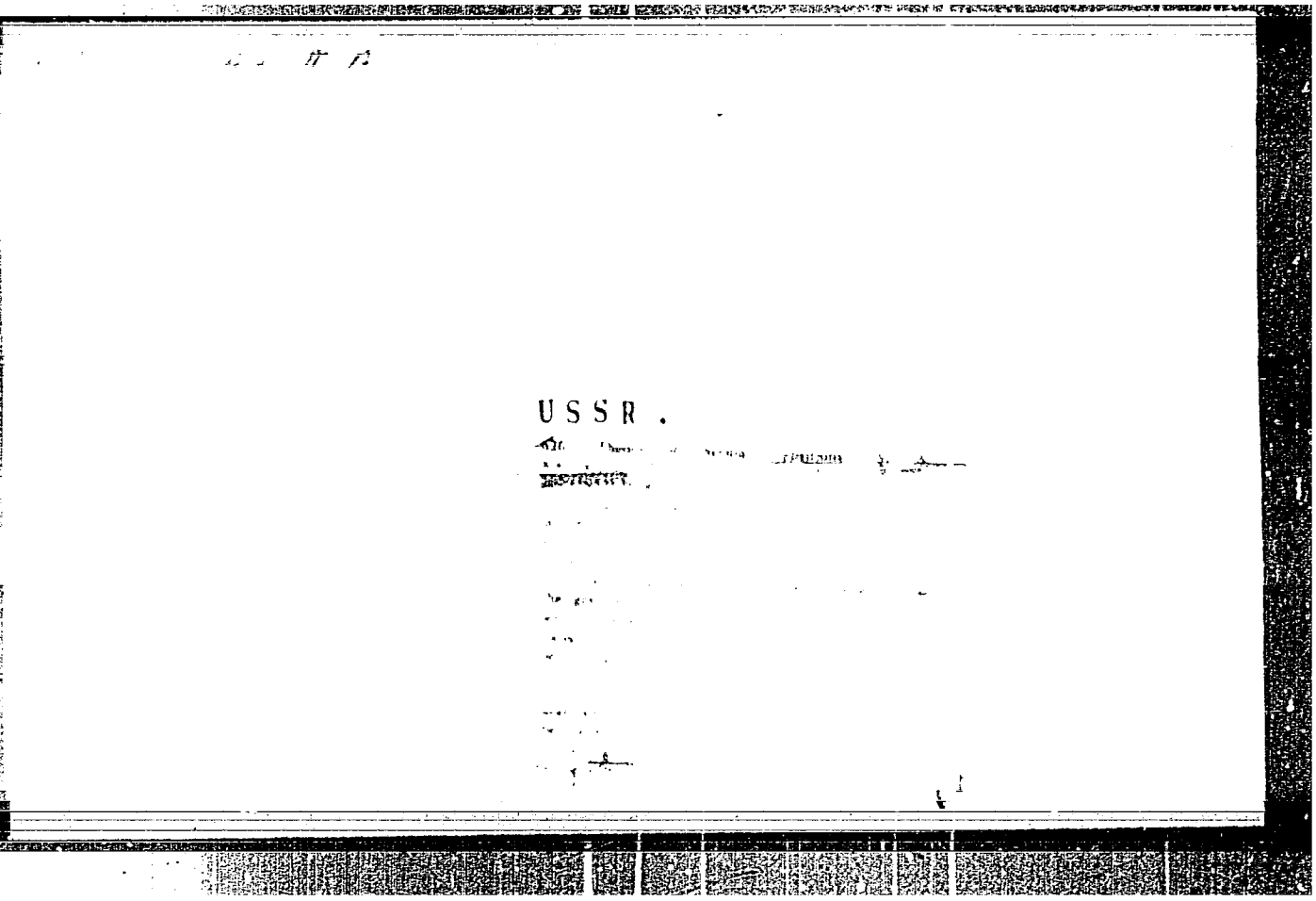

KR[illegible], I. M.

"Application of the Theory of Quantum Conversions to Solid State," Kand. fiz.-mat. nauk, Laboratory of Metallophysics, Acad Sci Ukrainian SSR, Kiev, 1954. (Kl, No 9, Feb 55)

SO: Sum. No. 631, 26 Aug 55 - Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (15)

KRIVOGLAZ,M.A.; SMIRNOV,A.A.

Effect of solute atoms on the self-diffusion of metals. Sbor. nauch. rab. Lab. metallofiz. no.5:128-137 '54. (MLRA 8:9)
(Iron--Metallography)

Theory of the diffusion of interstitial atoms in self-ordering alloys. II. M. A. Krivoglaz and A. A. Smirnov (Lab. Metal Phys., Akad. Sci. Ukr. S.S.R., Kiev.). *Zhur. Eksptl. i Teoret. Fiz.* **27**, 673-80(1954); cf. *C.A.* 49, 2142*i*.—The diffusion of interstitial atoms in self-ordering alloys with the face-centered $AuCu_3$ lattice is calcd., the interstitial atoms are located either in the center of the cubic cells or at the centers of sides. Calcns. show that in this type of alloy at the temp. of the transition ordered-disordered diffusion and activation energy change discontinuously.
S. Pakswer

62

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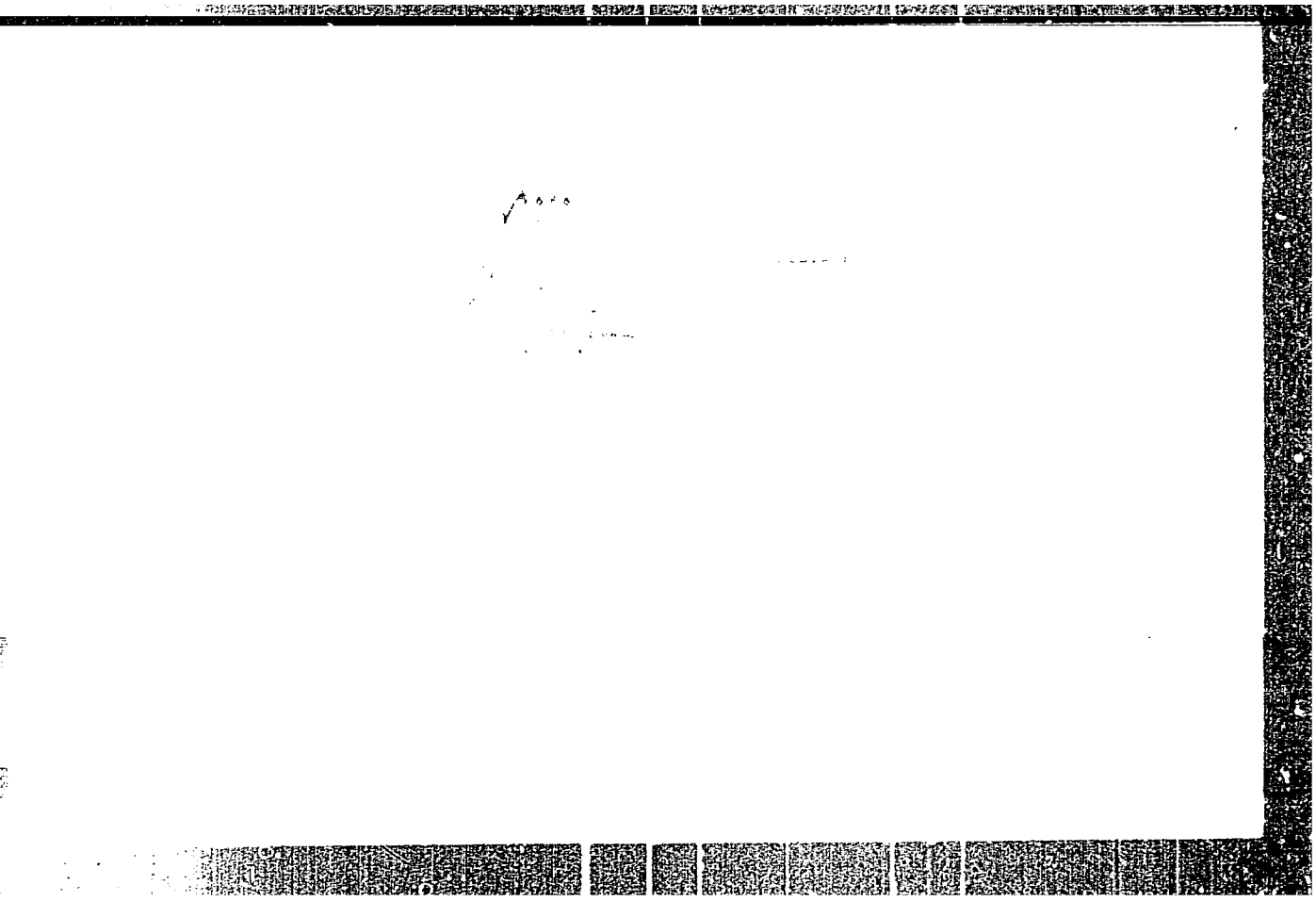


KRIVOGLAZ, M. A.

FD-1012

USSR/Metallurgy - Alloy ordering

Card 1/1 : Pub. 153 - 16/24

Author : Kirvoglaz, M. A.

Title : Solubility in ordered alloys, I

Periodical : Zhur. tekh. fiz., 24, 1077-1089, Jun 1954

Abstract : Considers the solubility of the atoms of a third element in the internodes of crystalline lattices of binary alloys of various structures. Investigates the dependence of solubility upon temperature, composition of allog and degree of distant ordering. Thanks A. A. Smirnov for his interest. Eleven references (e.g. Joint works of A. A. Smirnov and M. A. Krivoglaz in Ukrainian publications).

Institution : -

Submitted : July 4, 1953

KRIVOGLAZ, M. A., MATYSINA, Z. A.

"On the Theory of Regulating Ternary Alloys"

an article in the book "Questions on the Physics of Metals and Metal Science", AS Ukr. SSR, Kiev, 1955, 151 pp.

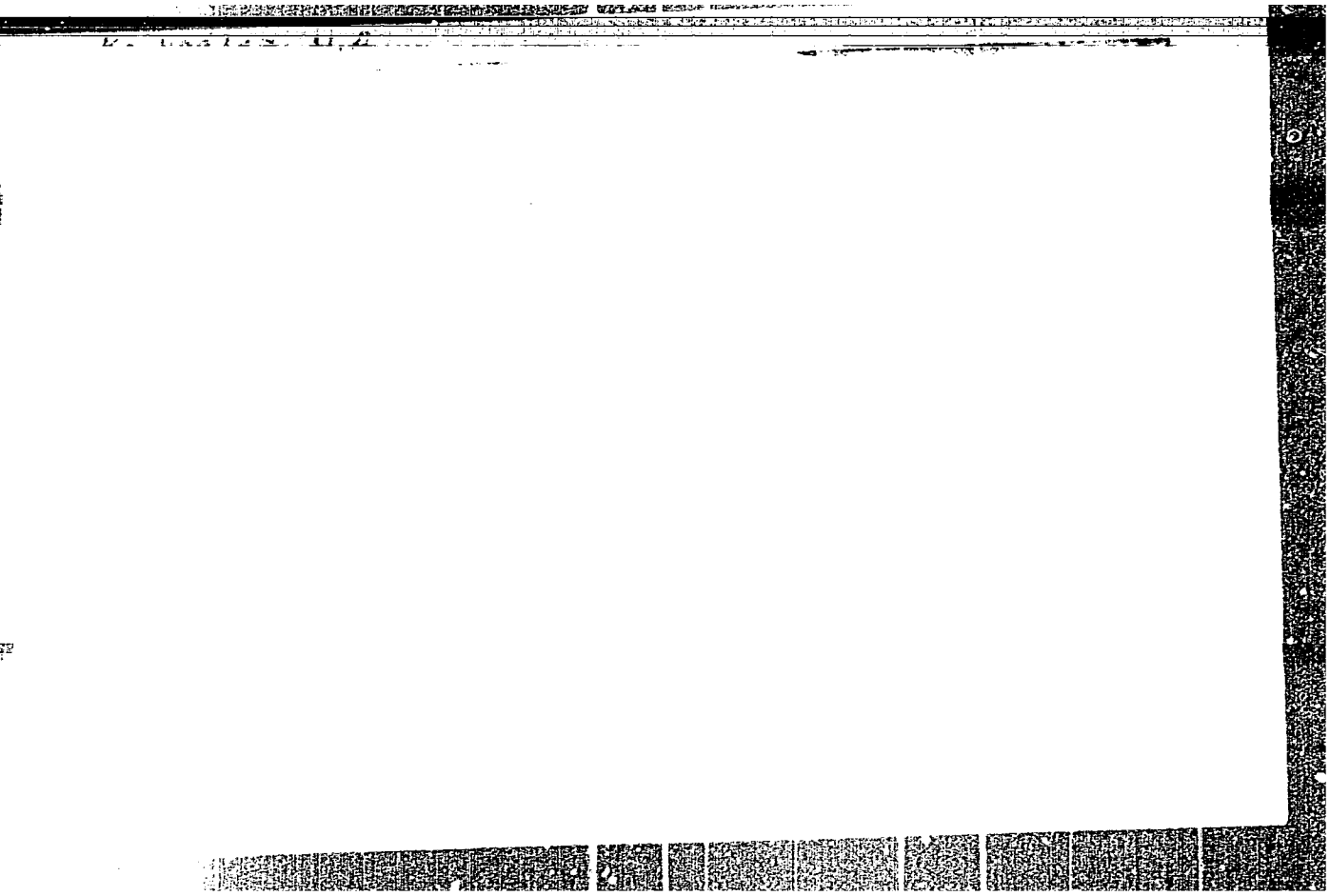
So: Sum, No1108, 19 Oct 56

KRIVOGLAZ, M. A., SMIRNOV, A. A.,

"The Effect of Admixtures of Implanted Atoms on Alloy Dissociation"

