction" mechanism associated with the Joule heat of induced currents resulting from the motion of wave-deformed metal regions in the magnetic field. In some fields and at some frequencies induction absorption is important. The character of the absorption was considered for the case in which the Larmor orbit diameter is considerably smaller than the sound wavelength and the absorption coefficient is nonperiodically dependent on the reciprocal of the field.

G. L. Kotkin reported on sound absorption in metals with an isotropic Fermi surface. The conditions for the maximum absorption coefficient were found to be different from those of Pippard.

A. A. Galkin and **A. P. Korolyuk** reported on the experimental detection of oscillations of the ultrasound absorption coefficient of tin and zinc in a magnetic field. Oscillation periods were used to determine electron momentum projections for different crystallographic directions. In strong magnetic fields the observed strong anisotropy of ultrasound absorption can be used to determine the shape of the Fermi surface.

A prominent topic was the theory of x-ray and slow-neutron scattering by solid solutions.

M. A. Krivoglaz and **E. A. Tikhonova** presented the general theory for scattering by solid solutions of arbitrary composition with arbitrary parameters of long-range and short-range order. The scattering intensity distribution in the vicinity of reciprocal lattice points was investigated; this can be used to determine the lattice locations of impurities. It was shown that the exponential index in the Debye attenuation factor is not quadratically dependent on wavelength and is nonadditively associated with static and dynamic displacements. **V.I. Iveronova** and **A. A. Katznel'son** used this theory to calculate diffuse scattering in a Debye diffraction pattern. Their experimental study of the alloy Ni_3Pt revealed good agreement of the calculated and measured intensity distributions. Krivoglaz discussed the scattering of x rays and thermal neutrons in the vicinity of a second-order phase transition and showed that when lattice distortions are taken into account the intensity distribution may be strongly modified. In crystals without symmetry centers and in crystals which are close to the critical point unusually strong scattering is exhibited close to structural as well as superstructural reflections. Similar anomalous scattering effects near the critical point of the disintegration curve and near the Curie temperatures of ferromagnetics and antiferromagnetics were also considered.

A. A. Smirnov and **E. A. Tikhonova** discussed the concentration dependence of regular reflections and of the scattered x-ray background in the case of disordered substitutional alloys, in which lattice irregularities result from the different atomic factors and radii of the components. The derived formulas can also be

used to determine slow-neutron scattering intensities.

V. M. Danilenko presented calculations for x-ray scattering in different domain structures (inexact superposition of close-packed layers, oppositely phased ordered domains etc.). In the general theory which had been developed it was found how different domain structures affect the character and magnitude of the smearing of regular reflections.

K. P. Ryaboshapka and **V. M. Danilenko** showed that dislocations in ordered alloys produce different broadening of intensity peaks for structural and superstructural reflections. It was shown how the intensities of regular reflections and of diffuse scattering change with the formation of Cottrell atmospheres around dislocations.

A. N. Men' and **A. N. Orlov** calculated the maximum frequency ω_m of atomic vibrations in a body-centered cubic binary solid solution. It was shown that ω_m increases with degree of order and that the characteristic temperature of the alloy thus rises.

A. P. Zvyagina and **V. I. Iveronova** noted that the Debye temperature θ of an alloy, which is determined from x-ray data, depends essentially on the spectrum of thermal atomic vibrations. A calculation showed that ordering of a solid solution increases the average rms thermal displacements of the atoms and reduces θ, while interatomic forces remain unchanged (and when the maximum atomic vibration frequency is increased).

A number of papers were devoted to magnetic properties of matter. **K. B. Vlasov** considered the rotation of the plane of polarization of elastic transverse waves propagating in metals in the magnetic field direction. This effect is closely related to the variation of sound absorption in magnetic fields and may be of considerable magnitude in fields of $\sim 10^3$ oersted at elastic wave frequencies of $\sim 10^7$ cps.

A. A. Berdyshev and **B. V. Karpenko** calculated an indirect interaction between inner-shell electrons which is mediated by conduction electrons. The indirect interaction always favors ferromagnetism, which may exist in the complete absence of direct coupling and even with a negative exchange integral. The indirect exchange interaction may account for the ferromagnetism of dilute alloys, Heusler alloys and rare earth metals. **B. V. Karpenko** and **A. A. Berdyshev** noted that the interaction between conduction electrons and spin waves in an antiferromagnetic prevents electron correlation close to the Fermi surface and thus prevents a transition to the superconducting state.

