84812

S/181/60/002/008/047/052/XX
B006/B070

24,7700 (1043,1143,1559)

AUTHOR: Moskalenko, S A

TITLE: Exciton Absorption of Light in a Cu_2O Crystal I The Absence of Constant External Fields

PERIODICAL: Fizika tverdogo tela, 1960, Vol 2 No 8 pp 1755-1765

TEXT: The present paper gives a group-theoretical classification of the electron, hole, and exciton bands of the Cu_2O crystal at different points of the $\vec{k}$-space. In the introduction, some related publications are briefly described. §1 gives a study of the structure of the cuprous oxide crystal - which belongs to the symmetry group $O_h^4(12)$ - and the crystal terms of the copper ion. §2 gives the study of the structure of the electron and hole bands at different points of the $\vec{k}$-space; in this connection only electrons of 3d and 2p shells are considered. A scheme of the electron and hole bands of Cu_2O is given in Fig 2. The characters of some irreducible representations are given in Tables 1 and 2. The exciton spectrum of Cu_2O at k=0 is studied in §3, and the products of the irreducible

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Exciton Absorption of Light in a Cu_2O Crystal. I. The Absence of Constant External Fields

S/181/60/002/008/047/052/XX
B006/B070

representations of the bands are calculated for four cases (Table 3). A comparison of theory and experiment is given in §4. It has been shown that for the same parity of electron and hole bands, the exciton series exhibit intensive bands, beginning with n=2. Fig. 3 shows a scheme of the exciton levels of four joint electron and hole bands (from n=2 to n=9). The splitting of the "new lines" is related to the different effective masses of the excitons. The appearance of the new lines is attributed either to quadrupole transitions in para-exciton states, or dipole transitions in orthostates for l=1 and in parastates for l=3. Some further characteristics of the green and yellow series are discussed. The results of the present paper were communicated to the III Vsesoyuznoye soveshchaniye po teorii poluprovodnikam (Third All-Union Conference on the Theory of Semiconductors) in L'vov on April 3, 1959. The author thanks K. B. Tolpygo for guiding the work, I. S. Gorban', I. Pastrnyak, Ye. F. Gross, A. A. Kaplyanskiy, S. I. Pekar, B. Ye. Tsekvava, and A. G. Zhilich are mentioned. There are 3 figures, 3 tables, and 24 references: 15 Soviet, 1 British, and 8 US.

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84812

Exciton Absorption of Light in a Cu_2O Crystal. I. The Absence of Constant External Fields

S/181/60/002/008/047/052/XX
B006/B070

ASSOCIATION: Institut fiziki AN USSR Kiyev (Institute of Physics AS UkrSSR, Kiyev)

SUBMITTED: April 20, 1959 (initially) and March 28 1960(after revision)

Card 3/3

S/051/60/009/003/004/011
E201/E691

AUTHOR: Moskalenko, S.A.

TITLE: Exciton Absorption of Light in a Cu_2O Crystal. II. The Case of Absence of Constant External Fields

PERIODICAL: Optika i spektroskopiya, 1960, Vol 9, No. 3, pp. 369-375

TEXT: The results reported in the paper were presented at the Third All-Union Conference on Semiconductor Theory held in April 1959 in L'vov. Part I (Ref. 1) is extended by a discussion of the hole bands of p-type. of the exciton spectrum related to excitation of oxygen ions and of the fundamental frequencies of the Cu_2O lattice vibrations. The following theoretical points were checked by comparison with experiment: (1) origin of two hydrogen-like absorption-line series reported by Gross et al. (Ref. 2); (2) nature of the background of these two series, (3) origin of the line λ_0 at 6125 Å. The theory failed to explain the following observed features:

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S/051/60/009/003/004/011
E201/E691

Exciton Absorption of Light in a Cu_2O Crystal. II. The Case of Absence of Constant External Fields

(A) the doublet splitting of the yellow-series bands by magnetic fields, and (B) sharp rise of background observed in some regions of the exciton absorption. Acknowledgment is made to K.B. Tolpygo who supervised this work. There are 3 tables, 2 figures and 22 references: 14 Soviet, 4 English, 3 German and 1 Japanese.

SUBMITTED: August 20, 1959

Card 2/2

ACCESSION NR: AT4016301 S/0000/62/000/000/0077/0080

AUTHOR: Moskalenko, S.A.

TITLE: Some questions on the theory of interacting excitons

SOURCE: Vses. soveshch. po fiz. shchelochnogaloidn. kristallov. 2d, Riga, 1961. Trudy*. Fiz. shchelochnogaloidn. kristallov (Physics of alkali halide crystals). Riga, 1962, 77-80

TOPIC TAGS: Bose-gas, Bogolyubov theory, exciton gas, non-ideal exciton gas, Landau-Khalatnikov theory, superfluidity, exciton, phonon, semiconductor, Bose-Einstein condensation, crystallography

ABSTRACT: The author discusses the thermohydrodynamic properties of a non-ideal exciton gas in a semiconductor using Bogolyubov's microtheory of a non-ideal Bose-gas and the Landau-Khalatnikov phenomenological theory of superfluidity. Assuming that (a) the exciton energy depends on its quasipulse $\vec{p}$ by the law $\Delta + \frac{p^2}{2m}$, where m is the isotropic mass and Δ is the excitation energy; (b) the thermodynamic equilibrium has time to establish itself during the exciton life span τ; (c) hydrodynamic processes in the gas are reversible and take less time than τ for completion; (d) phonons promote the equilibrium of and determine the life span τ; and (e) the direct interaction of the excitons and the indirect

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ACCESSION NR: AT4016301

interaction of the phonons result in the predominance of repulsion, the author presents the energy and pulse of a non-ideal exciton gas in the state of Bose-Einstein condensation on the level $\vec{P}_0$ as:

$$E = E_0(\xi) + N\frac{P_0^2}{2m} + N\Delta + \sum_{p \pm 0} [E(\vec{P}, \xi) + \vec{P}\vec{V}_0] n_p$$
$$\vec{P} = N\vec{P}_0 + \sum_{\vec{P}} n_p \vec{P} \qquad (1)$$

The author concludes that: (1) from the comparison of the exciton gas in a semiconductor with liquid helium He II, a number of optical and hydrodynamic effects in crystals may be predicted; (2) at subcritical temperatures primary and secondary sounds whose velocities differ greatly may exist in an exciton gas; (3) light scattering over density fluctuations results in a cleavage of the initial frequency; (4) exciton superfluidity sets on at small velocities $u \leqslant u^*$; and (5) mechanocaloric or thermomechanical effects cause the superfluid component to transfer the exciton mass over microcapillary ducts. Orig. art. has: 3 figures and 9 formulas.

Card 2/3

ACCESSION NR: AT4016301

ASSOCIATION: Institut fiziki i matematiki Moldavskogo filiala AN SSSR (Institute of Physics and Mathematics, Moldavian Branch AN SSSR)

SUBMITTED: 00	DATE ACQ: 06Mar64	ENCL: 00
SUB CODE: EC, GP	NO REF SOV: 007	OTHER: 002

Card 3/3

SHMIGLYUK, M.I.; MOSKALENKO, S.A.

Polarization effect of a yellow exciton series in copper oxide crystals. Fiz. tver. tela 6 no.9:2729-2736 S '64.

MIRA 17:11

1. Institut prikladnoy fiziki AN Moldavskoy SSR, Kishinev.

3/181/62/[illegible]
B[illegible]/B104

24,3500 (1137, 1138, 1144)

AUTHOR: Moskalenko, S. A

TITLE: Reversible optic-hydrodynamic phenomena in an imperfect exciton gas

PERIODICAL: Fizika tverdogo tela, v. 4, no. [illegible], 1962, 376, 44

TEXT: The collective properties of interacting excitons in a semiconductor have been studied using results of the microscopic theory of an imperfect Bose gas and of the phenomenological theory of superfluidity. The hydrodynamic properties of an exciton gas were compared with those of liquid helium. The paper starts with an introduction and a detailed review of various articles, in which the following Soviet bloc authors are mentioned: P. L. Kapitsa (Nature 141, 74, 1938; DAN SSSR 18, [illegible] I, No. Landau (J. Phys. USSR 5, 71, 1940; ZhETF 11, 592, 1941; ZhETF 14, [illegible] 1944; J. Phys. USSR, 11, 91, 1947). N. N. Bogolyubov (Izv. AN SSSR ser. fiz., 9, 23, 1947; Vestn. MGU, 7, 43, 1947; Lektsii po kvantovoy statistike Gl. III. Rad. shkola Kiyev, 1949; ZhETF, 18, 7, 622, 1947). A. I. Ansel'm

Card 1/4

13367

S/[illegible]/62/[illegible]/[illegible]/[illegible]
B[illegible]/B[illegible]