an article in the book "Questions on the Physics of Metals and Metal Science", AS Ukr. SSR, Kiev, 1955, 151 pp.

SO; Sum. No. 1102, 19 Oct 56



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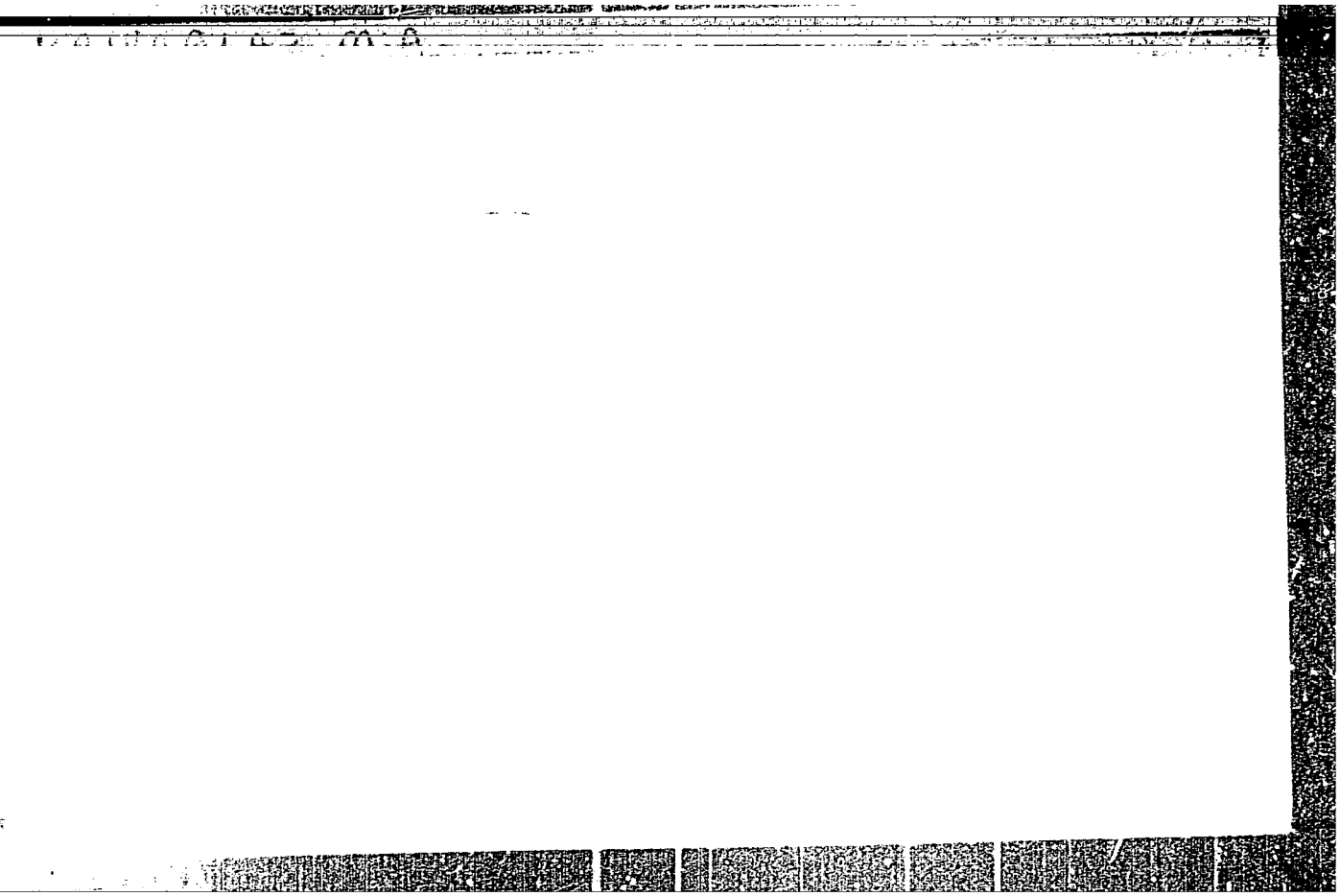

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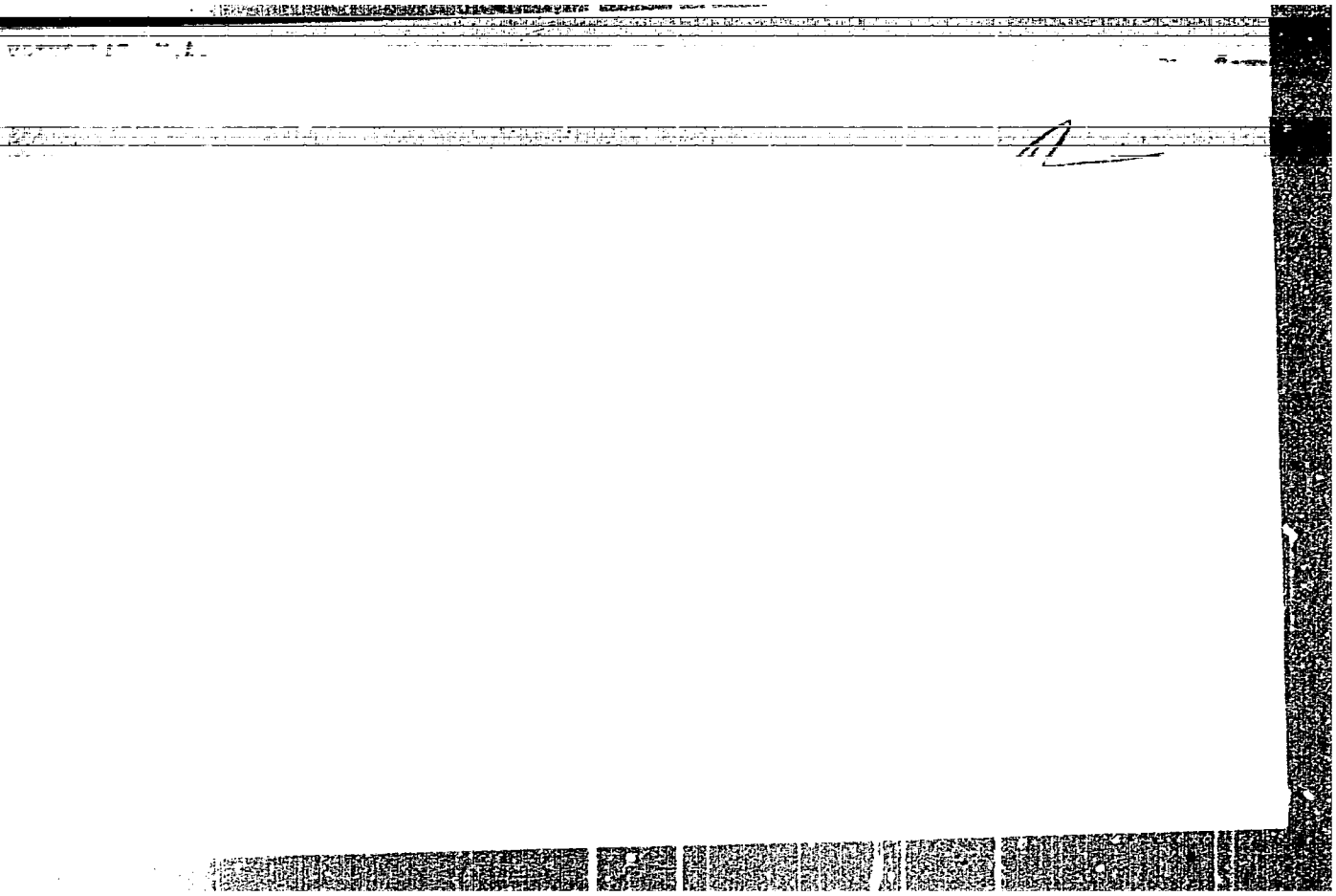


APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826520019-8"

FD-1888

USSR/Physics - Resistance of alloys

KRIVOGLAZ, M.A.

Card 1/1 Publ 146-8/21

Author : Krivoglaz, M. A., and Matysina, Z. A.

Title : Theory of electrical resistance of ordered alloys

Periodical : Zhur. eksp. i teor. fiz. 28, 61-69, January 1955

Abstract : The authors discuss the residual electrical resistance of binary ordered alloys in the framework of the poly-electron theory. He shows that the dependence of resistance upon the composition of an alloy and degree of distance ordering is obtained in the same way as in the mono-electron approximation. He takes into account correlation in alloys. He thanks Prof. A. A. Smirnov. Six references: e.g. A. A. Smirnov, ibid., 17, 743, 1947; S. V. Vonsovskiy, Usp. fiz. nauk, 48, 289, 1952; A. V. Sokolov, ZhETF, 25, 341, 1953.

Institution: Laboratory of Metal Physics, Academy of Sciences Ukrainian SSR

Submitted : February 16, 1954

KRIVOGLAZ, M. A.

USSR/Physical Chemistry. Thermodynamics, Thermochemistry, B-8
Equilibria, Physical-Chemical Analysis, Phase Transitions.

Abs Jour: Ref Zhur-Khimiya, No 5, 1957, 14683

Author : M. A. Krivoglaz, A. A. Smirnov
Inst :
Title : On the Theory of Disintegration of Alloys Accompanied by A Separation of Chemical Compound.

Orig Pub: Fiz. metallov i metallovedeniye, 1955, 1, No 2, 311-315

Abstract: The paper contains the thermodynamic computation of the general case of disintagration of an alloy of two metals, in the crystal lattice of which atoms of a third element have been introduced; this disintergration consists in the formation of a chemical compound of this third element with the metals and a solid solution of an altered composition. The computation of the first phase representing the solid solution is carried out statistically taking into consideration only the configuration part of the free energy. It is assumed that the disintegrating

Card 1/2

USSR/Physical Chemistry. Thermodynamics, Thermochemistry, B-8
Equilibria, Physical-Chemical Analysis, Phase Transitions.

Abs Jour: Ref Zhur-Khimiya, No 5, 1957, 14683.

Abstract: alloy has a face-centered cubic lattice and that the interaction energy of atoms does not depend on the temperature and composition of the alloy.

Card 2/2

KRIVOGLAZ, M.A.