L. M. Petrova and **Yu. P. Irkhin** reported a calculation of the ordinary Hall constant R of a ferromagnetic metal using Vonsovskiĭ's s-d exchange model with a two-zone structure of the conduction band. The calculation showed that R decreases as the temperature is lowered, as has been observed in nickel and nickel-copper alloys.

P. S. Zyryanov, T. G. Izyumova and **G. V. Skrotskiĭ** discussed the electrical resistance of ferromagnetic metals at radio frequencies near ferromagnetic resonance. Around the resonance frequency the amplitude of spin waves generated by the applied electromagnetic field increases sharply. This is accompanied by a strong rise of the electrical resistance associated with energy dissipation through interactions between induced spin oscillations and conduction electrons. Without taking spin-wave damping into account the electrical resistance is found to be inversely proportional to the square of the difference between the field and resonance frequencies.

Yu. A. Izyumov and **G. V. Skrotskiĭ** discussed spin magnetic resonance of conduction electrons in ferromagnetic and nonferromagnetic metals.

A. I. Gubanov used a quasichemical approximation to study ferromagnetism in amorphous ferromagnetics. He noted that long-range order of atoms is not required for the existence of ferromagnetism. In his formula for the Curie temperature an important part is played by the distribution function of separations between neighboring atoms.

M. Ya. Azbel', V. I. Gerasimenko and **I. M. Lifshitz** discussed paramagnetic resonance in metals for the case in which the skin depth is very small compared with the dimensions of a specimen. Because of the diffusion of conduction electrons with spins reversed through resonant absorption the demagnetized region of a specimen may be considerably greater than the skin layer. Consequently, at the resonance frequency the transmission of electromagnetic radiation through a thin film is sharply enhanced. An important result is the indicated possibility of producing nuclear orientation through paramagnetic resonance in a layer that is thicker than the skin layer.

V. P. Silin proposed a macroscopic theory of optical effects in metals which is applicable to both the normal and anomalous skin effects. It is pointed out that the displacement of an electron during its oscillatory period is small compared with the skin depth even through the mean free path may be large. This theory permits the study of optical effects in small-sized conductors as well as in large specimens upon which light impinges obliquely.

S. V. Konstantinov and **V. I. Perel'** derived an expression for the conductivity and magnetic susceptibility of a metal in an alternating electromagnetic field taking space dispersion into account. The results are applicable to the electrons of a metal in a strong magnetic field. It is shown that in metals with few conduction electrons an electromagnetic wave at lower than cyclotron frequency can be propagated in the magnetic field direction.

B. A. Grinberg and **A. N. Orlov** discussed the change of resistance in a magnetic field and the Hall effect in

a pure metal with parallel dislocation lines. Dislocations cause considerable anisotropy of galvanomagnetic effects in metals.

A. A. Smirnov and **A. I. Nosar'** discussed a theory of electrical resistance in alloys with deformed lattices, using a many-electron metal model. It was shown that the dependence of residual electrical resistance in alloys on composition and order may be derived by using a very small number of model assumptions. Additional resistance resulting from different atomic sizes depends on alloy composition through the relation between concentration and volume.

G. V. Samsonov and **V. S. Neshpor** showed that conductivity in Mo_3Si and $MoSi_2$ is of metallic character, with Mo_3Si being an *n*-type and $MoSi_2$ being a *p*-type conductor.

G. V. Samsonov and **Yu. B. Paderno** reported on their study of the physical properties and electronic structure of hexacarbides of rare earth metals with the structure of CaB_6 and having a small electron work function.

V. E. Mikryukov analyzed extensive experimental data with regard to the fulfillment of the Wiedemann-Franz law in metals and alloys.