Reversible optic-hydrodynamic

Yu. A Firsov (ZhETF, 28 2 [illegible] 1955; 32, 4, 719 1957), Z S Kachlishvili (FTT, 3 2 392, 1961) L Urivnak (Chekhoslov fizich zhurn 1, 390, 1957) V L. Broude A F Prikhot'ko E I Rashba (UFN 67 [illegible] 99 1959), V Ye. Lashkarev, Yu. I Karkhanin (DAN SSSR 121 no 5 829, 1955) S I Pekar (ZhETF, 33 4 1022, 1957; D ki na soveshchan po teorii, poluprovodnikov, Lvov 1960) and K B Tolpygo (Avtoreferat IFAN USSR Kiyev, 1959) The present paper is based on the [illegible] publications, and the results are valid under the following [illegible] requirements. (1) During the exciton lifetime τ there must prevail quasi equilibrium distribution and reversible hydrodynamic processes must be possible; (2) repulsion must predominate between the [illegible]; (3) the exciton band must be quadratic with m_e > 0; (4) [illegible] are neglected. Proceeding from the Hamiltonian H for N [illegible] excitons the partition function for the Bose statistics

$Z_s = Sp(e^{-\beta\hat{H}+\beta Pv})$ is calculated in second quantization, whence the thermodynamic functions and the flow of matter are [illegible]. The [illegible] of sound above and below the critical temperature [illegible]

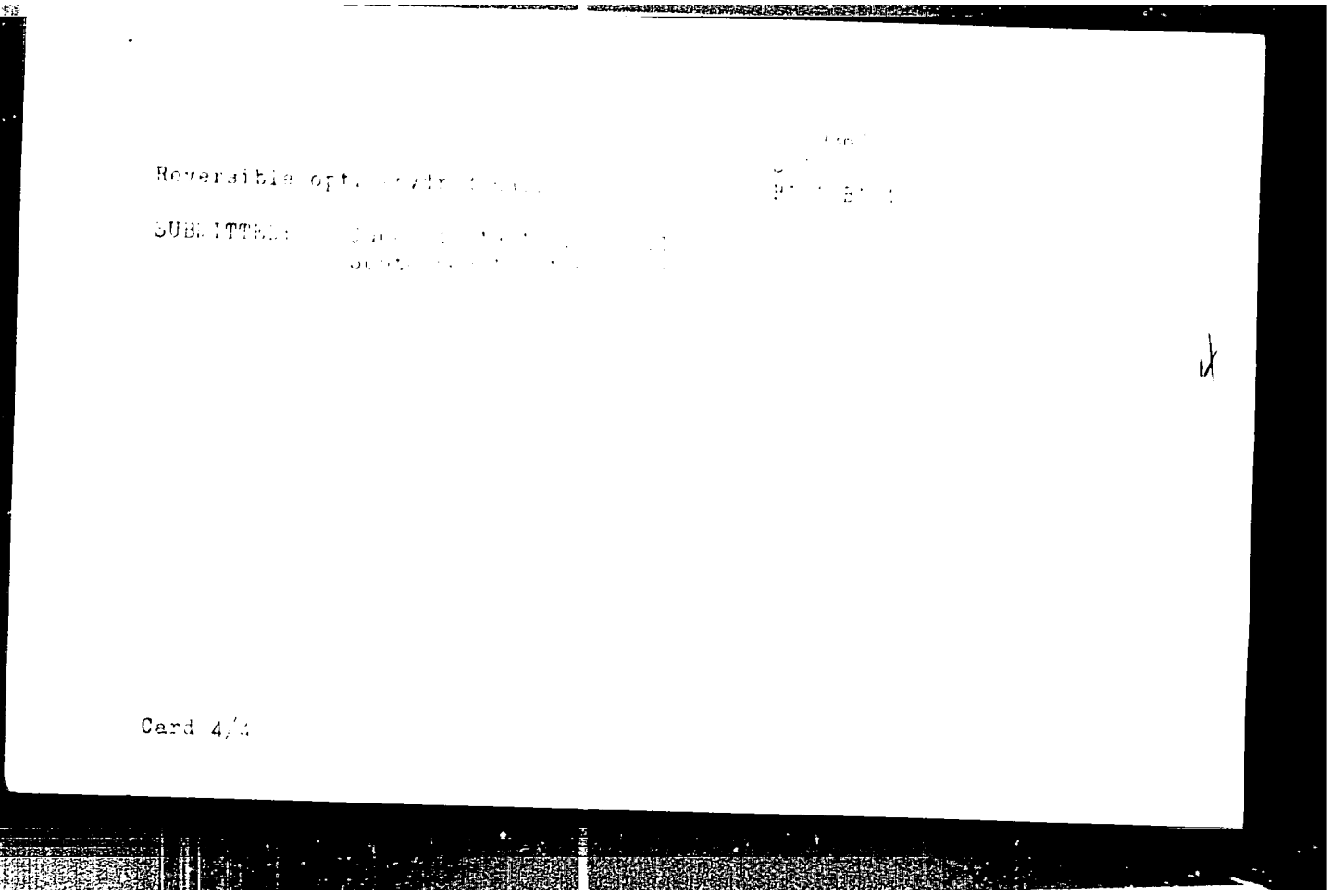
Card 2/[illegible]

Reversible optical [illegible]

and, in accordance with T D Lee [illegible] was discovered in the latter case. The paper is [illegible] of the possible occurrence of a Bose Einstein [illegible] comparison between the superfluid motion of [illegible] impurities and dislocations and the motion of [illegible] powder or porous glass. V [illegible] Gurevich, D N Zubarev, K B Tolpygo, S V Tyablikov, A Tserkovnikov are thanked for interest and advice. There are 1 table, and 33 references: 24 Soviet-bloc and 9 non-Soviet-bloc. The four most recent references to English-language publications follow: T D Lee, C N Yang, Phys Rev ___, b) 113, no 6, 1406, 1959; T C N Yang, Phys Rev ___ Glasgold A N Kaufman K M Watson, Phys Rev ___ Y Takeuti Progr Theoret Phys ___, [illegible]; [illegible] Rev, 112, no 5, 1965, 1957

ASSOCIATION: Institut fiziki i matematiki AN KaSSR Karaganda Institute of Physics and Mathematics AS Kazakhskaya SSR

Card 3/4



Reversible opt[illegible]

SUBMITTED:

Card 4/4

S/181/62/004/008/002/041
B125/B104

24 7000

AUTHORS: Moskalenko, S. A., and Bobrysheva, A. I.

TITLE: Selection rules and energy spectrum of electrons. Consideration of external fields and directional deformations

PERIODICAL: Fizika tverdogo tela, v. 4, no. 8, 1962, 1994-2004

TEXT: From the exciton function, a linear combination of many-electron functions, the following selection rules are obtained for the exciton absorption without the participation of phonons in binary crystals having the point space symmetry group G, when the extrema of the bands lie at the point $\vec{k} = 0$: When light polarized along the ξ-axis is incident along the η-axis, the allowed transition will lead to such levels to which at the point $\vec{k}$ correspond certain irreducible representations. These are contained in representations formed over the following bases: $S_e = \{\nabla_\xi, \nabla_\eta\}$ in the dipole case, $S^{(+)}_{\vec{k}e} = \{[r_\xi \nabla_\xi + r_\eta \nabla_\eta], [r_\xi \nabla_\eta + r_\eta \nabla_\xi]$ in the quadrupole case, and $S^{(-)}_{\vec{k}e} = \{[r_\xi \nabla_\xi - r_\eta \nabla_\eta], [r_\xi \nabla_\eta - r_\eta \nabla_\xi]$ in the

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Selection rules and energy...

magneto-dipole case. In all these cases $D \in G$. $\vec{k}_{exc} = \vec{k}$ is the selection rule with respect to the group of the wave vector: Under the action of light with the polarization e_ξ the allowed transitions lead from the ground state to exciton states with a representation over the base $(\Gamma_\xi, g\Gamma_\xi)$ of the group of the wave vector $\vec{Q}_{\vec{k}}$ equivalent to $\vec{k}$. These selection rules indicate that the transition probability depends on the wave vector. In the presence of external constant fields and directional deformations, the levels of a cubic crystal are split up as a result of the change in the crystal symmetry. The splitting of the exciton levels and the selection rules for the split components are the principal factors characterizing the change in the exciton spectrum at given external conditions. The selection rules describe the exciton absorption in free crystals with the symmetries D_{4h}, D_4, C_{4h}, D_{3d}, D_3, S_6; D_{2h}, D_2, C_{2h} even if the crystal is not subject to any external forces. There are 11 tables.

ASSOCIATION: Institut fiziki i matematiki AN MSSR, Kishinev (Institute of Physics and Mathematics AS MSSR, Kishinev)

SUBMITTED: January 4, 1962

Card 2/2

MOSKALENKO, S.A.; BOBRYSHEVA, A.I.

Rules of selection and energy spectrum of excitons. Part 2: Effect of external fields and directional strains on cubic crystals. Izv. AN Mold SSR no.5:60-70 '62. (MIRA 18:3)

L 13026-63 EWT(1)/BDS AFFTC/ASD/ESD-3 IJP(C)/GG

ACCESSION NR: AP3000628 S/0181/63/005/005/1444/1453

AUTHOR: Moskalenko, S. A.; Khadzhi, P. I.; Bobry*sheva, A. I.; Lelyakov, A. V.