G-4

Category : USSR/Electricity - Conductors

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1620

Author : Krivoglaz, M.A., Matysina, Z.A., Smirnov, A.A.
Title : Theory of Residual Electric Resistivity of Trinary Disordered Alloys

Orig Pub : Fiz. metallov i metallovedeniye, 1955, 1, No 3, 385-392

Abstract : The residual electric resistivity of trinary disordered alloys is calculated within the framework of the multi-electron theory of metals as a function of the concentration and of the annealing temperature, taking into account the correlation in all the coordination spheres.

Inst. Metallophysics AS Ukr SSR

Card : 1/1

KRIVOGLAZ, M.A.

USSR/ Physical Chemistry - Crystals

B-5

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 10988

Author : Krivoglaz M.A.
Title : Solubility in Alloys Undergoing Orderly Arrangement

Orig Pub : Fiz. metallov i metallovedeniye, 1955, 1, No 3, 393-403

Abstract : Within the scope of the usual statistical model of an alloy, an analysis is made of substitution solubility of atoms of a third element introduced into a binary alloy. Calculations are performed at quasi chemical approximation in the case of alloys with body-centered cubic lattice. Solubility in the alloy depends upon reverse temperature, not exponentially as in the case of pure metals, but in a more complex manner. Under definite conditions the graph of temperature dependence of solubility should show a minimum. At the point of transformation of an alloy with beta-brass type of lattice, to an ordered state, the curves of temperature dependence, or concentration dependence, of solubility, must show a break. On orderly arrangement there is possible a drastic redistribution of admixture atoms at lattice points of 1-st and 2-nd kind. This phenomenon can be utilized for experimental roentgenographic detection of superlattice in binary alloys having proximate atomic factors of scattering. Part I see RZhMet, 1956, 667.

Card 1/1

USSR/Solid State Physics - Phase Transformations in Solids, E-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34736

Author: Krivoglaz, M. A.

Institution: Metal-Physics Laboratory, Academy of Sciences Ukrainian SSR

Title: Solubility in Order-Disorder Alloys, II

Original Periodical: Fiz. metallov i metallovedeniye, 1955, 1, No 3, 393-403

Abstract: Within the framework of the usual statistical model of an alloy, an investigation was made of the solubility of atoms of the third element at the sites of the crystalline lattice of a binary alloy. Calculations are made in the quasi-chemical approximation for the case of alloys with volume-centered cubic lattices. The solubility in the alloy depends on the reciprocal of the temperature not exponentially, as in the case of pure metals, but in a more complicated manner. Under certain conditions one should observe a minimum on the temperature-solubility curve. A break should be observed on the temperature-solubility or concentration-solubility curve at the point where an alloy having a lattice of the β-brass type is transferred into the ordered state. A sharp redistribution of the admixture atoms at the sites of the first or second kind is possible during the ordering process. This phenomenon

USSR/Solid State Physics - Phase Transformations in Solids, E-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34736

Author: Krivoglaz, M. A.

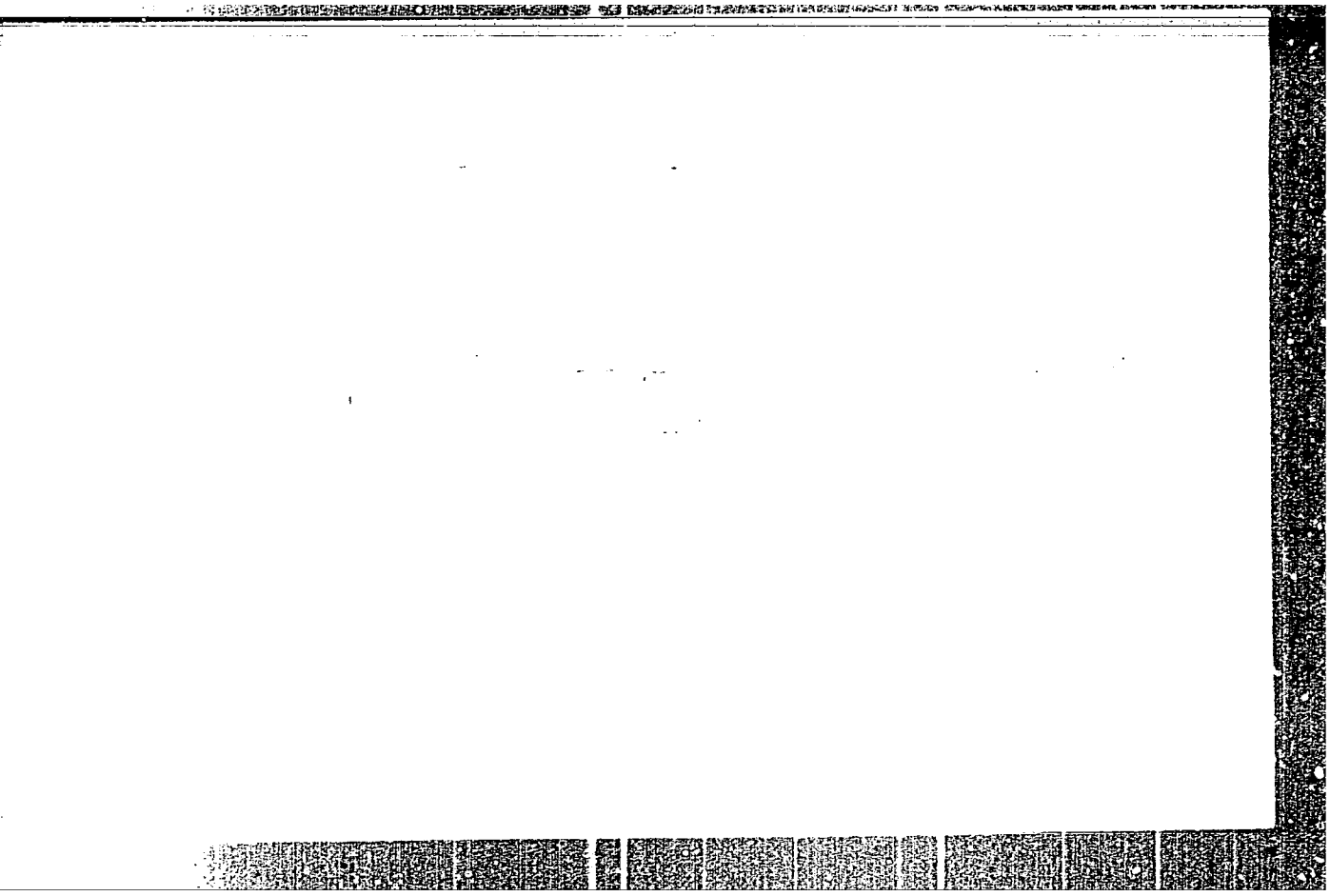
Institution: Metal-Physics Laboratory, Academy of Sciences Ukrainian SSR

Title: Solubility in Order-Disorder Alloys, II

Original Periodical: Tiz. metallov i metallovedeniye, 1955, 1, No 3, 393-403

Abstract: can be used for x-ray diffraction observation of the superstructure in binary alloys with nearly-equal atomic scattering factors.

For first part of article see Referat Zhur - Fizika, 1955, 2764.



APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826520019-8"

USSR/Physics - Diffusion in metals
KRIVOGLAZ, M.A.
Card 1/2 Pub. 118 - 4/8

Authors : Krivoglaz, M. A., and Smirnov, A. A.

Title : A theory of atomic diffusion in alloys

Periodical : Usp. fiz. nauk 55/3, 391-442, Mar 1955

Abstract : An explanation of the diffusion phenomena is presented. Two theories (out of three mentioned) on the atomic diffusion are discussed. One theory explains the diffusion phenomena as the atom movements along the lattice inter-sites. The theory considers two types of cubical structure crystals: 1. of the β-brass crystals with regularly and irregularly arranged atoms;

Institution: .....

Submitted : .....

Card 2/2 Pub. 118 - 4/8

Periodical : Usp. fiz. nauk 55/3, 391-442, Mar 1955

Abstract : and 2. of the Fe_3Al type. The other theory explains the diffusion phenomena as the atom movements along the vacant lattice sites. Methods for determining diffusion coefficients are presented. The dependance of these coefficients on temperature and crystal concentration is discussed and formulas for the coefficients are derived. The so-called self-diffusion phenomenon in the regular or irregular crystals are also discussed. Twenty-nine references: 25 USSR and 8 USA. Graphs; diagrams.

USSR

10745* Theory of Diffusion of Atoms in Alloys. Teoriia diffuzii atomov v splavakh. (Russian.) M. A. Krivoglaz and A. A. Smirnov. *Uspekhi Fizicheskikh Nauk*, v. 60, no. 3, Mar. 1955, p. 391-442.

Diffusion effected by vacancy mechanism interstitially in crystal lattice; equations for determining diffusion coefficient in alloys of β-brass, Fe_3Al, etc. Diagrams, graphs. 29 ref.

KRIVOGLAZ, M.A.

Self-diffusion of alloys. Sbor. nauch. rab. Inst. metallofiz. AN USSR no.7:95-104 '56. (MIRA 11:1)
(Diffusion) (Alloys--Metallography)

KRIVOGLAZ, M.A.; KOCHERZHINSKIY, Yu.A.

Diffusion in solids during heating. Sbor. nauch. rab. Inst. metallofiz. AN USSR no.7:105-114 '56. (MIRA 11:1)
(Solutions, Solid) (Heat--Conduction)

KRIVOGLAZ, M.A.

G-4

USSR/Electricity - Conductors

Abs Jour : Ref Zhur - Fizika, No 1, 1958, 1390

Author : Krivoglaz, M.A., Smirnov, A.A.

Inst : -

Title : Concerning the Dependence of the Residual Electric Resistivity of an Alloy on the Composition and on the Degree of Ordering.

Orig Pub : Sb. nauch. rabot In-ta metallofiz. AN USSR, 1956, No 7, 115-117

Abstract : Without employing the concept of the mean free path and without assuming the energy of the electron to be independent of the direction of the wave vector, but within the framework of the single-electron approximation, the known relations for the resistance of an alloy were derived for the following two cases: (1) for a binary ordered alloy without allowance for the correlation -- the dependence on the concentration of the component

Card 1/2

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...our : Ref Zhur - Fizika, No 1, 1958, 1390

G-4

and on the degree of the far order; (2) for a ternary unordered alloy with small concentration of components C -- concentration dependence. As usual, it is assumed that the potential energy of the conduction electron in the field of atoms type A and B differs little, and that the number of the electrons of conduction does not depend on the composition and on the order in the alloy.

Card 2/2

USSR/Physical Chemistry - Crystals, B-5

Abst Journal: Referat Zhur - Khimiya, No 1, 1957, 229

Author: Krivoglaz, M. A.

Institution: None

Title: A Comparison of the Theory of Luminescence of Solids with Experiment

Original Periodical: Optika i spektroskopiya, 1956, Vol 1, No 1, 54-65

Abstract: The theoretical values obtained by S. I. Pekara and the author are compared with experimental values obtained by investigating the temperature dependence of the curves of the emission spectrum of the phosphor Zn_2SiO_4-$MnSiO_4$ (0.1%), the relation between the half-width of the emission band and the Stokes shift of the M-centers in LiF and for $ZnSiO_4$-Mn, and the temperature dependence of the probability of a nonradiating thermal transition (quantum yield of phosphorescence) in the phosphors $CaWO_4$, $PbWO_4$, $MgWO_4$, and Zn_2SiO_4-Mn. A satisfactory agreement between theory and experiment was found.

Card 1/1

KRIVOGLAZ, M.A.

USSR/Electricity - Dielectrics G-2

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12076

Author : Krivoglaz, M.A., Pekar, S.I.

Inst : Kiev University, USSR

Title : Connection Between the Parameters of Longitudinal and Transverse Optical Oscillations of Ions in a Crystal.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 31, No 2, 343-346

Abstract : For cubic ionic crystals, containing an arbitrary number of atoms in an elementary cell, the authors have used a phenomenological treatment to derive formulas for the frequencies and for the amplitudes (for a specified external field) of the optical oscillations, provided the dependence of the dielectric constant on the frequency of the light is known. The relations obtained are correct for oscillations, in which the wavelength is considerably

Card 1/2

USSR/Eletricity - Dielectrics G-2

Abs Jour : Ref Zhur - Fizika, No 5, 1957, 12076

higher than the lattice constant, but is not too large ($\lambda \lesssim 10$ cm), so that it becomes possible to neglect the time delay. Cases are noted when the relations derived are valid also fro optically-anisotropic crystals.