G. E. Pikus and **V. B. Fiks** discussed electrokinetic effects in liquid metals, in which upon passage of an electric current electrons collide with the walls and oppositely-directed momenta are imparted to the walls and to the liquid. The resulting pressure differential is proportional to the potential difference and depends on the character of electron scattering at the walls. An inverse effect associated with the appearance of a potential difference also depends on the character of the electron scattering at the walls. This potential difference results from the lag of the electron current behind the ion current as a result of collisions with the walls. A pressure drop of ~ 1 kg/cm^2 in mercury will produce a potential difference of $\sim 10^{-6}$ v.

I. B. Borovskiĭ and **K. P. Gurov** reported their investigation of the effect produced by small amounts of impurities on the physical properties of transition metals (diffusion, linear expansion coefficient, elastic modulus, internal friction, resistivity etc.). Nonmonotonic dependence of such properties on impurity content was attributed to the effect which the extra charge of an impurity atom has on the electronic structure of the crystal region near the impurity.

M. I. Korsunskiĭ and **G. P. Borovikova** discussed the effect of small amounts of impurities on the x-ray spectra of solids. It was shown that 0.01 – 0.001 atomic percent of impurities will appreciably shift the x-ray levels of germanium.

A large group of papers dealt with phase transformations in metals and alloys. **I. M. Lifshitz** discussed a new type of phase transformation in metals at high pressures, resulting from discontinuity of the conduction electron distribution function at absolute zero. For certain values of the pressure p_k, when the topology of the Fermi surface changes, the pressure dependence of the thermodynamic potential also becomes discontinuous. Since compressibility close to the transition point varies proportionally to $(p - p_k)^{1/2}$, such transitions may be designated as of "order 2.5". Strictly speaking, we can speak of a phase transition of this order (that is, of a discontinuity of the thermodynamic potential) in a pure metal only at absolute zero. At positive temperatures (or with impurity content) the discontinuity is smeared. Near the transition point there is a complicated dependence of electron paramagnetic susceptibility on pressure. The kinetic coefficients must change sharply in a transition. It is estimated that phase transitions of this order will occur under pressures of $\sim 10^4 - 10^5$ atmospheres or when the impurity content is relatively small.

I. M. Lifshitz and **G. I. Stepanova** proposed a method of describing solutions in which the atomic configuration does not correspond to thermodynamic equilibrium for a given temperature. Correlation functions for atomic groups are introduced. A method was described for determining these correlation functions and the free energy of a nonequilibrium solid solution, in a manner which is especially convenient for low impurity content. The procedure can be used to study the thermodynamic characteristics of solutions when the correlation parameters vary at a constant rate or remain unchanged at a given hardening temperature *s*.

B. N. Finkel'shtein discussed the thermodynamics of a ternary solid solution. The free energy was calculated using a quasichemical approximation for interactions between pairs of atoms. The case in which two components are present in small amounts was investigated to determine the temperature dependence of the short-range order parameter and of the thermodynamic activities of the components.

Z. A. Matysina and **A. A. Smirnov** discussed a theory of the ordering of hexagonal close-packed alloys using statistical theory both without and with account of correlation in a quasi-chemical approximation. They determined the order-disorder transition temperature, the dependence of long-range order on temperature and composition and the correlation parameters.

I. A. Gindin, B. G. Lazarev, Ya. D. Starodubov and **V. I. Khotkevich** reported on the existence of low-temperature polymorphic transformations in a number of metals (alkali metals, bismuth and beryllim). Such transformations occur following plastic deformation and the low-temperature modification possesses a more closely packed lattice.

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transformations occur following plastic deformation and the low-temperature modification possesses a more closely packed lattice.

I. M. Lifshitz and **V. V. Slezov** discussed the coalescence of particles in late stages of disintegration when precipitating spherical particles are quite large and there is a low degree of supersaturation of a solution. A rigorous solution was obtained for the difficult mathematical problem of determining the time equation for the particle-size distribution function. An asymptotic solution was obtained for large values of the time t; the critical radius of a nucleus at large t is directly proportional to $t^{1/3}$. The results can be applied to the process of sintering and to the formation of pores in crystals that are oversaturated with vacancies. The pores first disappear from the surface layer of a metal of thickness proportional to $t^{1/3}$. **R. I. Garber** commented that the study of the kinetics of pore formation in rocksalt crystals confirms the foregoing.