TITLE: Optical-hydrodynamical phenomena in the exciton-photon system

SOURCE: Fizika tverdogo tela, v. 5, no. 5, 1963, 1444-1453

TOPIC TAGS: exciton, phonon, Bose-Einstein condensation, Hamiltonian, exciton dispersion, phase transition, mean free path

ABSTRACT: The authors have studied the interaction of phonons with weakly bound excitons and have analyzed the various laws of exciton dispersion. They have also investigated that particular case when, in the system of excitons and phonons (acoustical or optical), thermodynamic equilibrium between excitons is established before equilibrium between excitons and phonons. Here the interaction of phonons with condensing excitons does not lead to normal scattering but changes the nature of the whole energy spectrum of the system. The necessary conditions for this are such that the mean free path during interexciton collisions must be considerably smaller than during exciton scattering at acoustical and optical phonons or at impurities. The interexciton relaxation time must naturally be less than the

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L 13026-63
ACCESSION NR: AP3000628

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life of the excitons. Computations according to different laws of exciton dispersion lead to qualitatively new results, but this matter is not resolved. "In conclusion, we express our deep thanks to V. L. Bonch-Bruyevich, S. I. Pekar, E. I. Rashba, K. B. Tolpy*go, and S. V. Tyablikov for discussing the paper and making comments." Orig. art. has: 1 figure and 35 formulas.

ASSOCIATION: Institut fiziki i matematiki AN MSSR. Kishinev (Institute of Physics and Mathematics, Academy of Sciences, MSSR)

SUBMITTED: 06Sep62 DATE ACQ: 11Jun63 ENCL: 00

SUB CODE: 00 NO REF SOV: 010 OTHER: 005

Card 2/2

MOSKALENKO, S.A.

Phase transitions of the second kind during Bose - Einstein condensation of excitons in a deformed lattice. Zhur. eksp. i teor. fiz. 45 no.4:1159-1163 O '63. (MIRA 16:11)

1. Institut fiziki i matematiki AN Moldavskoy SSR.

MOSKALENKO, S.A.; SHMIGLYUK, M.I.

Energy spectrum of excitons in CdS type crystals. Fiz. tver. tela 6 no.12:3535-3537 D '64 (MIRA 18:2)

1. Institut prikladnoy fiziki AN Moldavskoy SSR, Kishinev.

L 10772-65 EWT(m)/EWP(b) IJP(c)/AFWD(t)/AFETR/ESD(t)/ASD(a)-5/SSD/AS(mp)-2/
ACCESSION NR: AP4044946 ESD(c) JD S/0181/64/006/009/2729/2736

AUTHORS: Shmiglyuk, M. I.; Moskalenko, S. A.

TITLE: On the polarization effect in the yellow exciton series of cuprous oxide crystals

SOURCE: Fizika tverdogo tela, v. 6, no. 9, 1964, 2729-2736

TOPIC TAGS: cuprous oxide, line splitting, exciton polarization, wave function, crystal structure, band spectrum

ABSTRACT: Gross, Kaplyanskiy et al. (FTT, v. 2, 2968, 1960; v. 4, 1660, 1962) found that strong directional deformation polarized the principal bands ($n \geq 2$) of the yellow exciton series of cuprous oxide, without splitting them. Similar deformation was found to polarize and split the $\lambda = 6125$ Å line, which is associated with the $n = 1$ state in the yellow series, and the first lines of the blue and violet series. The present paper shows that the unusual be-

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L 10772-65
ACCESSION NR: AP4044946

3

havior of the principal bands of the yellow series is associated with the degeneracy of the relative motion of excitons, with the complex structure of the unit cell, and with the mixing and changes in the wave functions of the crystal terms. The amplitudes of the optical transition of the split components of the Γ_4^--type np-levels are determined. Estimates show that the splitting of the levels is of the same order as the breadth of the absorption lines under pressure." The authors thank Profs. A. G. Samoylovich and K. B. Tolpygo for their interest." Orig. art. has: 2 figures, and 17 formulas.

ASSOCIATION: Institut prikladnoy fiziki AN MSSR, Kishinev (Institute of Applied Physics, AN MSSR)

SUBMITTED: 06Dec63 ENCL: 00

SUB CODE: SS, OP NR REF SOV: 010 OTHER: 001

Card 2/2

L 17122-65 EWA(h)/EWG(k)/EWT(l)/EWT(m)/EWP(b)/T/EWP(t) Pz-6/Peb ASD(a)-5/ SSD/AFWL/AFETR/RAEM(j)/ESD(gs)/ESD(t)/IJP(c) AT/JD

ACCESSION NR: AP5000643 S/0181/64/006/012/3535/3537

AUTHOR: Moskalenko, S A.; Shmigiyuk, M. I.

TITLE: Energy spectrum of excitons in crystals of the CdS type

SOURCE: Fizika tverdogo tela, v. 6, no. 12, 1964, 3535-3537

TOPIC TAGS: exciton, energy spectrum, polarization, crystal symmetry, band structure, energy level

ABSTRACT: It is pointed out that earlier discussions of the structure and symmetry of the energy band in crystals of the wurtzite type did not take sufficient account of the fact that the unit cell of such crystals contains two molecules. The authors therefore calculate the actual bands at the point k = 0 and take into account the complex structure of the unit cell. The possible exciton levels are determined for the relative-motion quantum numbers n = 1, 2, 3; these are determined on the basis of a group-theoretical calculation made by one of the authors in an earlier paper (Moskalenko, FTT v. 2, 1755, 1960).

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L 17122-65
ACCESSION NR: AP5000648

The activities and polarizations of the exciton levels are calculated in the dipole and quadrupole approximations, the exciton spectrum is discussed briefly in the presence of an external magnetic field, and the vibrational spectrum of crystals of the CdS type for $k = 0$ is presented. The results show that the previously proposed interpretations of the complex absorption and luminescence spectra in crystals of CdS type must be revised. "The authors thank V. V. Sobolev, whose discussion gave rise to the idea of the present communication." Orig. art. has: 2 figures, 2 formulas, and 1 table.

ASSOCIATION: Institut prikladnoy fiziki AN MolSSR, Kishinev (Institute of Applied Physics, AN MolSSR).

SUBMITTED: 09May64 ENCL: 00

SUB CODE: SS, NP NR REF SOV: 002 OTHER: 004

Card 2/2

EWT(1)/T IJP(c)

ACC NR: AP6030970 SOURCE CODE: UR/0181/66/008/009/2730/2734

63

AUTHOR: Bobrysheva, A. I.; Moskalenko, S. A.

ORG: Institute of Applied Physics, AN MSSR, Kishenev (Institut prikladnoy fiziki AN MSSR)

TITLE: The angular dependence of probabilities of three-photon absorption

SOURCE: Fizika tverdogo tela, v. 8, no. 9, 1966, 2730-2734

TOPIC TAGS: nonlinear optics, three photon absorption, ABSORPTION COEFFICIENT, PHOTON, CONDUCTION BAND, VALENCE BAND, BRILLOUIN ZONE

ABSTRACT: The dependence of the absorption coefficient on the direction of polarization vectors of three photons taking part in a transition was considered under the assumption that the valence band maximum and the conduction band minimum occur in the Brillouin zone at a point $\vec{k} = 0$ where the transition takes place. General formulas were obtained for the angular dependence of the coefficient of three-photon absorption for an arbitrary orientation of polarization vectors and for the special case of three identically polarized photons at equal frequencies. Although the derived expressions are more unwieldy than those obtained for the case of two-photon absorption, they can be used for band-to-band and exciton transitions and in the local centers. Orig. art. has: 6 formulas. [YK]

SUB CODE: 20/ SUBM DATE: 30Mar66/ ORIG REF: 003/ OTH REF: 007/ ATD PRESS: 5078

Card 1/1

ACC NR: AP6036318 SOURCE CODE: GE/0030/66/018/011/0379/0390

AUTHOR: Moskalenko, S. A.; Khadshi, P. I.

ORG: Institute of Applied Physics, Academy of Sciences of the Moldavian SSR, Kishinev

TITLE: Infrared absorption by excitons due to photoionization and intraband lattice scattering

SOURCE: Physica status solidi, v. 18, no. 11, 1966, 379-390

TOPIC TAGS: IR absorption, absorption coefficient, exciton absorption, quantum mechanics, photoionization, carrier scattering, semiconductor laser

ABSTRACT: A quantum mechanical theory is presented for infrared absorption by excitons due to photoionization and intraband lattice scattering. An investigation was made of the coefficient of infrared absorption by excitons in order to evaluate accurately the role of excitons in laser operation in semiconductors. Infrared absorption by excitons may take place as the result of the following processes: 1) Transitions from one discrete level of the internal motion of the exciton to other discrete levels, 2) transitions between discrete levels of two different series of the exciton, 3) photoionization, 4) photoionization with simultaneous band-to-band transition of the electron or hole, and 5) intraband scattering of the excition by acoustical and optical phonons. Only the third and fifth cases were considered. Taken into account were the interaction between excitons

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ACC NR: AP6036318

and acoustical and optical phonons and the Maxwell and Bose-Einstein exciton distribution functions. The first- and second-order perturbation-theory approximations, which are valid for the range of frequencies c q, were employed. This range is much greater than τ_{rel}^{-1}, where τ_{rel} is the relaxation time of excitons ($c\,q\,\tau_{rel} \ll 1$). The Hamiltonian was derived for the interaction of excitons with the infrared radiation field responsible for the processes of exciton scattering. The absorption coefficient $\gamma(q)$ due to photoionization of excitons was calculated for materials in which the existence of direct excitons with a wave vector $\vec{k}$ lying at the center of the Brillouin band has been established. For Cu_2O, Ge, InP, and GaSb, $\gamma(q)$ was plotted as a function of ncq/I_{1S} for the following exciton concentrations: 10^{12} cm^{-3} in Ge, 10^{13} cm^{-3} in Cu_2O, and 10^{14} cm^{-3} in InP and GaSb crystals. The effect of the exciton photoionization is observable at the threshold frequency at comparatively low exciton concentrations. Orig. art. has: 30 formulas, 3 figures, and 1 table. [WA-14]

SUB CODE: 20/ SUBM DATE: 22Mar66/ ORIG REF: 012/ OTH REF: 016/

Card 2/2

ACC NR: AP7004997 SOURCE CODE: UR/0048/66/030/009/1539/1541

AUTHOR: Bobryshova,A.I.; Moskalenko,S.A.