Card 2/2

KRIVOGLAZ, M. A.

Category: USSR / Physical Chemistry - Crystals B-5

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29640

Author : Krivoglaz M. A.
Inst : not given
Title : Theory of Diffused Scattering of X-Rays by Solid Solutions. I.

Orig Pub: Zh. eksperim. i teor. fiziki, 1956, 31, No 4, 625-635

Abstract: By means of phenomenological considerations a determination is made of the intensity of diffused scattering of x-rays by mixed crystals. The expression giving the background intensity includes thermodynamic quantities which can be determined on the basis of other experiments. An investigation is made of the characteristic features of scattering in the vicinity of points of phase transitions of the second kind, and the critical points of the decomposition curve, and also considered is scattering by weak, ideal and almost completely ordered solid solutions.

Card : 1/1 -7-

KRIVOGLAZ, M.A.

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✓ [illegible]EORY OF DIFFUSE SCAT[illegible]

[illegible] have been investigated, and also the scattering by weak, by ideal, and by almost completely ordered solid solutions has been examined. (auth)

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826520019-8"

KRIVOGLAZ, M.A.

Theory of diffusion scattering of X rays by ternary alloys.
Fiz. met. i metalloved 5 no.203-211 '57. (MIRA 11:3)

1.Institut metallofiziki AN USSR.
(X rays) (Diffusion)

137-58-6-13104

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 274 (USSR)

AUTHORS: Krivoglaz, M.A., Smirnov, A.A.

TITLE: To the Termodynamic Theory of Second-order Phase Transitions in Solid Solutions (K termodinamicheskoy teorii fazovykh perekhodov vtorogo roda v tverdykh rastvorakh)

PERIODICAL: Sb. nauchn. rabot In-ta metallofiz. AN UkrSSR, 1957, Nr 8, pp 65-69

ABSTRACT: Relationships are obtained between the second derivatives of the thermodynamic potential Φ relative to the temperature T, the pressure P, and the concentration c which are generalizations of Ehrenfest's relationships for solid solutions. Within the framework of the thermodynamic theory of second-order phase transitions, relationships of the degree of the lower-range order of η were calculated relative to P and c close to the transition point. With T and P constant, $\eta \sim \sqrt{c-c_0}$, while with T and c constant, $\eta \sim \sqrt{P-P_0}$, where c_0 and P_0 are the values corresponding to the transition curves. To determine the slope coefficient of these relationships it is necessary

Card 1/2

To the Thermodynamic Theory (cont.)

to know the coefficients of the expansion of Φ according to powers of η, as performed in thermodynamic theory, and the derivatives $\partial T_o/\partial c$ or $\partial T_o/\partial P$, where T_o is the transition temperature.

M.K.

1. Metals--Phase studies 2. Metals--Thermodynamic properties

Card 2/2

KRIVOGLAZ, M.A.

Intensity distribution of diffusely scattered X-rays and thermal neutrons of a Debye powder pattern. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.8:199-208 '57. (MIRA 11:5)
(X rays--Scattering) (Neutrons) (Crystal lattices)

KRIVOOLAZ, M.D.

On X-ray scattering in the neighborhood of the critical and isolated points of a phase transition of the second order. Ukr. fiz. zhur. 2 no.2:114-121 Ap-Je '57. (MLRA 10:6)

1. Institut metalofiziki Akademii nauk URSR.
(X-ray crystallography)

AUTHOR: Danilenko, V.M., Krivoglaz, M.A., Matysina, Z.A. and Smirnov, A.A. 104

TITLE: On the theory of scattering of the waves of the crystal lattice of solid solutions. (K teorii rasseyaniya voln kristallicheskoy reshetkoy tverdykh rastvorov.)

PERIODICAL: "Fizika Metallov i Metallovedenie" (Physics of Metals and Metallurgy), 1957, Vol.IV, No.1 (10), pp.28 - 35, (U.S.S.R.)

ABSTRACT: Formulae are derived for the probability of scattering of various types of waves caused by the non-ordered alternation of atoms of various types on the nodes of the crystal lattice for the general case of a multi-component system with any number of components, taking into consideration the distant order and the correlations in all the coordination spheres. In the assumed general case, the solid solution crystal will have in the non-ordered state any type of Bravais lattice, any state and any distant order; in substituting the nodes of the crystal lattice by atoms of various types correlation is taken into consideration in all the coordination spheres. In considering the starting formulae for the probability of scattering, the authors reduce the various known formulae of the probability of scattering of X-rays, of slow neutrons and of electrons to a single unified equation:

$$w = C (S + w')$$

On the theory of scattering of the waves of the crystal lattice of solid solutions. (Cont.) 104

where w is the probability of scattering per unit of time and per unit of solid angle; C is the coefficient of proportionality which is independent of the composition and the character of distribution of the atoms and can be determined by taking into consideration eqs. (4), (7) and (8), pp. 29-30; S is expressed by eq. (11), and some components of this equation are expressed for the case of X-rays, neutrons and electrons by eq. (12) and two other equations on P.31. In the second part of the paper, the formulae for the probability of scattering are derived. 14 references, 8 of which are Russian.

Institute of Metal Physics, Ac.Sc., Ukraine. Recd. April 2, 1956.

KRIVOGLAZ, M. A.

126-2-2/35

AUTHOR: Krivoglaz, M. A.

TITLE: The Theory of Diffuse Scattering of X-rays by Triple Alloys. (Teoriya diffuznogo rasseyaniya rentgenovykh luchey troynymi splavami).

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol.5, No.2, pp. 203-221 (USSR)

ABSTRACT: The scattering of X-rays by fluctuations in the concentration of components in a triple unordered alloy is considered. Formulae are obtained which determine the dependence of the scattered intensity of a monochromatic radiation by a monocrystal on the angle of scattering, orientation of the monocrystal, alloy composition, temperature of annealing and constants of interatomic interaction. As in Refs. 1 and 2 it is assumed that all the atoms are at the nodes of an ideal periodic crystal lattice. This is correct if the radii of the different atoms of the alloy are nearly the same and distortions of the third kind are not present. Diffuse scattering connected with thermal oscillations of atoms and Compton scattering are not considered. In addition, it is assumed that the atomic scattering factor is independent of the nearest neighbours. A definite

Card 1/2

The Theory of Diffuse Scattering of X-rays by Triple Alloys. 126-2-2/35

statistical model of the alloy is used as in Ref.2. Using this model calculations are carried out for diffuse scattering of X-rays and thermal neutrons. It is shown that the scattered intensity is determined by the magnitude of the mean values of the squares and products of the Fourier components of the fluctuations of the concentration of the atoms A and B in different atomic planes. These means values can be obtained from the usual formulae of fluctuation theory. An explicit expression is obtained for the scattered intensity. A. A. Smirnov collaborated.
There are 6 references, all of which are Slavic.

SUBMITTED: June 19, 1956.

ASSOCIATION: Institute of Physics of Metals, Ac.Sc. Ukrainian SSR (Institut Metallofiziki AN USSR)

AVAILABLE: Library of Congress.

Card 2/2

KRIVOGLAZ, M.A.

AUTHOR: KRIVOGLAZ,M.A., PEKAR,S.M.

TITLE: The Trace Method for Conductien Electrens in Semiconductors, I.The Weak Interactien between Electrens and Oscillatiens. (Meted shpurev dlya elektronev provedimesti vpoluprovednikakh. Slabeye vzaimedeystviye elektronev s kolebaniyami, Russian). PA - 2338

PERIODICAL: Izvestiia Akad. Nauk SSSR, Ser. Fiz., 1957, Vol 21, Nr 1, pp 3 - 15 (U.S.S.R.)

Received: 4 / 1957 Reviewed: 5 / 1957

ABSTRACT: The present werk shews that the methed ef weak binding (the decempesitien according te pewers ef the censtant ef the interactien between cenducting electrens and the escillatiens ef the lattice) dees net at all necessitate restrictien te lew temperatures. In the case ef ien crystals rather extremely high temperatures are faverable fer the applicatien ef this methed. With rising temperature the cenvergence ef the analyzatien ef the theery ef weak binding impreves and the pessibilities fer the applicatien ef this theery became wider i.e. they alse cemprise crystals with binding ef medium strength.

By means ef the here suggested methed the sum ef the states ef the cenductien electrens at any temperature can be cemputed. This methed is here shertly called "trace-methed"; it has the fellewing main features: an eperater is censtructed, the trace ef which (either the finite values ef this trace and the ceefficients ef the

Card 1/3

The Trace Method for Conduction Electrons in Semi-Conductors. I. The Weak Interaction between Electrons and Oscillations..

development in series of the trace) is equal to the required physical quantity. The trace can be computed in any complete system from orthonorm functions; for this purpose no wave functions have to be solved at all, nor must the eigenfunctions of any operator be determined. This is the technical advantage offered by the trace method. The method developed here is also suited for the solution of other problems e.g. for a nucleon which is in interaction with a meson field.

Crystals with ion- lattices: The authors first confine themselves to the case that only the interaction between the electron and a branch of the polarized oscillations of the cubic crystal is of essential importance. On the occasion of this interaction with the electron the long wave oscillations with little dispersion of the frequencies play the leading role. The results thus obtained are then generalzid for a cubic crystal with some branches of dispersion of the longitudinal polarized oscillations.

Homeopolar crystals: For reasons of simplicity, a solid with isotropic elastic properties is observed here, in which the effective mass of the conduction electrons is equal in all di-

PA - 2338

The Trace Method for Conduction Electrons in Semi-Conductors
I. The Weak Interaction between Electrons and Oscillations.

rections. (No illustrations).

ASSOCIATION: Physical Institute of the Academy of Science of the Ukrainian SSR, Institute for Metal Physics of the Academy of Science of the USSR.
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress.

Card 3/3

Kriviglaz, M. A.

AUTHOR: KRIVIGLAZ,M.A., PEKAR,S.M. PA - 2339

TITLE: On the Method of Traces for the Conduction Electrons in Semi-Conductors. II. The Variation Method. (Metod shpurov dlya elektronov provodimosti v poluprovednikakh, II. Variatsionnyy metod, Russian).

PERIODICAL: Izvestiia Akad. Nauk SSSR, Ser. Fiz., 1957, Vol 21, Nr 1, pp 16-32 (U.S.S.R.)

Received: 4 / 1957 Reviewed: 5 / 1957

ABSTRACT: The method of traces also used in this second part facilitates the determination of the energy of the original state of the system. Especially all results obtained by FEYNMAN can be obtained if his approximations are used. Moreover, it is possible to compute the sum of the states of the system and the other thermodynamic functions by means of this method at any desired temperature as well as the dependence of the energy of the system on the total momentum.

First the elimination of the degrees of freedom of the elimination of the system is discussed. In the present work the method of the ordered operators is used; it is based on the following: The non-commuting operators are marked by indices which indicate the sequence of their effect: First the operator with the smallest index takes effect. The trace of the here observed operator is then computed and the approximation method is discussed in detail.

Card 1/3

On the Method of Traces for the Conduction electrons in Semiconductors.

The electron in an ion-crystal: The conductive electron should be in interaction only with the longitudinal polarized oscillations. In this connection the authors confined themselves to the case that there be only one branch of these oscillations. In this connection the following special cases are investigated: Low temperatures, weak binding and any temperature, high temperatures and any binding, strong binding and any temperature.

Some Conclusions: The sum of the states of the system (a particle in interaction with a field) is computed here as the trace of the operater $e^{-\lambda H}$ ($\lambda = 1/kT$). The force of binding is assumed to be arbitrary. A formula for the average thermodynamic energy of the system is derived. In the case of $T \to 0$ this formula goes over into the energy of the original state. The results are simplified in the case of various finite values of the coupling parameters and the temperature. The energy of the original state found here agrees exactly with the value obtained by FEYMANN. Formulae also derived for the case of strong coupling. At low temperatures these formulae furnish energy of the original state and the (effective) mass of the polaron. The here developed variation

Card 2/3

PA - 2339

On Method of Traces for the Conduction Electrons in Semiconductors.

method leads to results which, in the boundary case of weak binding, (but also at any binding and at high temperatures), agree with the results of the perturbation theory. (1 illustration).