V. I. Vladimirov discussed the theory of the coalescence of excess vacancies in solids and showed that large crystal defects cannot be formed through the coalescence of uniformly distributed vacancies at constant temperature. Coalescence takes place during cooling. In an infinitely extended body coalescence is impossible above a critical temperature T_{cr}. The kinetics of the formation of coalescence centers below T_{cr} depends on the rate of cooling. The critical specimen size was estimated at which coalescence is interrupted by the emergence of vacancies at the surface. Maximum and average sizes were also estimated for plane defects of the prismatic location type resulting from vacancy coalescence.

B. Ya. Lyubov and **A. L. Roĭtburd** discussed the theory of martensite crystal growth. By the use of a one-dimensional model taking interatomic interactions into account a critical value f_{cr} of the motive force for growth was obtained, below which growth of the new phase results from thermal fluctuations when thermal motion is sufficiently intense. For $f > f_{cr}$ growth results from the directed passage of atoms through a potential barrier, facilitated by the passage of preceding atoms. The temperature at the transition front was evaluated for steady growth conditions. For a specific model the stress field and elastic energy of the matrix were calculated as functions of the transition parameters and external loads.

L. N. Larikov discussed the kinetics of recrystallization in deformed metals and alloys. It was shown that the fluctuational formation of undistorted small crystals can occur with appreciable speed only in the most highly disordered portions of deformed metals. The formulas derived for the growth rate of recrystallization centers agree satisfactorily with experimental findings for pure metals. The mechanism by which soluble and insoluble impurities affect the linear growth rate of centers was considered.

I. V. Salli discussed metastable equilibrium curves in diagrams of binary systems. Using the molecular-kinetic and thermodynamic theory of crystallization, he critically analyzed papers in which equilibrium curves were extended into the subcritical region. He finds that metastable phases which appear at high rates of cooling are usually stable under other crystallization conditions and are present in an equilibrium diagram at higher concentrations than in the crystallizing liquid. Confirmation was provided by data from the investigation of certain alloys which had hardened at cooling rates up to 100,000° per second.

M. I. Zakharova and **I. N. Stetsenko** discussed phase transformations in iron-vanadium alloys. The existence of a new ferromagnetic β phase was established through investigations of the magnetic properties and structure of these alloys while undergoing polymorphic transformations. The new phase was observed in a wide range of concentrations at temperatures above that of the $\sigma \rightarrow \alpha$ phase transition. In the 1050 to 1150° region unusually slow phase transition rates were observed.

Atom and ion mobilities in metallic systems were discussed in several papers. **K. P. Gurov** used Brennig's formalism to consider the relation between the activation energy of self diffusion and the characteristic temperature of a pure metal; this is the first approximation of a more general relation including nonequilibrium characteristics of the process. Calculated and experimental activation energies were compared.

I. M. Fedorchenko and **A. I. Raĭchenko** considered the volumetric growth of mixed metallic powders during annealing in connection with the Kirkendall effect. The model used was a face-centered cubic lattice consisting of metal cubes in a matrix of another metal A. The calculation was made for a nonporous body assuming the diffusion coefficient of metal B to be independent of concentration and time. The calculated maximum volume effects were compared with experimental data for a Cu-Ni system.

E. A. Tikhonova discussed the diffusion theory of intersitial atoms in A–B alloys of the CuAu type, where ordered A and B atoms are located in alternating planes parallel to one of the cube faces. It was shown that the diffusion coefficient and activation energy change discontinuously in an order-disorder transformation of the alloy. Strong anisotropy of the diffusion coefficient should also be observed in the ordered alloy. The coefficient of diffusion parallel to layer boundaries is usually larger than that for the direction perpendicular to the layers.

V. B. Fiks discussed the mechanism for the mobility of impurity ions in metals within electric fields, taking into account the entrainment of ions by electrons. It was shown that the effective mobility of an impurity

ion in a metal depends on the cross section for electron scattering as well as on charge. The motion of neutral impurity ions depends entirely upon entrainment by electrons. The theory permitted derivation of Scaupi's conduction rule and of the limits of its applicability. A calculation also showed that entrainment may account for a considerable portion of the experimentally observed effect in thermal diffusion.

P. P. Kuz'menko and **E. I. Khar'kov** reported interesting experimental results from the study of electrical migration in pure metals by means of labeled atoms.