ORG: none

TITLE: On two-photon stimulated luminescence in intrinsic semiconductors and dielectrics. Transitions from an exciton state. /Report, Fourteenth All-Union Conference on Luminescence (Crystal Phosphors) held at Riga, 16-23 Sept. 1965/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 30, no.9, 1966, 1539-1541

TOPIC TAGS: luminescence, semiconductor crystal, dielectric crystal, nonlinear effect, laser, exciton, mathematic physics

ABSTRACT: For a cubic crystal under pressure and for the 32 point groups, the authors have calculated the angular dependences of the emission and absorption coefficients associated with exciton transitions due to the A^2 interaction term and the angular dependences of transitions due to the $A \cdot p$ interaction term, and have discussed the features of the two-photon emission that arise from the fact that excitons are bosons. In the present paper they present and briefly discuss some of their results. If the temperature is so low that the excitons are degenerate (form an Einstein-Bose condensate), there can be emitted only two oppositely directed photons of the same energy. This circumstance is favorable for the realization of a two-photon laser based on degenerate excitons. The emission of photons of one frequency can be stimulated by

Card 1/2

ACC NR: AP7004997

an intense beam of photons of another frequency. As an example, the authors present the angular dependences of the emission coefficient for O_h symmetry. When the cubic crystal is subjected to uniaxial compression there appear in the expressions for the angular dependences coefficients that must be determined experimentally. The authors are presently engaged in calculating the corresponding transition probabilities due to the A^2 and A·p interaction terms. These data are required for design of the two-photon laser proposed by A.M.Prokhorov and A.S.Selivanenko (Avt. avid.No.872303 ot 24 XII 1963 g.) and by P.P.Sorokin and N.Braslau (IBM J. research and develop., 8,177 (1964)). Orig. art. has: 8 formulas.

SUB CODE: 20 SUBM DATE: none ORIG. REF: 004 OTH REF: 004

Card 2/2

L 33259-66

ACC NR: AR6017243 SOURCE CODE: UR/0058/65/000/012/D039/D039

38

AUTHORS: Moskalenko, S. A.; Shmiglyuk, M. I.

TITLE: Group-theoretical investigation of exciton absorption bands in Cu_2O crystals

SOURCE: Ref. zh. Fizika, Abs. 12D324

REF SOURCE: Tr. Komis. po spektroskopii. AN SSSR, t. 3, vyp. 1, 1964, 454-458

TOPIC TAGS: cuprous oxide, exciton absorption, absorption band, group theory, Hamiltonian, exciton, Coulomb interaction

ABSTRACT: Starting from the many-electron formulation of the problem, the authors obtain in matrix form the Hamiltonian of the exciton with account of the complex structure of the crystal, for electron and hole bands of different symmetry, at different functions of electron-hole relative motion and with allowance for the Coulomb-interaction terms. A study is made of the energy levels of the exciton, their splitting, and polarization as functions of the external conditions. [Translation of abstract]

SUB CODE: 20

Card 1/1

MOSKALENKO, S.F., inzh.

Building mine surfaces using large blocks. Shakht. stroi. no.4: 26-27 '58. (MIRA 11:6)

1.Trest Leninugol', Karaganda.
(Building blocks)

MOSKALENKO, S.I.; GABOVICH, M.S.; BACHINSKIY, Yu.V.; TOMILIN, A.V.; MEDVEDEV, P.M.; LOMAKOVA, M.M.; GOLOVKOV, P.D.; GAYDUKOV, G.I.; ALEYNIKOV, V.V.; STENIN, N.D.; MIRONOVA, V.V.; BELAVINTSEVA, Ye.S.; TSVETSINSKIY, S.V.; NECHEPURNYY, P.; KOBZAR', M.K.; ROZHNOVA, Ye.S.; PELETMINSKIY, V.N.; GORDEYCHUK, V.K.; SHMERIGO, V.F.; KISLYUK, N.

Fifty years in the sugar industry. Sakh.prom. 33 no.2:18 F '59. (MIRA 12:3)

(Shtepan, Georgii Viacheslavovich, 1888-)

MOTKIN, Ye.M.; KUR, G.Ye.; A. OKHTEYN, N.M.; prinimali uchastiye: KAMNEV, V.S.; SHASHIN, N.N.; TYURIN, V.I.; VENBRIN, V.D.; MAREYEV, D.I.; VILENSKAYA, I.A.; BORODIN, B.V.; DON-YAKHIO, I.A.; MOSKALENKO, S.M.; ABRAMOVA, Z.A.; KLIMOV, M.D.; VASIL'YEV, I.A. LUK'YANOV, S.K.

Introducing automatic control in coremaking. Lit. proizv. no.6: 15-19 Je '62. (MIRA 15:6)

1. Nauchno-issledovatel'skiy institut santekhniki Akademii stroitel'stva i arkhitektury SSSR (for Luk'yanov).
(Coremaking) (Automatic control)

MOSKALENKO, S.Ye.

Experience in manufacturing eighteen meter long BKBD- 18-2 beams with prestressed components. Energ. stroi. no.37: 56-58 '63. (MIRA 17:6)

1. Zamestitel' nachal'nika proizvodstvenno-tekhnicheskogo otdeleniya Stroitel'nogo upravleniya Pridneprovskoy gosudarstvennoy rayonnoy elektrostantsii.

MOSKALEVA, S.V.

Age of ultrabasic rocks of the Southern Urals. Dokl. AN SSSR 150 no.6:1323-1326 Je '63. (MIRA 16:3)

1. Vsesoyuznyy nauchno-issledovatel'skiy geologicheskiy institut. Predstavlena akademikom D.V.Nalivkinym.
(Ural Mountains--Rocks, Igneous)

MOSKALENKO, T.A.

Paleontologic finds in the coal-bearing formation along the shores of the Chirakhchay River. Trudy Geol.inst.Dag.fil. AN SSSR 1: 236-240 '57. (MIRA 14:9)
(Chirakhchay Valley--Coal geology) (Paleontology)

MOSKALENKO, T.A.

Foraminifera and some new data on the stratigraphy of the Middle Jurassic of Daghestan as revealed by the Tsmur cross section (Rychal-vats and Trmur-chay Valleys). Trudy Geol.inst.Dag.fil. AN SSSR 2:154-161 '60. (MIRA 15:12)
(Daghestan—Foraminifera, Fossil)

MOROZOVA, V.G.; MOSKALENKO, T.A.

Plankton foraminifera from boundary deposits of the Bajocian and Bathonian stages of central Daghestan (northeastern Caucasus). Vop. mikropaleont. no.5:3-30 '60. (MIRA 14:8)

1. Geologicheskiy institut AN SSSR i Institut geologii Dagestanskogo filiala AN SSSR.
(Daghestan--Foraminifera, Fossil)

BROVKOV, G.N.; MOSKALENKO, T.A.

Leptochlorite horizon in middle Jurassic deposits of contral Daghestan. Dokl.AN SSSR 136 no.1:163-166 Ja '61. (MIRA 14:5)

1. Institut geologii i geofiziki Sibirskogo otdeleniya AN SSSSR i Institut geologii Dagestanskogo filiala AN SSSR. Predstavleno akademikom N.M.Strakhovym.
(Chokh region--Geology, Stratigraphic)
(Leptochlorite)

BROVKOV, G.N.; MOSKALENKO, T.A.

First find of conglomerates containing pebbles of Pre-Jurassic igneous and metamorphic rocks in the Bajocian of southeastern Daghestan. Trudy Geol.inst.Dag.fil. AN SSSR 2:165-168 '62. (MIRA 15:12)

(Daghestan--Conglomerate)

TYABLIKOV, S.V.; MOSKALENKO, V.A.

Theorem on statistical averages for Pauli operators. Dokl. AN SSSR 158 no.4:839-842 O '64. (MIRA 17:11)

1. Matematicheskiy institut im. V.A. Steklova AN SSSR i Institut matematiki AN Moldavskoy SSR. Predstavleno akademikom N.N. Bogolyubovym.