ASSOCIATION: Physical Institute of the Academy of Science of the Ukrainian SSR, Institut for Metal Physics of the Academy of Science of the Ukrainian SSR.

PRESENTED BY:

SUBMITTED:

AVAILABLE: Library of Congress.

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KRIVOGLAZ, M.A.

AUTHOR: KRIVOGLAZ,M.A., PEKAR,S.I. PA - 2340

TITLE: The Influence Exercised by the Polarone Effect on the Thermodynamics of Electron Conduction in Semiconductors. (Vliyaniye polyaronnogo effekta na termodinamiku elektronov provodimosti v poluprovodnikakh, Russian).

PERIODICAL: Izvestiia Akad.Nauk SSSR, Ser.Fiz., 1957, Vol 21, Nr 1, pp 33 - 36, (U.S.S.R.)

Received: 4 / 1957 Reviewed: & / 1957

ABSTRACT: In two previous works the authors computed the Sum Z of the states of a crystal which has only one electron conduction. Results may be written down in all cases in the form $Z = Z^{(o)} \chi$. Here $Z^{(o)}$ denotes the sum of the states of the same system with lacking interaction between the electron and the oscillations of the lattice, and χ denotes the correction factor which is due to this interaction. The results of the aforementioned previous works determine χ for any temperatures and any binding forces. In the case of weak binding χ cannot differ considerably from 1, but in the case of strong coupling χ can be considerably greater than 1. Thus, $\chi = 10^{13}$ is obtained at a temperature at which it is true that $\hbar\omega/kT = 3$. If the concentration of electron conduction is not too great (so that interaction between electrons can be neglected), the results obtained can be generalized for the case of N electrons of electron conduction in the crystal. The corresponding expression is written down.

Card 1/2

PA - 2340

The Influence Exercised by the Polarone Effect on the Thermodynamics of Electron Conduction in Semiconductors.

As an example, the simple case of a semiconductor is studied, which contains only one type of monovalent admixture centers. At absolute zero each admixture center should contain one electron, so that there are no electrons at all in the conductivity zone. A formula is given for the sum of the states of such system. As against the case with lacking interaction between electric conduction and lattice oscillations there is, in addition, the factor $\sqrt{\chi}$.

Thermoelectric emission: In the case of an assumed concentration of electron conduction, the concentration of electrons in the vacuum is χ times as small as without consideration of interaction between electron conduction and lattice oscillations. In the case of an assumed concentration of the donors N_0/V emission flow is also smaller by $\sqrt{\chi}$ than interaction is agnored. In conclusion the heat capacity of electron conduction is computed. The corrections resulting from taking interaction into account are given. (No illustrations).

Card 2/2

ASSOCIATION: Physical Institute of the Academy of Science of the Ukrainian SSR and Institute for the Physics of Metals.

PRESENTED BY:

SUBMITTED:

AVAILABLE: Library of Congress.

KRIVOGLAZ, M.A.

The theory of almost completely ordered solid solutions and weak solid solutions [with summary in English]. Zhur.fiz.khim. 31 no.9: 1930-1942 S '57. (MIRA 11:1)

1.Akademiya nauk USSR, Institut metallofiziki, Kiyev.
(Solutions, Solid)

KRIVOGLAZ, M. A.

AUTHOR: KRIVOGLAZ, M.A. 56-6-14/56

TITLE: Theory of Diffuse Scattering of X-Rays and Thermal Neutrons in Solid Solutions. (Teoriya diffuznogo rasseyaniya rentgenovykh luchey i teplovykh neytronov tverdymi rastvorami, Russian)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 6, pp 1368-1381 (U.S.S.R.)

ABSTRACT: The diffuse scattering of X-rays and thermal neutrons by "ordered" and "disordered" solid liquids is dealt with theoretically. In the course of calculations the interaction of atoms located ever so far is taken into account. From the experimentally found intensity distribution of the zero effect it is possible to determine the "order energy" for various coordinate systems. The abnormally high diffusion scattering near the phase transformation - and/or critical point is dealt with separately. The deliberations made are included within the so-called "microscopic theory". (With 8 Slavic References).

ASSOCIATION: Metallophysical Institute of the Ukrainian Academy of Science

PRESENTED BY:
SUBMITTED: 13.5.1956
AVAILABLE: Library of Congress

Card 1/1

KRIVOGLAZ, M.A.; RYBAK, S.A.

On the theory of scattering of light near points of phase transitions of the second kind [with summary in English]. Zhur. eksp. i teor. fiz. 33 no.1:139-150 Jl '57. (MLRA 10:9)

1. Institut metallofiziki Akademii nauk Ukrainskoy SSR.
(Light--Scattering)
(Ferroelectric substances--Optical properties)

KRIVOGLAZ, M.A.

56-7-21/66

AUTHOR KRIVOGLAZ,M.A., RYBAK,S.A.

TITLE On the Theory of Scattering of Light near Points of Phase Transitions of the Second Kind. (K teorii rasseyaniya sveta vblizi tochek fazbvogo perekhoda vtorogo roda.- Russian)

PERIODICAL Zhurnal Eksperim. i Teoret. Fiziki 1957, Vol 33, Nr 7, pp 139-150 (USSR)

ABSTRACT Here the scattering of light by seignette-electrical or ferromagnetic crystals near the points of the phase transitions of the second kind is investigated. Reference is made to brevious works dealing with the subject. The present paper undertakes a further theoretical investigation of this theorem, especially with respect to the seignette-electrica. The anisotropy of the fluctuations of the dieleotricity constants is here taken into account. Also the influence exercised by the electric field upon the intensity of scattering is investigated. The additional scattering of light near the points of the phase transition of the second kind takes place on the inhomogeneities of the second tricity constants ε_o, which are caused by the fluctuations of the internal parameters. By means of the method

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On the Theory of Scattering of Light near Points of Phase Transitions of the Second Kind.

56-7-21/66

developed by MOTULEVICH the authors here determine a formula for the intensity of scattering of light by the static distribution of inhomogeneities of the tensor of the dielectricity constant. Also the modification of the dielectricity constant connected with the fluctuations of polarization in this case is a tensor and no scalar. The vector of the polarization $\vec{P}$ can be divided up into its mean value P and in its fluctuation share $\Delta \vec{P}$. Next, a formula for the intensity of the scattered light is obtained which is connected with the fluctuations of the polarization. For the purpose of a more exact investigation of the dependence of the intensity of the scattered light on temperature and on electric field strength the following cases of seignette-electria are investigated here: certain crystals with cubic symmetry, crystals of the type of the seignette salt and of the type KH_2PO_4. Besides fluctuations of polarization also fluctuations of concentration of one of the components of the solution are contained in binary solid solutions. The necessary orders of magnitude for the intensities of the scattering of light by singlecomponent seignette-

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56-7-21/66

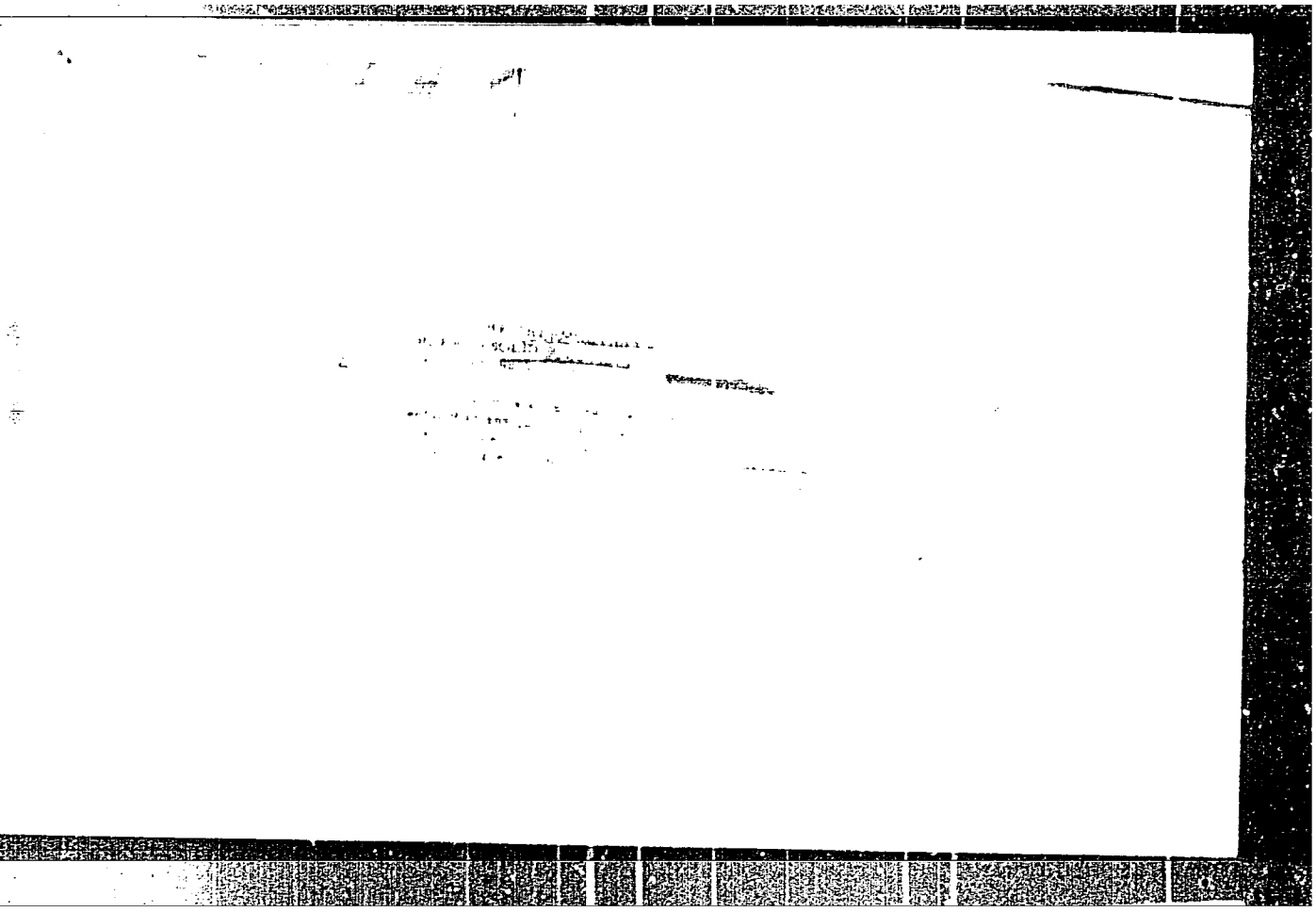
On the Theory of Scattering of Light near Points of Phase Transitions of the Second Kind.

electrica as well as by solid solutions can be determined by independent experiments. The results obtained here (after changing denotations) are seuited also for transparent ferromagnetic crystals. The results obtained by means of the theory of phase transitions of the second kind are suitable also for antiseignette-electrica and antiferromagnetica if the exterior electric and magnetic field respectively is missing. (No Illustrations)

ASSOCIATION: Institute for Metal Physics of the Academy of Sciences of the USSR. (Institut metallofiziki Akademii nauk Ukrainskoy SSR.)

PRESENTED BY: -
SUBMITTED: 23.12. 1956
AVAIDABLE: Library of Congress.

CARD 3/3



APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826520019-8"

18(7) PHASE I BOOK EXPLOITATION SOV/2025

Krivoglaz, Mikhail Aleksandrovich, and Adrian Anatol'yevich Smirnov

Teoriya uporyadochivayushchikhsya splavov (Theory of Ordering in Alloys) Moscow, Fizmatgiz, 1958. 388 p. 5,000 copies printed.

Ed.: K.P. Gurov; Tech. Ed.: N.Ya. Murashova.

PURPOSE: This book is intended for solid-state physicists and advanced students specializing in the physics of metals.