I. N. Frantsevich, D. F. Kalinovich, I. I. Kovenskiĭ, M. D. Smolin and **M. D. Glinchuk** presented results of a study, using radioactive isotopes, of the electrical migration of both components in binary solid solutions of carbon, chromium, molybdenum and tungsten in iron and also of tungsten in nickel. It was found that ions of carbon, chromium and tungsten in these solution migrate to the cathode in a constant electric field. In a solid solution of molybdenum in iron the molybdenum atoms migrate to the anode. Iron atoms in these solutions migrate in the direction opposite to that of the dissolved element.

A number of papers discussed the mechanism of creep and fracture of metals at high temperatures. **I. A. Oding** and **V. N. Geminov** discussed metal fracture through creep at elevated temperatures. An explanation was found in the gradual accumulation of intragranular and intergranular damage through a dislocation-vacancy mechanism.

I. A. Oding and **L. K. Gordienko** discussed results obtained through micromechanical tests of changes in the mechanical properties of metals previously subjected to a creep test. Formulas were determined for changes in plasticity, flow properties and tensile strength of commercial iron and a nickel-chromium alloy at different stages under conditions of creep. Change of the mechanical properties was compared with the microstructure of the specimens.

B. Ya. Pines discussed the diffusion mechanism of creep and presented data showing that a criterion for a creep mechanism is to be found in the influence of cold working and annealing on the creep rate. Diffusion creep is accelerated after cold working but is slowed down after annealing. The opposite is observed in the case of dislocation creep. The observed diffusion creep in crystals differs, however, from viscous flow in amorphous substances in the existence of nonequilibrium states which disturb the simple regularity of viscous flow. This was illustrated by much experimental data from investigations of recovery and aftereffects in cermets.

N. S. Zhurkov and **A. V. Savitskiĭ** discussed an experimental test of the diffusion theory of mechanical rupture in pure silver and in an alloy of silver with 5 atomic percent aluminum. The dissimilar temperature dependences of the rupture and self-diffusion processes and the different ways in which they are affected by small amounts of alloying material indicate that the two processes differ in nature and also throw doubt on the diffusion theory of crack growth.

N. S. Fastov discussed the thermodynamics of irreversible hardening and softening processes in metals. The accumulation of energy in plastically deformed crystals was considered. Practically all energy expended to produce small deformations is accumulated as hardening energy, but with increasing degree of deformation the ratio decreases. A calculation was made of the position and width of the maximum hardening-energy release rate in the case of a constant heating rate. The results agree qualitatively with experimental data obtained by **V. I. Khotkevich** for cadmium.

In the course of the discussion of this last group of papers it was agreed that although the mechanisms of different processes cannot be compared reliably on the basis of only the temperature dependence of their rates, we at present have sufficient grounds for reexamining certain simplifications of the mechanisms of metal creep and rupture at high temperatures.

The papers of **A. I. Gindin** and **Yu. M. Plishkin** were closely related to the foregoing. In his short communication A. I. Gindin presented interesting data on the enhanced plasticity of Armco iron at low temperatures resulting from previous plastic deformation at higher temperatures. Yu. M. Plishkin investigated the stable configurations of atomic layers as a function of axial elongation in cylindrical crystals. By means of certain simplifying assumptions the crack form corresponding to minimum potential energy was determined.

K. P. Rodionov used available experimental data as a basis for suggesting the existence of a temperature region, not generally that of the melting point, where the physical properties of solids may change anomalously with pressure and temperature. He analyzed thermodynamically the pressure and temperature dependences of compressibility, thermal expansion, specific heat and other parameters in the anomalous region and made some qualitative remarks concerning the nature of the effect.

N. I. Varich discussed the periodic variation of interatomic binding forces as a function of position in the periodic table of the elements.

G. M. Vorob'ev discussed measuring x-ray interference intensities reliably in textured specimens.

A. S. Viglin discussed the quantitative measurement of texture in polycrystalline materials. At the final plenary session the conference adopted a resolution which pointed out the most important problems in the theory of metals and alloys together with the required directions of further investigation. Certain practical organizational steps were also recommended for the improvement of work in metal theory.

Translated by I. Emin