L 26475-65 EWT(1)/EEC(f)/EWA(d) IJP(c) GG

ACCESSION NR: AR5004861 S/0058/64/000/011/E086/E086

22
10
B

SOURCE: Ref. zh. Fizika, Abs. 11E693

AUTHORS: Moskalenko, V. A.; Palistrant, M. Ye.; Kon, L. Z.

TITLE: A criterion for superconductivity

CITED SOURCE: Izv. AN MoldSSR. Ser. yestestv. i tekhn. n., no. 7, 1963, 63-78

TOPIC TAGS: superconductivity, pair excitation, electron pair, Frohlich model, superconductivity criterion

TRANSLATION: The conditions for stability in a Frohlich model, with account of Coulomb interaction, was investigated with the aid of the criterion for the instability of the normal state relative to formation of electron pairs, introduced by Bogolyubov and consisting in the fact that the energy of such paired excitations becomes imaginary. A numerical analysis is presented for the superconductivity criterion obtained in this manner. R. Suris.

SUB CODE: SS, MM ENCL: 00

Card 1/1

L 25069-65 EWT(m)/EPA(w)-2/EWA(m)-2 Pab-10/Pt-10 IJP(c)

ACCESSION NR: AR4045745 S/0275/64/000/007/A051/A051

SOURCE: Ref. zh. Elektronika i yeye primeneniye. Svodnyy tom, Abs. 7A298 36 B

AUTHOR: Moskalev, V. A.; Skvortsov, Yu. Zh.; Okulov, B. V.; Shestakov, V. G. 19

TITLE: Measurement and recording of fall current in a 25-Mev stereobetatron

CITED SOURCE: Sb. Elektron. uskoriteli. M., Vyssh. shkola, 1964, 204-209

TOPIC TAGS: betatron, stereobetatron

TRANSLATION: Results of a study of acceleration process and beam characteristics are reported. Possibility is considered of determining the charge of accelerated electrons by a direct measurement of the charge of the electrons that struck the target. For measuring the accelerated-electron charges, a combination circuit is used which records simultaneously the target current and the signal induced in a special indicating electrode; the circuit can operate at any particle energy. Stereobetatron potentialities as a pulse flow detector were assessed by using it for examination of a lead bar having artificial defects. The circuits are supplied, and the experimental results are discussed.

ENCL: 00

SUB CODE: NP

Card 1/1

L 15248-65 EWT(l)/EEC(b)-2/T TJP(c)/ASD(a)-5/BSD/AFWL/AS(mp)-2/APGC(b)/ESD(gs)/ESD(t)

ACCESSION NR: AP4048744 S/0051/64/017/005/0728/0733

AUTHORS: Palistrant, M. Ye.; Moskalenko, V. A.

TITLE: Contribution to the theory of optical bands of F-centers

SOURCE: Optika i spektroskopiya, v. 17, no. 5, 1964, 728-733

TOPIC TAGS: F center, optical band, spectral curve, phonon, crystal lattice vibration, emission spectrum, absorption spectrum

ABSTRACT: The first moments of the spectral curves are calculated with allowance for the change in the phonon equilibrium positions and the phonon frequencies during an electronic transition from a 1s ground state to a 2p excited state. Simplified electronic functions are used together with a simple model for the lattice vibrations, and the temperature shift of the maximum of the spectral light absorption and emission bands are calculated, together with their half-widths and the deviations from mirror symmetry of the light

Card 1/2

L 15248-65

ACCESSION NR: AP4048744

emission and absorption spectra. "One of the authors (O. V. Moskalenko) expresses deep gratitude to S. V. Tyablikov for a discussion of the results of the work." Orig. art. has: 29 formulas and 2 tables.

ASSOCIATION: None

SUBMITTED: 28Nov63 ENCL: 00

SUB CODE: OP, SS NR REF SOV: 010 OTHER: 004

Card 2/2

L 16447-65 EWT(l)/EEC(f)/EWA(d)/EEC(b)-2 IJP(c)/ESD(t)/AEDC(a)/SSD/AFWL/ ASD(a)-5/AS(mp)-2/AFETR GG
ACCESSION NR: AP4042038 S/0126/64/017/006/0827/0833

AUTHOR: Polistrant, M. Ye.; Moskalenko, V. A.

TITLE: Variational principle in thermodynamics of superconducting systems

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 6, 1964, 827-833

TOPIC TAGS: superconductivity, variational principle, thermodynamics, Green's function, functional Froehlich model

ABSTRACT: The authors consider the superconducting state of metal in the Froehlich's model with Coulomb interaction between the electrons. The thermodynamic potential of the system is represented by a functional of a complete electronic and ionic Green's function. It is shown that this functional is a stationary one with respect to the independent variations of electronic and phononic Green's functions, and to the mass- and polarization operations. An expression for the second variation of this functional is obtained. Orig. art. has: 24 equations.

Card 1/2

L 16447-65
ACCESSION NR: AP4042038

ASSOCIATION: Institut fiziki i matematiki AN MSSR (Institute of Physics and Mathematics, AN MSSR)

SUBMITTED: 13Jul63 ENCL: 00

SUB CODE: NP, TD NO REF SOV: 008 OTHER: 002

Card 2/2

MOSKALENKO, V. A.

Effective mass of the polarizing exciton. A. G. Chelan and V. A. Moskalenko. *Uchenye Zapiski Kishinev. Univ.* 17, 115–18(1955); *Referat. Zhur., Khim.* 1956, Abstr. No. 35168.—Theoretically it was calcd. that the effective masses of excitons in *s* and 2*p* levels are (in g.) NaCl 8.8×10^{-28}, 3.1×10^{-28}; KCl 7.4×10^{-28}, 2.35×10^{-28}; KBr 0.98×10^{-28}, 1.21×10^{-28}, resp. The decrease of mass when an exciton moves to the excited state is related to the decreased interaction with the phonon field.

V. S. Mikhailov

Distr: 4E4c

MOSKALENKO, V.A.

B-5

USSR/Crystals.

Abs Jour : Referat Zhur - Khimiya, No 6, 1957, 18332

Author : V.A. Moskalenko.
Inst : Kishinev University.
Title : Temperature Displacement of Exiton Absorption in Ionic Crystals

Orig Pub : Uch. zap. Kishinevsk. un-ta, 1956, 24, 55-62

Abstract : The short wave displacement of the absorption line spectrum of an exiton at a temperature drop is studied theoretically. It is surmised that the interaction of the exiton with the inertial polarization of the lattice created by the exiton, i.e. the perturbation of the system, is the cause of the displacement. An approximation of the effective mass method and the macroscopic method of computation of crystal polarization are used for the computation. Numerical computations are carried out for Cu_2O and alkali-haloid crystals. The results for Cu_2O

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MOSKALENKO, V.A.

Theory of interaction between an exciton and phonon field. Zhur.eksp. i teor.fiz. 30 no.5:959-961 My '56. (MIRA 9:9)

1.Kishinevskiy gosudarstvennyy universitet.
(Field theory) (Particles, Elementary)

56-2-13/51

AUTHOR: Moskalenko, V. A.

TITLE: On the Theory of the Thermal Excitation of Polarons (K teorii teplovogo vozbuzhdeniya polyarona)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1956, Vol 34, Nr 2, pp 346-354 (USSR)

ABSTRACT: The present work computes the probability of a quantum transition of a polaron between the states 1s and 2p caused by the thermal transitions of a lattice. For this the basic ideas and the method of the theory of radiation-less transitions in an F-center are used (see M. Lax, reference 4). Here thermal transition is understood to be the transition (1s → 2p) caused by the thermal oscillations of the lattice. In the first chapter the Hamiltonian of the polaron problem is put down and discussed. The electron function is determined in first approximation. In the next chapter the probability of the radiation-less transition is calculated, the course of calculation being followed step by step. Then the parameters of the theory are calculated and the transition probability is estimated for the ground state of

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the polaron, the state 2p of the polaron, and for the self consisting state 2p. Furtheron expressions for the effective mass of the polaron in the excited state, for the mean effective mass of the polaron and for the ratio of the effective masses of the polaron in two states are put down. The data found speak in favor of the probability of the thermal excitation of a polaron 1s → 2p having remarkable values at room temperatures and at higher temperatures. The transition into the excited state takes place within a time of about 10^{-8} and 10^{-9} sec. There are 2 tables and 13 references, 7 of which are Slavic.

ASSOCIATION: **Kishinev State University** (Kishinevskiy gosudarstvennyy universitet)

SUBMITTED: February 25, 1957 (initially), and November 2, 1957 (after revision)

AVAILABLE: Library of Congress

1. Polarons-Thermal excitation-Theory 2. Polarons-Mathematical analysis

20-119-4-14/60

AUTHOR: Moskalenko, V. A.