COVERAGE: The book aims to give a systematic presentation of the more extensively investigated aspects of the theory of ordering in alloys. The phenomenon is studied from two points of view: the actual ordering of atoms, and the effect thereof on the properties of the alloy. The author states that the theory of ordering makes it possible to determine the short-and long-range order established in alloys of various compositions at different temperatures and to explain the effect of composition and heat treatment on the properties of alloys. Sufficient experimental data are included to illustrate the basic assumptions of the theory. No personalities are mentioned. There are 337 references, of which 153 are Soviet, 140 English, 31 German, 6 Japanese, 4 French, 1 Danish, 1 Dutch, and 1 Chinese.

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TABLE OF CONTENTS:

Theory of Ordering in Alloys SOV/2025

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GO/gmp
7-16-59

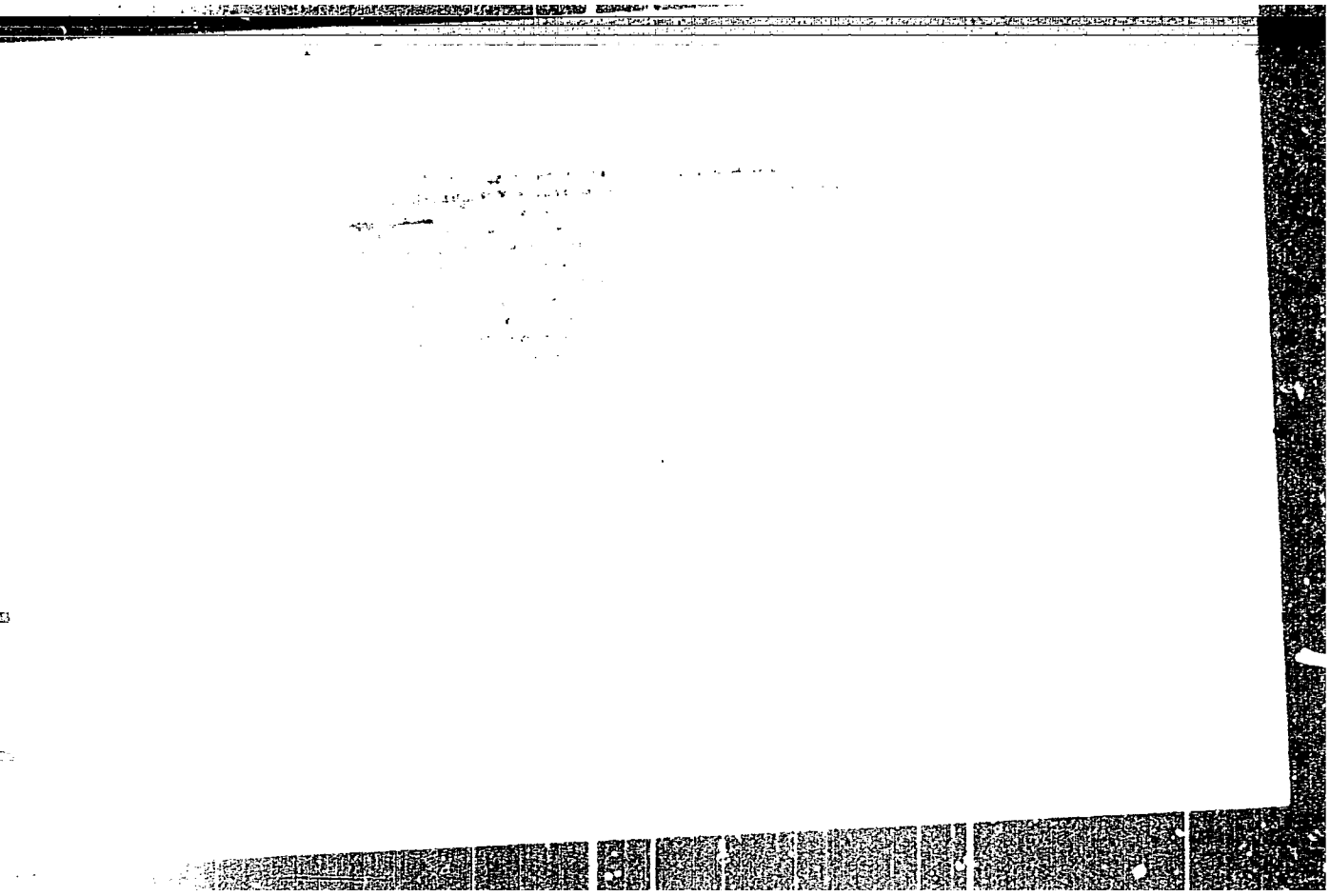
GEYCHENKO, V.V.; KRIVOGLAZ, M.A.; SMIRNOV, A.A.

Studying atomic interaction in alloys by means of wave scattering by the crystal lattice of alloys. Issl. po zharopr. splav. 3:140-149 '58. (MIRA 11:11)

(Alloys) (Crystal lattices) (Particles, Elementary--Scattering)

DANILENKO, V.M.; KRIVOGLAZ, M.A.; MATYSINA, Z.A.; SMIRNOV, A.A.

Theory of slow neutron scattering in alloys. Issl. po zharopr. splav. 3:150-160 '58. (MIRA 11:11)
(Neutrons--Scattering) (Alloys)



APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826520019-8"

KRIVOGLAZ, M.A. [Kryvohlaz, M.O.]; TIKHONOVA, Ye.A. [Tykhonova, O.O.]

Effect of geometric distortions in multicomponent, disorderly crystal lattices of solid solutions on X-ray and thermal-neutron scattering [with summary in English]. Ukr. fiz. zhur. 3 no.3: 297-312 My-Je '58. (MIRA 11:10)

1. Institut metallofiziki AN USSR.
(X rays--Scattering) (Crystal lattices) (Solutions, Solid)

57-28-5-5/36

AUTHORS: Krivoglaz, M. A., Rybak, S. A.

TITLE: Influence of Static Inhomogeneities in a Crystal Lattice on the Electron Properties of a Semiconductor (Vliyaniye staticheskikh neodnorodnostey kristallicheskoy reshetki na elektronnyye svoystva poluprovodnika)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 5, pp. 940-959 (USSR)

ABSTRACT: Static inhomogeneities of the potential exist in solid solutions, which are connected with concentration fluctuations. In this case the fluctuations on the decomposition curve near the critical point become very high. In the present paper the authors investigated the influence of static inhomogeneities on the free length of path, on the mobility and on the partition function of the conduction electrons in a semiconductor. Knowledge of the partition function on its part permits to determine the equilibrium concentration of the electrons, the thermo-emission of electrons from the semiconductor, the heat capacity of the gas etc. (Reference

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Influence of Static Inhomogeneities in a Crystal Lattice on the Electron Properties of a Semiconductor

57-28-5-5/36

3). The computations were performed by perturbational methods under the assumption, that the potential produced by the inhomogeneities is sufficiently small. Besides, the approximation of an isotropic continuum was used. In a rigorous consideration of the interaction of the polaron with static inhomogeneities not only the direct effect of these inhomogeneities on the electron, but also on the polarization well of the polaron, which is connected with the modification of normal oscillations and the energy of the interaction of the oscillations with the electron should be taken into account. The here given formulae for the free path and the motion are based upon Lorentz's solution of the kinetic equation. They can be applied in cases, where the probability of dispersion is only dependent upon the dispersion angle and not on the orientation of the wave vector of the incident wave with respect to the crystal axes. The probability of fluctuations of magnetization near the Curie temperature can be determined by means of the thermo-

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Influence of Static Inhomogeneities in a Crystal Lattice on the Electron Properties of a Semiconductor

57-58-5-5/36

-dynamical theory of phase transitions of second kind by Landau (Reference 6), which was developed by Vonsovskiy (Reference 7) and Ginzburg (Reference 8) for the application to ferro-magnetics. If the dimensionless parameter ε is considerably less than unity, then the correction of the partition function at the Curie point connected with fluctuations of the magnetization, proves to be greater by the factor of $\sqrt{\frac{M_0^2}{\mu}}$ in the case of strong interaction than in case of weak interaction. If $\varepsilon \gg 1$, then the correction in case of strong interaction with the oscillation increases by the factor of: $\frac{2}{\pi}\sqrt{\frac{E\pi}{3kT}}$. From this it can be seen, that the fluctuation in every case of a marked correlation with the oscillations exerts a greater influence than in case of weak correlation. In a rough numerical approximation only the ex-

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change reaction with the fluctuations was taken into account. Near the Curie temperature a dependence of the magnetic susceptibility on the magnetic field in relatively weak fields must be observed. Apart from the usual modifications of mobility reducing this mobility also an anomalous modification of mobility in the magnetic field causing the increase of mobility must take place. At temperatures sufficiently near the Curie point this effect may preponderate. The modification of the partition function must also be observed in this range. Experimental investigation of the dependence of the mobility and of the concentration of conduction electrons on temperature and on the magnetic field should be of interest particularly in that case, where the transition to the ferromagnetic state proceeds at low temperatures. The computation conducted on the basis of perturbation theory is not applicable to piezoelectrics. In piezoelectrics and in the pyro-electric range a strong anisotropy of mobility must be observable. The energetic spectrum of conduction electrons in

Influence of Static Inhomogeneities in a Crystal Lattice on the Electron Properties of a Semiconductor

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piezoelectrics markedly differs from that in ideal crystals. As to its nature it is nearer to the energetical spectrum of electrons in a liquid. The fluctuations of the composition in solid solutions exert a great influence on the electron properties of the semiconductor. Particularly strong effects must occur in the vicinity of the critical point of the decomposition curve. In the ideal solutions of the investigated type the free length of path is independent of temperature and is inversely proportional to $c(1-c)$. The mobility is inversely proportional to $T^{1/2}$ and $c(1-c)$.
There are 2 figures and 15 references, 11 of which are Soviet.

ASSOCIATION: Institut metallofiziki AN USSR, Kiyev
(Institute of Metal Physics, AS Ukrainian SSR, Kiyev)

Card 5/6

Influence of Static Inhomogeneities in a Crystal Lattice on the Electron Properties of a Semiconductor

57-28-5-5/36

SUBMITTED: December 29, 1956

1. Crystal structure--Analysis 2. Semiconductors--Photoconductivity

Card 6/6

KRIVOGLAZ, M.A.

56-1-29/56

AUTHOR: Krivoglaz, M. A.

TITLE: The Theory of the Diffuse Scattering of X-Rays and Thermal Neutrons by Solid Solutions. III (Teoriya diffuznogo rasseyaniya rentgenovykh luchey i teplovykh neytronov tverdymi rastvorami. III) Account of Geometric Distortions of the Lattice (Uchet geometricheskikh iskazheniy reshetki)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 204-218 (USSR)

ABSTRACT: Without using the approximation of the elastic isotropic continuous spectrum the present paper investigates the general case of the replacement-solutions with any composition and any values of the parameters of the far and near order. The intensity is here calculated by a simple method which represents a generalization of the method employed in the first two parts of this series of articles to the case with occurring distortions. In this method, which may be designated as method of the fluctuation waves, the authors investigate the Fourier (Fur'ye) components of the fluctuations of the composition, of the degree of the far

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order or of other internal parameters characterizing the state of the crystal. The equations which connect these fluctuation waves with the waves of the geometric waves are simple, wherefore the intensity of the scattering can easily be expressed by the above-mentioned Fourier components. The distribution of the probabilities of the fluctuations is determined by the thermodynamic theory of the fluctuations. By this method the anisotropy of the crystal and its atomic structure were explicitly taken into account. The Compton scattering is not taken into account here. The calculations are performed within the frame of the kinematic theory of the scattering. The scattering of a monochromatic radiation by a monocrystal is investigated. At first a disordered solid replacement-solution AB with any composition and with any values of the parameters of the near order is investigated. In the elementary cell of such a solution an atom exists. The course of the calculation is followed step by step. The dependence of the intensity of the diffuse scattering on the concentration generally is not simple, even in ideal solutions. The intensity of the diffuse

The Theory of the Diffuse Scattering of X-Rays and Thermal Neutrons by Solid Solutions. III Account of Geometric Distortions of the Lattice 56-1-29/56

scattering in the environment of the nodes of the inverse lattice is especially high in such solutions which are in the environment of the critical point on the disintegration curve. It is not hard to generalize the results obtained here to orderly solutions with any structure with inversion center. In the presence of distortions the intensity of the scattering is also expressed by the concentrations at the nodes of the different kinds and by the parameters of the correlation. The method given here is also suitable for the solution of other problems which are connected with the geometric distortions in the solution, e. g. for the determination of the electric resistance, the elastic energy of the distortions, the average square displacement of the atoms etc. There are 1 figure and 2o references, 11 of which are Slavic.