TITLE: Exciton Energy in Ionic Crystals (Energiya eksitona v ionnykh kristallakh)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol 119, Nr 4, pp 678 - 681 (USSR)

ABSTRACT: In the present paper an expression for the energy and the effective mass of an exciton is determined which is subjected to no restrictions with respect to the value of the coupling constant and to temperature. The same problem for the polaron was solved by M. A. Krivoglaz and S. I. Pekar (Reference 6). First, the Hamiltonian of the system is written down and explained. For the purpose of calculation the statistical sum its representation by means of a continuous Feynman integral is used. This statistical sum is calculated by means of a variation process. The process of calculation is followed step by step and the thus obtained expression for lnZ (which applies in the case of any couplings and temperatures), is explicitly written down. For the domain of extremely low temperatures the expression obtained here can be simplified. Also for the effective mass of the exciton an expression is given. In con-

Card 1/2

clusion the author expresses his gratitude to N. N. Bogolyubov, Member, Academy of Sciences, USSR, and V. V. Tolmachev for the interest they displayed in this work and for their discussion of the results obtained. There are 7 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: November 29, 1957, by N. N. Bogolyubov, Member, Academy of Sciences, USSR

SUBMITTED: November 25, 1957

24(3),24(8) SOV/20-123-3-14/54

AUTHOR: Moskalenko, V. A.

TITLE: The Thermodynamics of Superconductivity
(K termodinamike sverkhprovodimosti)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 3, pp 433-436
(USSR)

ABSTRACT: In a recently published paper by N. N. Bogolyubov et al. (Ref 1) the theory of the phase transition in superconductors was investigated on the basis of the model Hamiltonian. Bardin et al. (Ref 2) developed a thermodynamics by means of an approximated variation method. I. A. Kvasnikov (Ref 3) investigated the possibility of the application of the variation principle to a model Hamiltonian of a more general nature; the results obtained confirm the results of the two aforementioned papers. In the present paper the following is shown: by means of the variation principle it is possible to determine the results obtained by the aforementioned earlier papers also in a more general form by proceeding immediately from Frelikh's Hamiltonian. For the purpose of calculating the statistical sum for an ensemble described by a large Gibbs distribution, the author introduces the chemical potential λ and investigates the Hamiltonian

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The Thermodynamics of Superconductivity

$$H = \sum_{k,\sigma} (E(k) - \lambda) a^{+}_{k,\sigma} a_{k,\sigma} + \sum_{q} \hbar\omega_q b^{+}_{q} b_{q} +$$

$$+ g \sum_{\substack{k,q,\sigma \\ q=k'-k}} (\hbar\omega_q / 2V)^{1/2} a^{+}_{k,\sigma} a_{k',\sigma} b^{+}_{q} + \text{complex conjugate terms.}$$

Here E(k) denotes the electron energy, $\hbar\omega_q$ - the phonon energy, g - the coupling constant, V - the volume of the system. Next, the statistical sum Z of the system is calculated by the operator method developed by Feynman (Ref 4). The variation principle applied here to the statistical sum is equivalent to the variation theorem represented in Lagrangian (Lagranzh) form. The author then goes over to new Fermi amplitudes α_{f0}, α_{f1} in accordance to an idea conceived by N. N. Bogolyubov by means of a canonical transformation. For the Hamilton operator the ansatz $H_0 = \sum_k \Omega(k)(\alpha^{+}_{k0}\alpha_{k0} + \alpha^{+}_{k1}\alpha_{k1})$ is used, where $\Omega(k)$

The Thermodynamics of Superconductivity

denotes the energy of the new elementary excitations. The expressions resulting from the minimum condition for the thermodynamic potential are written down. An integral equation for calculating the gap in the spectrum of the elementary excitations of the superconductor is further obtained. This equation always has a trivial solution; a nontrivial solution exists only at the temperatures $T < T_c$. The critical temperature T_c can be determined from an equation given here. Besides, a considerably simplified equation is given for the estimation of T_c. At the critical point there is no phase transition of the first kind, but there exists a jump Δc of the thermal capacity of the metal, which is different from zero. D. N. Zubarev and Yu. A. Tserkovnikov (Ref 8) recently investigated the thermodynamics of superconductivity in Frelikh's model by applying the thermodynamic perturbation theory in consideration of the renormalization of sound velocity. The author thanks N. N. Bogolyubov, Academician, as well as D. N. Zubarev, I. A. Kvasnikov, V. V. Tolmachev and Yu. A. Tserkovnikov for

Card 3/4

their valuable advice and for discussing results.
There are 8 references,6 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: June 24, 1958, by N. N. Bogolyubov, Academician

SUBMITTED: June 20, 1958

MOSKALENKO, V. A.: Master Phys-Math Sci (diss) -- "Some problems in the theory of electron-photon systems". Moscow, 1959. 12 pp (Kishinev State U, Phys-Math Faculty, Chair of Theoretical Phys, Moscow Order of Lenin and Order of Labor Red Banner State U im M. V. Lomonosov, Phys Faculty, Chair of Mechanics and Stat Phys), 150 copies (KL, No 16, 1959, 105)

24.7700

67682

SOV/126-8-4-3/22

AUTHOR: Moskalenko, V.A.

TITLE: On the Superconductivity of Metals, Taking Into Account the Overlapping of Energy Bands

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, Nr 4, 1959, pp 503-513 (USSR)

ABSTRACT: Recently, Bogolyubov (Ref 1) developed a new method for the theoretical study of superconductivity. The theory is based on the analogy between the superfluidity of a non-ideal Bose-gas and the superconductivity of the electrons in a metal. In this new theory an important part is played by electron pairs with opposite momenta and spins and lying in the neighbourhood of the Fermi surface. A similar though somewhat different approach has been used by Cooper (Ref 2) and Bardeen et al (Ref 3). However, up to the present time no quantitative studies have been published on the effect of the periodic field of the lattice on the properties of superconductors since so far the lattice was in fact replaced by a vibrating continuum. If the periodic field is taken into account two effects come into play, namely, overlapping of energy bands and the so-called umklapprozess. In the

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On the Superconductivity of Metals, Taking Into Account the Overlapping of Energy Bands

present paper only the first of these two effects is considered and the second is neglected. For simplicity, the magnetic degeneracy of p- and d- bands is neglected and the author introduces certain effective densities of electron states near the Fermi surface and certain averaged matrix elements for transitions under the action of thermal lattice vibrations. The Hamiltonian of the electron-phonon system in the case of overlapping energy bands can be obtained as a direct generalisation of the Bardeen Hamiltonian (Ref ?). The Hamiltonian used is given by Eq (1) where V is the volume of the system, s is the spin index, $E_1(\vec{k})$ is the energy of an electron in the first energy band, λ_1 is the chemical potential of this band corrected for the interaction, a_{ks}, a^+_{ks} are the annihilation and creation operators of the first band, and the intensity of electron-phonon interaction within the limits of the first band is denoted by I_1. The corresponding quantities for the second band are denoted by

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On the Superconductivity of Metals, Taking Into Account the Overlapping of Energy Bands

$E_2(\vec{k})$, λ_2, b_{ks}^+, b_{ks}, I_2 .

The summation in Eq (1) is carried out over the momentum space limited to the neighbourhood of the Fermi surface by a width $2\hbar\omega$, where h is the Planck constant divided by 2π and ω is some average phonon frequency. Using this model, a calculation is made of the thermodynamic potential, the critical temperature, singularities in thermodynamic quantities, and the energy of the ground state. It is shown that under certain conditions the d- band plays the main role in the determination of the parameters of the superconductivity state. Acknowledgements are made to S.V. Tyablikov , who suggested this topic, and D.N. Zubarev for discussions and suggestions.
There are 3 figures and 10 references, of which 4 are English and 6 are Soviet (one a translation from English).

Card 3/3

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: October 31, 1958

33099
S/058/6[illegible]/012/[illegible]/[illegible]
A058/A[illegible]

24500

AUTHORS: Tyablikov, S.V., Moskalenko, V.A.

TITLE: Frequency spectrum of the quantum field in adiabatic perturbation theory

PERIODICAL: Referativnyy zhurnal Fizika, no. 12, 1961, 31-32, abstract 12A419 (Uch. zap. Kishinevsk. un-t, 1960, no. 55, 113-127)

TEXT: The authors scrutinize the problem of interaction between particles and quantum field in an approximation of adiabatic coupling. Owing to interaction in the system there arise collective motion of translation with effective mass M and fluctuation motion of particles about the center of collective motion. On the assumption of low translation velocity, a system of equations is derived for the wave functions of particle and field, from which it is possible to determine the eigenvalues of the frequency operator of the quantum field. Cases of zero frequency and positive frequency are studied in detail, as well as the [illegible]

X

Card 1/2

33655

Frequency spectrum

zero translation velocity. The frequency spectrum is obtained in explicit form for a model in which the fluctuation motion of particles is viewed as [illegible] oscillations.

Y. Nikitin

[Abstracter's note: Complete translation]

Card 2/2

S/058/61/000/010/068/100
A001/A101

24,7700

AUTHORS: Tyablikov, S.V., Moskalenko, V.A.