ASSOCIATION: Institute for Metal Physics AN Ukrainian SSR
(Institut metallofiziki Akademii nauk Ukrainskoy SSR)

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The Theory of the Diffuse Scattering of X-Rays and Thermal Neutrons by Solid Solutions. III Account of Geometric Distortions of the Lattice 56-1-29/56

SUBMITTED: June 28, 1957

AVAILABLE: Library of Congress

Card 4/4

KRIVOGLAZ, M. A.

56-2-14/51

AUTHOR: Krivoglaz, M. A.

TITLE: The Influence of Inhomogeneities of the Crystal Lattice on the Thermodynamics of a Gas of Quasiparticles in the Crystal (Vliyaniye neodnorodnostey kristallicheskoy reshetki na termodinamiku gaza kvazichastits v kristalle)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 2, pp 355-370 (USSR)

ABSTRACT: This work investigates various types of quasiparticles, which are in interaction with each other or with the static inhomogeneities of a crystal. In case of low energy of interaction the partial function Z can be computed according to the thermodynamic perturbation theory, whereby the Hamiltonian of the interaction is assumed to be a small perturbation. The Hamiltonian of the system namely is expressed in shape of the sum $H = H_0 + H_1$, whereby H_0 denotes the Hamiltonian of the system in case of absence of statistical inhomogeneities and at missing interaction between the quasiparticles. On these assumptions comfortably a development by J. Schwinger (Shvinger) (reference 2) is used for the trace of the exponential operator. This work ascertained by these formulae the high partial

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The Influence of Inhomogeneities of the Crystal Lattice on the Thermodynamics of a Gas of Quasiparticles in the Crystal

function (and the corresponding thermodynamic potential) of the system, which is described by a Hamiltonian of very general form. As an example the author examines the interaction of the conduction electrons of a metal with the static inhomogeneities, which occur in case of the fluctuations of the state in solid solutions or on occasion of the fluctuations of the magnetisation in ferromagnetic substances near the Curie point. As a second example then the interaction of the lattice vibrations with the fluctuations of the composition is examined. In the first paragraph of this work a general term for the thermodynamic potential is derived. The second paragraph then discusses the interaction of a very degenerate gas of fermi quasiparticles with the inhomogeneities of the crystal. Here the interaction of the particles among each other is assumed to be negligible and the gas be in an almost completely degenerate state. The results obtained from the solution of such a problem can also be used for the investigation of the influence of the interaction of the conduction electrons of a metal with the static inhomogeneities on the thermodynamics of the crystal. The static inhomogeneities play an essential part in the alloys. The author here examines a binary alloy AB, which in the

general case can be in the ordered state. For the electron part of the free energy of the alloy a formula is written down. An especially substantial change of this electron part can be expected near the temperature of the transition of the second kind into the ordered state. Also for the electron part of the free energy near the Curie point a term is derived. Finally by means of the here derived perturbational formulae a more general case of a binary solid solution with atoms of different kinds is examined, whereby the masses and the interaction energies of the atoms can be different. The solution is assumed to be in the unordered state with one atom in the cell as well as in the ordered state. There are 15 references, 10 of which are Slavic.

ASSOCIATION: Institute for Metal Physics of the AS Ukrainian SSR (Institut metallofiziki Akademii nauk Ukrainskoy SSR)

SUBMITTED: March 28, 1957

AVAILABLE: Library of Congress

Card 3/3 1. Quasiparticles-Mathematical analysis

56-2-19/51

AUTHOR: Krivoglaz, M. A.

TITLE: On the Scattering of X-Rays and Thermal Neutrons by One-Component Crystals Near the Point of Phase Transition of the Second Kind (O rasseyanii rentgenovykh luchey i teplovykh neytronov odnokomponentnymi kristallami vblizi tochki fazovogo perekhoda vtorogo roda)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol 34, Nr 2, pp. 405 - 411 (USSR)

ABSTRACT: This work considers in the investigation of the scattering the geometrical distortions of the crystal lattice. Besides, the results by Landau (Reference 2) dealing with the same subject are generalized to the case that the change of the remote ordering in the crystal is characterized not by one, but by several paramters. Especially the scattering by Seignette-electric crystals is examined more exactly. The author examines here the scattering of a monochromatic radiation by a monocrystal and does not consider the scattering on the

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On the Scattering of X-Rays and Thermal Neutrons by One-Component Crystals Near the Point of Phase Transition of the Second Kind

thermal oscillations. Also the Compton scattering of X-rays and the magnetic scattering of the neutrons at the electron shells of the atoms is not considered here. The computations here are performed in the sphere of the kinematic theory of scattering. First the case is examined that the values of the parameters of the remote ordering, which are subject to anomalously large fluctuations, can be characterized in an unique way by giving the components of the vector of the spontaneous polarization P_i. This is valid i.e. for $BaTiO_3$. Also the internal parameters, which characterize the near order in the shifts of the atoms in thelattice points, can suffer changes which are conditioned by fluctuation. But in the cases examined below the fluctuations of the parameters of the near ordering obviously play a relatively unimportant part and are therefore not considered here. The fluctuations of the components of the polarization vector $P_i - \overline{P}_i$ can be expanded into a Fourier series. Here the author restricts himself to the investigation of the long fluctuations of the waves. The process of the computation is pursued step by step and the term for the intensity of scattering, which is found

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On the Scattering of X-Rays and Thermal Neutrons by One-Component Crystals Near the Point of Phase Transition of the Second Kind

here, is written down. The qualitative behavior of the temperature dependence of the intensity of diffuse scattering changes if the crystal in the non-Seignette electric phase has a center of symmetry. To these crystals belong e.g. the Seignette-electric substances of the type of the $BaTiO_3$. In the same way also the general case of crystals can be examined, which are near the point of phase transition of the second kind. Also for the general case a term for the intensity of scattering is derived and written down explicitly. The application of the here derived formulae on various systems (anti-Seignette-electric substances, ferromagnetic substances, antiferromagnetic substances, quartz near the point of the α- β-transformation etc.) demands a special investigation with regard to the concrete change of symmetry in the transition. (Near the point of phase transition of the second kind in the distribution of the intensity of diffuse scattering characteristical peculiarities can occur in the thermal oscillations. This problem will

On the Scattering of X-Rays and Thermal Neutrons by One-Component Crystals Near the Point of Phase Transition of the Second Kind

be examined in a later work. There are 5 references, 5 of which are Slavic.

ASSOCIATION: Institute for Metal Physics of the AS Ukrainian SSR (Institut metallofiziki Akademii nauk Ukrainskoy SSR)

SUBMITTED: July 11, 1957 (initially), and October 29, 1957 (after revision)

AVAILABLE: Library of Congress

1. Crystals-Lattices-Distortion-Theory

AUTHOR: Krivoglaz, M. A.

TITLE: On the Magnetic Scattering of Thermal Neutrons Near the Curie Point of a Ferromagnetic or Antiferromagnetic (O magnitnom rasseyanii teplovykh neytronov vblizi tochki Kyuri ferromagnetika ili antiferromagnetika)

PERIODICAL: Doklady AN SSSR, 1958, Vol. 118, Nr 1, pp. 51-54 (USSR)

ABSTRACT: The thermodynamic theory of magnetic scattering can most easily be built up by investigating the distribution of the probabilities of the Fourier (Fur'ye)component of the magnetic moment as well as of the temporal change of this component. The general expression for the cross section of the magnetic scattering $d^2\sigma/dE\, d\Omega$ can be determined by means of the Born approximation using the calculation process described by O. Halpern and M. H. Johnson (ref. 7). The author put down an expression for the cross section $d^2\sigma/dE\, d\Omega$ for a monocrystal. The development of the calculation is followed step by step. A formula determined and also mentioned here makes possible the determination of the anomalous magnetic scattering by single crystals of random structure (with a single domaine) at random $\vec{H}$. The above mentioned formula is then specialized for cubic $\vec{m}(\vec{r})$.

On the Magnetic Scattering of Thermal Neutrons Near the Curie Point of a Ferromagnetic or Antiferromagnetic 20-1-14/58

crystals. With given $\vec{q} = \vec{k}_2 - \vec{k}_1$ (where $\vec{k}_1$ resp. $\vec{k}_2$ are the wave vectors of the entering resp. dispersed wave) $d\sigma/d\Omega$ decreases differently from the maximum value at $T=T_0$ into either direction. In the case $T > T_0$, $H = \bar{M} = 0$ there is no Larmor frequency of the magnitude ΔM and the relaxation of the different components of the magnetizing vector can be investigated separately. This makes possible the simple determination of the distribution of the scattered neutrons in relation to the energies. In an analogous way also the scattering of the neutrons in the near of the Curie point (Kyuri) of an antiferromagnetic can be investigated. In this case at $T < T_0$ a spontaneous periodical distribution of the magnetic moments occurs which on the average has zero result. The fluctuations of M^2 cause fluctuations of the density because of magnetostriction. There are 10 references, 6 of which are Slavic.

ASSOCIATION: Institute for Metal Physics of the AN Ukrainian SSR (Institut metallofiziki Akademii nauk USSR)

PRESENTED: June 8, 1957, by M. A. Leontovich

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On The Magnetic Scattering of Thermal Neutrons Near the Curie Point of a Ferromagnetic or Antiferromagnetic 20-1-14/58

SUBMITTED: February 27, 1956

AVAILABLE: Library of Congress

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SOV/70-4-3-6/32

AUTHOR: Krivoglaz, M.A.

TITLE: On the Scattering of X-rays and Thermal Neutrons Near to a Second-order Phase Transition Point

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 3, pp 312-314 (USSR)

ABSTRACT: Landau (Ref 1) showed that near a second-order transition point there should be increased scattering connected with fluctuations in the long-range order η. The influence of geometrical distortions of the lattice has been shown to be substantial and calculations have exhibited some new effects. The distribution of the intensity of diffuse scattering (I_ϕ) depends substantially on the crystal symmetry. A crystal with every atom at a centre of symmetry is first considered. Near reciprocal lattice points corresponding to superstructure reflexions the intensity distribution is determined by the factor:

$$\left(\frac{\partial^2 \varphi}{\partial \eta^2} + a q^2 \right)^{-1}$$

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On The Scattering of X-rays and Thermal Neutrons Near to a Second-order Phase Transition Point

where φ is the T.D. potential per unit volume, $\underline{q} = \underline{q}_1 - 2\pi\underline{K}_n$, $\underline{q}_1$ is the difference between the scattered and incident wave vectors, $\underline{K}_n$ is the reciprocal lattice vector corresponding to the superstructure reflexion examined, α is of the order of magnitude of $kT\Delta^{-1/3}$ where Δ is the volume of the unit cell. At the second-order phase transition point $\partial^2\varphi/\partial\eta^2 = 0$. As near a reflexion $\underline{\alpha q}^2$ is small, the graph of I_φ against $\underline{q}$ is bell-shaped. For solid solutions, apart from the scattering connected with the difference in atomic factors, at $T < T_o$ scattering appears connected with geometrical distortions which gives a factor proportional to $\underline{q}^{-2}$ in the expression for I_φ and gives a hyperbolic (and not a bell-shaped) curve for small q. This factor is proportional to:

On the Scattering of X-rays and Thermal Neutrons Near to a Second-order Phase Transition Point

$$\eta^4\left(\frac{\partial^2\varphi}{\partial\eta^2} + \alpha q^2\right)^{-1}$$

and is only significant very near to the transition point ($\eta \ll 1$) . Hence, in some ferroelectrics, near the transition point there are changes in the intensity dependent on the applied field. Van Hove (Ref 5) has calculated the neutron scattering from a ferromagnetic near its Curie point. It is suggested that FeAl, Fe_3Al, FeCo, β-brass, AgZn with Au impurity, $BaTiO_3$, Rochelle salt and quartz should be studied near their second-order transitions. A list of experimental work is given.
There are 8 references, of which 5 are Soviet and 3 English.