TITLE: Multi-phonon scattering of polarons

PERIODICAL: Referativnyy zhurnal. Fizika, no. 10, 1961, 237, abstract 10E20 ("Uch. zap. Kishinevsk. un-t", 1960, v. 55, 129 - 141)

TEXT: The authors consider scattering of polarons by lattice defects in ionic crystals. Scattering processes are taken into account which are accompanied by production or destruction of an arbitrary number of phonons, these processes being caused by the existence of a relation between the translational motion of the polaron and fluctuation motion of the electron in the polaron potential well. The method of Bogolyubov's adiabatic perturbation theory ("Ukr. matem. zh.", 1950, v. 2, no. 2, 3) is used for the analysis. Shifts of the equilibrium positions of the nuclei and changes in frequencies of lattice oscillations during the changes in the states of polaron translational motion are taken into account. The method of calculating these parameters is developed for the case of weak non-adiabaticity. A finite expression is obtained for the probabili-

Card 1/2

Multi-phonon scattering of polarons

S/058/61/000/010/068/100
A001/A101

ty of multi-phonon scattering by a Coulomb center. The sums of lattice oscillation states, entering this expression, are calculated by means of the Green function method.

M. Krivoglaz

[Abstracter's note: Complete translation]

Card 2/2

MOSKALENKO, V.A.; ZUBAREV, D.N., otv. red.; KORKINA, A.I., tekhn. red.

[Calculation of the thermodynamic potential of quantum systems] Vychislenie termodinamicheskogo potentsiala kvantovykh sistem. Moskva, Akad. nauk SSSR, 1961. 56 p. (MIRA 15:12)
(Quantum theory)

KAUSHANSKIY, D.A., inzh.; MOSKALENKO, V.A., inzh.

Converter of a butane dehydrogenation unit. Khim.mash. no.3:3-5 My-Je '61. (MIRA 14:5)
(Butane) (Converters) (Dehydrogenation)

S/044/63/000/001/027/053
A060/A000

AUTHORS: Kasiyan, A. I., Moskalenko, V. A.

TITLE: An approximation in the theory of Green's quantum functions

PERIODICAL: Referativnyy zhurnal, Matematika, no. 1, 1963, 67, abstract 1B319 (Izv. AN MoldSSR, 1961, no. 10 (88), 27 - 32, summary in Moldavian)

TEXT: The authors investigate a system of equations for Green's temperature functions describing a system of electrons and phonons. In uncoupling the obtained system of equations one arrives at the approximation

$$\langle T(\varphi\bar{\psi}\varphi\varphi)\rangle \cong \langle\varphi\varphi\rangle\langle T\psi\bar{\psi}\rangle,$$

equivalent to replacing the peaking operator by unity in Dayson's equations. As result, a system of nonlinear integral equations is obtained for Green's phonon and electron function.

A. V. Tulub

[Abstracter's note: Complete translation]

Card 1/1

35970
S/517/61/064/000/006/006
D299/D301

24.7700

AUTHORS: Tyablikov, S. V. and Moskalenko, V. A.

TITLE: The method of Green's quantum functions in the theory of multi-phonon transitions

SOURCE: Akademiya nauk SSSR. Matematicheskiy institut. Trudy. v. 64, 1961, 267-283

TEXT: A method is proposed for calculating the characteristic function of phonon transitions; the method involves the use of Green's quantum functions. The multi-phonon transition-probability is determined (to within a factor of proportionality), by the quantity

$$J(\nu) = \sum_{(m,n)} W_m |(bn\, M_{ba}(q)\, am)|^2 \delta(E_{bn} - E_{am} - h\nu) \qquad (3)$$

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The method of Green's ...

where ν denotes either the frequency of electromagnetic radiation (in radiative transitions), or it equals zero (in non-radiative transitions); W is a weighting factor; E_{am} and E_{bm} denote the total initial and final energy of the system. Expression (3) was calculated by M. Lax (Ref. 4: The Franck-Condon principle and its application to crystals. Journ. Chem. Phys., 20, N 1, 1725-1760, 1952) by means of the Fourier transform

$$I(t) = \int_{-\infty}^{\infty} J(\nu) e^{-2\pi i \nu t} d\nu$$

$$J(\nu) = \int_{-\infty}^{\infty} I(t) e^{2\pi i \nu t} dt \qquad (5)$$

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By virtue of formulas (3) - (5), one obtains

$$I(t) = \frac{1}{\mathrm{Sp}\, e^{-\beta H_a}} \mathrm{Sp}\, e^{-\beta H_a} M^{+}_{ba}(q) e^{\frac{i}{\hbar} H_0 t} M_{ba}(q) e^{\frac{i}{\hbar} H_a t} e^{-\beta H_a} \qquad (10)$$

where M_{ba} is the matrix element of the quantum transition. If M_{ba} is a c-number (the Condon approximation), then the characteristic function is

$$I(t) = |M_{ba}|^2 S(t) \qquad (11)$$

where

$$S(t) = \langle U(t) \rangle;$$

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The method of Green's ...

$$U(t) = e^{\frac{i}{\hbar}H_a t}\, e^{-\frac{i}{\hbar}H_b t} \qquad (12)$$

If M_{ba} is a linear form:

$$M_{ba} = \sum_{(\mu)} (M_\mu b_\mu + \tilde{N}_\mu \tilde{b}_\mu) \qquad (13)$$

then the characteristic function is

$$I(t) = \sum_{(\mu_1,\mu_2)} \left[\tilde{M}_{\mu_1} M_{\mu_2} G_1(\mu_1,\mu_2|t) + \tilde{M}_{\mu_1} \tilde{N}_{\mu_2} F_2(\mu_1,\mu_2|t) + \right.$$

Card 4/8

The metnod of Green's ...

$$+ N_{u_1} M_{u_2} F_2(\mu_1, u_2 | t) + \overset{+}{N}_{u_2} N_{\mu_1} G_2(\mu_1, u_2 | t)] \qquad (17)$$

(where G_1, G_2, F_1 and F_2 are given by expressions involving b_u and $U(t)$). The proposed method involves calculating (11) and (17) by means of Green's quantum functions. The method can be also extended to more complex M_{ba}. Three temperature-time Green's functions are introduced; the first of them is

$$D(u_1, \tau_1 | \mu_2, \tau_2) = \frac{\langle P | b_{u_1}(\tau_1) \overset{+}{b}_{u_2}(\tau_2) U'_\alpha(t) \rangle}{S'_\alpha(t)} \qquad (22)$$

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The method of Green's ...

These functions differ from the ordinarily used functions; they have no time-homogeneity. In addition to the functions (22), the functions

$$\varphi(\mu, \tau|) = \frac{\langle P[b_\mu(\tau)\, U'_*(t)]\rangle}{S'_*(t)};$$

$$\varphi(|\mu, \tau) = \frac{\langle P[b_\mu(\tau)\, U'_*(t)]\rangle}{S'_*(t)}.$$

are introduced. Calculation of S'(t) reduces to determining the functions (22) and (23), followed by addition and integration. The functions D are sought in the form of sums of Ψ and Δ (where the new functions Δ satisfy a system of equations). Thus, a closed finite system of equations is obtained for the Green functions. With small t, the functions Ψ and Δ are calculated by an approximate me-

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The method of Green's ...

thod (iteration). The obtained approximate formulas determine I(t) in the Condon approximation. The spectral moments of the optical bands can be exactly calculated, i.e. the formulas for the first moments of J(ν) take into account the displacement of the oscillators from the equilibrium position, as well as the change in phonon frequency during the electronic transitions. The obtained formulas for the moments are in agreement with the results of Ref. 4 (Op. cit.). Taking into account the change in phonon frequencies, leads to an increase in the half-width of the spectral curve; the half-width of the absorption and emission curves may differ (which is not the case if the frequency effect is neglected). By setting $\vartheta = 0$ in Eqs. (3) and (5), one obtains the function J(0) which determines the probability of non-radiative transitions. After calculations, an approximate expression is obtained for J(0). The above results are extended to more complex M_{ba}. The formulas thereby obtained can be interpreted by the Fock-Hartree method. There are 8 references: 5 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: Kun

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TYABLIKOV, S.V.; MOSKALENKO, V.A.

Method of quantum Green functions in the theory of optical bands in crystals. Dokl. AN SSSR 139 no. 4:851-854 Ag '61. (MIRA 14:7)

1. Matematicheskiy institut im. V.A. Stekova AN SSSR i Laboratoriya teoreticheskoy fiziki Moldavskogo filiala AN SSSR. Predstavleno akademikom N.N. Bogolyubovym.
(Potential, Theory of) (Crystal lattices)

KOVARSKIY, V.A.; MOSKALENKO, V.A.

Thermodynamic theory of perturbation for a local center. Izv. AN Mold. SSR no.5:47-59 '62. (MIRA 18:3)

MARTIN, P.[Martin, Paul]; SHVINGER, Yu.[Schwinger, Julian]; MOSKALENKO, V.A.[translator]; KASIYAN, A.I.[translator]; BONCH-BRUYEVICH, V.L.[translator]; ZHABOTINSKIY, Ye.Ye., red.; DUDAYEVA, G.M., tekhn. red.