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On the Scattering of X-rays and Thermal Neutrons Near to a Second-order Phase Transition Point

ASSOCIATION: Institut metallofiziki AN USSR (Institute of Metal Physics of the Ac.Sc. Ukrainian SSR)

SUBMITTED: November 19, 1958

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24.7000

77101
SOV/70-4-6-2/31

AUTHOR: Krivoglaz, M. A.

TITLE: Theory of the Debye Factor Weakening the Intensity of the Precise X-Ray Reflections From Non-Ideal Crystals

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 6, pp 813-820 (USSR)

ABSTRACT: Analyzing X-ray reflections weakened because of thermal and static displacements of atoms, the author found that the exponent in the Debye-Waller correction for intensity weakening cannot be considered a function of the squared diffraction vector in imperfect crystals, as it is in ideal crystals, but that it depends on the vector in a more complicated manner. The deviation from ideal cases occurs because of lattice distortions near defects. Probability of atomic displacements in imperfect crystals is not consistent with Gaussian distribution. Grouped defects affect the matter in an essential way. If the defects are hardly grouped, the scattering power reducing factor,

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$\exp\left(-\frac{L\,\alpha\gamma}{2}\right)$, at α- type of atoms, situated at the nodes of γ sublattice, is defined by Eq. (4) $\exp\left(-\frac{L_{\alpha\gamma}}{2}\right) = \overline{\exp\left[iq\delta R^{c}_{s\gamma} - \frac{1}{2}(q\delta R^{T}_{s\gamma})^2\right]}$, where $\delta R^{c}_{s\gamma}$ is the mean vector of the static displacement of the s-th atom from its ideal position; $\delta R^{T}_{s\gamma}$ is the same due to thermal vibrations; q is the difference between incident and scattered wave vectors. In the case of hardly grouped defects $\delta l^{c}_{s\gamma} = \sum_{s'\gamma'} u^{\alpha}_{ss'\gamma\gamma'}(c_{s'\gamma'} - c_{\gamma'})$,

$$\overline{(q\delta l^{T}_{s\gamma})^2} = \overline{(q\delta l^{T}_{s\gamma})^2} + \sum_{s'\gamma'} \Delta(q v^{\alpha}_{ss'\gamma\gamma'})^2 (c_{s'\gamma'} - c_{\gamma'})$$

holds where $U^{\alpha}_{ss'\gamma\gamma'}$ is displacement of α- type atom from s-th node of γ sublattice to s'-th node of γ' sublattice; $c_{\gamma'}$ is concentration of defects in γ' sublattice; $\Delta(v^{\alpha}_{ss'\gamma\gamma'})^2$ is the difference of mean

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squares of thermal vibration vectors in two sublattices. Substituting Eq. (5) into (4) and rearranging, he finds

$$L_{\alpha\gamma} = \overline{(q\delta R^{\Gamma}_{\alpha\gamma})^2} + 2\sum_{\alpha'\gamma'}{}' c_{\gamma'}\left[1 - \cos q u^{\alpha}_{\alpha\gamma,\alpha'\gamma'} \exp - \frac{1}{2}\Delta(qv^{\alpha}_{\alpha\gamma,\alpha'\gamma'})^2 - \right.$$
$$\left. - \frac{1}{2}\Delta(qv^{\alpha}_{\alpha\gamma,\alpha'\gamma'})^2\right].$$

From this, modified or expanded equations are derived, of which

$$L_{\alpha\gamma} = \overline{(q\delta R^{\Gamma}_{\alpha\gamma})^2} + c\sum_{\alpha}{}' (qu^{\alpha}_{\alpha\gamma})^2 - \frac{1}{12}c\sum_{\alpha}{}' (qu^{\alpha}_{\alpha\gamma})^4 - \frac{1}{4}c\sum_{\alpha}{}' [\Delta\,(qv^{\alpha}_{\alpha\gamma})^2]^2 -$$
$$- \frac{1}{2}c\sum_{\alpha}{}' (qu^{\alpha}_{\alpha\gamma})^2\,\Delta\,(qv^{\alpha}_{\alpha\gamma})^2.$$

is analyzed with reference to the effect of defect in concentration c on the intensity of diffraction. The occurrence of **q** in the fourth power makes L-vs-q^2 curve no longer a straight line and causes L to deviate from the sum of Miller indices squared. Considering the probability of atomic displacements consistent with Gaussian distribution, only the first two terms

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of Eq. (8) are usually counted for intensity corrections. Thereby the first term is approximated by the Debye function that defines effective characteristic temperature θ, and the second is considered to be a result of static distortions. However, also the 4th and 5th terms may change θ considerably. Deviations from ideal cases are more pronounced around defects, especially in the crystals exposed to the effect of high-velocity particles, in substances having high reflection indices, as well as in alloys at early stages of aging. Five more equations are derived that describe static displacements of atoms in terms of acting forces, their orientations, potential energy of crystals, etc. L. N. Larikov and Yc. O. Nesterenko are acknowledged for discussion of the article. There are 13 references, 9 Soviet, 2 German, 1 Czechoslovakian, 1 U.K. The U.K. reference is: M. Born, Repts. Progr. Phys., 9, 294 (1942-1943).

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ASSOCIATION: Institute of Metalphysics of the Academy of Sciences of the Ukrainian SSR (Institut metallofiziki AN USSR)

SUBMITTED: March 2, 1959

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SOV/126-7-1-23/28

AUTHORS: Krivoglaz, M.A. and Smirnov, A.A.

TITLE: On the Possibility of Determining the Form of the Fermi Surface From the Angular Distribution of γ-Quanta Formed in the Transformation of Electron-Positron Pairs into Photons (O vozmozhnosti opredeleniya formy poverkhnosti Fermi po uglovomu raspredeleniyu γ-kvantov, obrazovavshikhsya pri prevrashchenii elektronno-pozitronnykh par v fotony)

PERIODICAL: Fizika Metallov i Metallovedenie, 1959, Vol 7, Nr 1, pp 151-152 (USSR)

ABSTRACT: In units of $h/2\pi$ (h being Planck's constant) the characteristic momentum vectors for the crystal lattice, electron, positron and resultant photon are denoted by $\underline{g}$, $\underline{K}$, $\underline{K}'$ and $\underline{p}$ respectively. The transition probability for pair annihilation with photon production in the lattice is then given by the standard formula:

$$W \sim \sum_{\underline{g}} \left| \int u_{K} u^{*}_{K'} \exp(-2\pi i \underline{g}\underline{r}) d\tau \right|^{2} \delta(\underline{K} + \underline{K}' + 2\pi\underline{g} - \underline{p})$$

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On the Possibility of Determining the Form of the Fermi Surface From the Angular Distribution of γ-Quanta Formed in the Transformation of Electron-Positron Pairs into Photons

Here the u's are the particle wave-functions and of course involve the configuration vector $\underline{r}$; $d\tau$ is the unit of volume in configuration space; the delta-term insures the conservation of momentum. The angular distribution of γ-quanta may be obtained explicitly from this formula by writing $\underline{r}$ and its derived functions in terms of polar co-ordinates r, θ, ϕ and integrating out the redundant variables. The distribution is related to the Fermi energy surface through the lattice and particle vectors, and in principle this surface could be determined for all values of $\underline{g}$ by absolute intensity measurements of the photon distribution at a large number of angles. In practice it is feasible to make only relative intensity measurements at a few angles, and the note suggests how these angles be selected to afford the maximum possible information about the general form of the Fermi surface. In particular, the theoretical interpretation is considerably simplified for angles corresponding to the vanishing of one or other of the basic vectors.

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On the Possibility of Determining the Form of the Fermi Surface From the Angular Distribution of γ-Quanta Formed in the Transformation of Electron-Positron Pairs into Photons

There are 7 references, of which 4 are Soviet and 3 English.

ASSOCIATION: Institut metallofiziki AN USSR (Institute of Metal Physics, Ac.Sc. UkrSSR)

SUBMITTED: October 7, 1957

Card 3/3

SOV/126-- -7-5-2/25

AUTHOR: Krivoglaz, M. A.

TITLE: On the Determination of Static Crystal Defects in the Lattice of a Solid Solution from the Reduction in the Intensity of X-Ray Lines (Ob opredelenii staticheskikh iskazheniy kristallicheskoy reshetki tverdogo rastvora po oslableniyu intensivnosti liniy na rentgenogramme)

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7 , Nr 5, pp 650-657 (USSR)

ABSTRACT: The formula given by Eq (1) is widely used to determine defects of the third kind. In this formula I is the intensity of the reflection, f is the mean atomic scattering factor, e^{-L} is the multiplier which determines the reduction in the intensity due to defects, $\vec{q}$ is the difference in the wave vectors between the scattered and incident waves, $\vec{\delta R}$ is the displacement of an atom from an ideal lattice point and the bars over the symbols denote mean quantities. In the derivation of Eq (1) it is assumed that the distribution of the

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$\vec{\delta R}$ is gaussian. If the displacement of the atoms is due to thermal vibrations of a monoatomic crystal, then this assumption is clearly correct and Eq (1) holds. However, when the displacements are static, for example, if they are associated with differences in the atomic radii of the components of a solid solution, then the distribution of the displacements is not gaussian although it is often assumed to be so. Under certain simplifying assumptions the distribution may be shown to reduce to a generalized binomial (Poisson) distribution. The present paper is concerned with studying the changes in the formula for e^{-L} which are introduced by taking into account the fact that $\vec{\delta R}$ is not gaussian. It is assumed that $\vec{\delta R}$ for a binary solution A-B may be represented in the form of statistically independent components corresponding to the two types of atoms, i.e.

$$\vec{\delta R} = \sum_{s \neq 0} \delta \vec{R}_s$$

On the Determination of Static Crystal Defects in the Lattice of a Solid Solution from the Reduction in the Intensity of X-Ray Lines

The model given in Ref 3 is used, in which the displacements of the atoms are determined in the elastic isotropic continuum approximation. The final formulae obtained for L are given by Eqs (7) and (8) where the notation of Ref 4 is used. The estimates represented by Eqs (7) and (8) are only approximate since neither anisotropy nor the atomic structure of the crystal are taken into account. However, these estimates show that for strongly distorted lattices and large values of q there should be appreciable deviations from Eq (1) due to deviations of the δR distribution from the gaussian. These effects lead to a deviation of the graph of L vs q^2 from a straight line and these deviations are different for lattice points lying on different lines in the reciprocal lattice space. The deviations from linearity may be small and over a sufficiently large interval of scattering angles the graph of L vs q^2 may be approximated by a straight line. However, the slopes

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of the straight lines in widely differing intervals of scattering angles and for different wavelengths will be different. It may be that this is a reason for the difference between the mean square displacements for different λ which were reported in Refs 11 and 12. There are 12 references, of which 6 are Soviet (1 translation from English), 1 Czech and the rest are English.

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ASSOCIATION: Institut metallofiziki AN USSR (Institute of the Physics of Metals, Academy of Sciences, Ukrainian SSR)

SUBMITTED: May 26, 1958.

SOV/126-8-2-1/26

AUTHORS: Krivoglaz, M. A. and Cherevko, A. S.

TITLE: On the Elastic Moduli of a Solid Mixture

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 2, pp 161-164 (USSR)

ABSTRACT: A theoretical paper in which the elastic properties of a solid two phase system are considered. Formulae are derived for the elastic moduli when the amount of one of the phases is small, or when the concentration is arbitrary but the moduli of the two phases are not very different. The corresponding problem for liquids was solved in Ref 1 in which it was shown that the compressibility of an emulsion is equal to the arithmetic mean of the compressibilities of its components. In the case of a solid mixture the formulae for the elastic moduli are more complicated. Eqs (8) and (9) give the formulae for the bulk modulus and the modulus of rigidity, where σ_1 and σ_2 are the Poisson coefficients of the two components, and K_1 and K_2 are the bulk moduli; c is the concentration of the second phase. The elastic properties of each of the phases are considered in the

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