[Theory of many-particle systems. Brownian motion of a quantum oscillator]Teoriia sistem mnogikh chastits. Brounovskoe dvizhenie kvantovogo ostsilliatora [By] Julian Schwinger. Moskva, Izd-vo inostr. lit-ry, 1962. 167 p. (MIRA 15:12)
(Quantum field theory) (Potential, Theory of)

L 16875-63 EPF(n)-2/EWT(1)/BDS AFFTC/ASD/SSD Pu-4 JW
ACCESSION NR: AR3006299 S/0058/63/000/007/B006/B006

SOURCE: RZh. Fizika, Abs. 7B50 59

AUTHOR: Moskalenko, V. A. 21

TITLE: Calculation of thermodynamic potential of quantum systems

CITED SOURCE: Sb. I-ya nauchn. sessiya AN MoldSSR. Kishinev, Shtiintsa, 1962, 145-151

TOPIC TAGS: quantum system, thermodynamic potential, electron phonon system, Green's function, vertex operator

TRANSLATION: It is shown that the principal results of the thermodynamic perturbation theory can be obtained by considering skeleton vacuum, self-energy, and polarization diagrams of the electron-phonon system and by setting the total Green's functions in correspondence with all the lines of these diagrams, and the vertex

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operator in correspondence with the right vertices of these diagrams. It was noted that it is possible to include in the theory the Coulomb interaction of the electrons, by replacing the zero Green's function of the phonon $D_{ph}(x)$ by the boson function $D(x)$:

$$D(x) = D_{ph}(x) - v(x)\,\delta(\tau)$$

where $v(x)$ is the energy of the Coulomb interaction.

DATE ACQ: 15Aug63 SUB CODE: PH ENCL: 00

Card 2/2

S/181/62/004/010/020/063
B108/B104

AUTHOR: Moskalenko, V. A.

TITLE: Determination of the critical temperature of a superconductor

PERIODICAL: Fizika tverdogo tela, v. 4, no. 10, 1962, 2770 - 2776

TEXT: The critical temperature of a superconductor is calculated on the basis of Fröhlich's Hamiltonian supplemented by a term which takes account of the Coulomb interaction between the electrons. Since the binding energy of pairs of electrons or holes with opposite spin orientations and momenta near the Fermi surface vanishes at the critical temperature, this point is found by solving the Bethe-Salpeter equation for zero binding energy and total momentum of the pairs. The critical temperature is in essential the eigenvalue of this equation. With the denotations

$$U(k|\Omega_n) = U(p_F|0)\,\varphi(k|\Omega_n), \tag{46}$$

$$\tilde{p} = \frac{mp_F}{2\pi^2}\,\bar{B}(p_F, p_F|0), \tag{47}$$

$$\tilde{p}\ln\tilde{\omega} = \sum_{i=1}^{\infty} A_i(p_F|0); \tag{48}$$

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the solution assumes the form

$$\frac{1}{\beta} = kT_e = \frac{\omega}{2} \exp\left[-\frac{1}{\beta} - \int_0^\infty \frac{\ln y}{\operatorname{ch}^2 y}\, dy\right], \quad (49),$$

$$\varphi(k|\Omega_n) = \frac{B(kp_F|\Omega_n)}{B(p_Fp_F|0)} + \sum_{i=1}^{l} \left(A_i(k,\Omega_n) - \frac{B(kp_F|\Omega_n)}{B(p_Fp_F|0)} A_i(p_F|0)\right). \quad (50)$$

where $\Omega_n = (2n+1)\pi/\beta$, ω_D is the Debye frequency. These solutions are valid for $\tilde{Q} > 0$.

ASSOCIATION: Institut fiziki i matematiki AN Mold. SSR, Kishinev
(Institute of Physics and Mathematics AS MolSSR, Kishinev)

SUBMITTED: May 18, 1962

B/540

S/020/62/147/006/016/034
B104/B180

AUTHOR: Moskalenko, V. A.

TITLE: A superconductivity criterion

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 147, no. 6, 1962, 1340-1343

TEXT: The article aims to ascertain the part played by the Coulomb interaction of metal electrons in the process of establishing the superconducting state, ignoring a number of other important properties of the metals. The interaction between the electron or hole pairs is described by means of a Bose quantum field; the binding energy of the pairs is determined according to Gell-Mann and Low (Phys. Rev., 84, 350 (1951)). It is shown that the Coulomb interaction is screened and, moreover, leads to renormalization of the phonon frequency and the bare coupling constant. Assuming the total momentum of the pair to be zero, it is shown that the energy of the collective particle pair excitation is imaginary. This corresponds to instability of the normal state of the metal, i.e. the superconducting state occurs. As superconductivity criterion $\tilde{Q} > 0$ is obtained, where

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$$\tilde{\rho} = -\frac{mp_F}{2\pi^3} Z^2(p_F) B(p_F p_F | 0).$$

$$(1-\rho\eta_m)^{-2}\left[a\rho(1-\rho\eta_m) - \rho' \ln\left(1+\frac{1-\rho\eta_m}{\rho'\eta_m} a^2\right)\right] > 0; \qquad (32)$$

is obtained as sufficient criterion for superconductivity where criterion $\omega_e^2(q) \geq 0$ for the stability of the crystal lattice is satisfied for all $q < q_m$. q_m is the maximum Debye momentum. Further

$$\omega_e^2(q) = \omega^2(q)\,(x^2 + \eta(x)(\rho' - \rho x^2))\,(x^2 + \rho'\eta(x))^{-1}; \qquad (20) \text{ and}$$

$$\eta(x) = -\frac{2\pi^2 T'_F}{p_F^2} \Pi(2p_F x; 0) = 1 + \frac{1-x^2}{2x} \ln\frac{1+x}{1-x}; \qquad (22)$$

$$\rho = p_F^2 g^2 / 2\pi^2 T'_F, \quad \rho' = e^2 / 2\pi T'_F, \quad x = q/2p_F. \qquad (23).$$

η_m is the $\eta(x)$ minimum. The other symbols are taken from the Gell-Mann study, and from works by V. M. Galitskiy, A. B. Migdal (ZhETF, 34, 139 (1958)), J. M. Luttinger (Phys. Rev., 121, 942 (1961)) and N. N. Bogolyubov (Kvazisredniye v zadachakh statisticheskoy mekhaniki, Rotoprint Ob"yedinenn. inst. yadern. issled.-Quasimeans in problems of statistical mechanics, Rotoprint of Joint Institute of Nuclear Research, Dubna, 1961).

ASSOCIATION: Institut fiziki i matematiki Akademii nauk MSSR (Institute of Physics and Mathematics of the Academy of Sciences MSSR)

PRESENTED: May 28, 1962, by N. N. Bogolyubov, Academician

SUBMITTED: May 24, 1962

MOSKALENKO, V.A.; TURBIN, B.I., doktor tekhn. nauk, prof., retsenzent; MAKLAKOV, N.A., inzh., red.; KOZLOV, A.P., red.izd-va; MAKAROVA, L.A., tekhn. red.

[Mechanisms] Mekhanizmy. Moskva, Mashgiz, 1963. 238 p. (MIRA 16:4)

(Mechanisms)

S/181/63/005/002/051/051
B102/B186

AUTHORS: Marinchuk, A. Ye., and Moskalenko, V. A.

TITLE: Crystal lattice thermodynamics

PERIODICAL: Fizika tverdogo tela, v. 5, no. 2, 1963, 575 - 580

TEXT: On the basis of the graph technique and the temperature Green functions the thermodynamic potential of a uniform lattice is calculated, cubic and quadruple anharmonisms being taken into account. For the system considered, whose Hamiltonian is given by

$$H = H_0 + H_i, \quad (1)$$

$$H_0 = \sum_k \hbar\omega_k (a_k^+ a_k + 1/2), \quad (2)$$

$$H_i = \frac{1}{3!}\sum_{klm} V_{klm}\rho_k\rho_l\rho_m + \frac{1}{4!}\sum_{klmn} W_{klmn}\rho_k\rho_l\rho_m\rho_n, \quad (3)$$

where $\rho_k = a_k - a_{-k}^+$, the thermodynamic potential $\Psi - \Psi_0 - (1/\beta)\langle U(\beta)\rangle_c$ is finally obtained as

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Crystal lattice ...

$$\Psi - \Psi_0 = -\frac{1}{\beta}\int_0^1 \frac{d\lambda}{\lambda}\int_0^\beta\int_0^\beta d\tau_1 d\tau_2 \sum_{kjj'} D_k^{jj'}(\tau_1-\tau_2)\times$$

$$\times\left\{\frac{1}{3}\Pi_{ik}^{jj'}(\tau_1-\tau_2)+\frac{1}{4}\Pi_{ik}^{jj'}(\tau_1-\tau_2)\right\}. \qquad (13)$$ or

$$\Psi - \Psi_0 = -\frac{1}{\beta}\int_0^1 \frac{d\lambda}{\lambda}\sum_{\omega_n}\sum_{kjj'} D_k^{jj'}(\omega_n)\left\{\frac{1}{3}\Pi_{ik}^{jj'}(\omega_n)+\frac{1}{4}\Pi_{ik}^{jj'}(\omega_n)\right\}$$ (14). Ψ_0 is the lattice potential in harmonic approximation and $U(\beta)$ is the evolution operator $U(\beta) = T\exp\left\{-\int_0^\beta H_i(\tau)d\tau\right\}$, $\beta = 1/T$, c is the coherence index; j is the number of the lattice vibration branch,

$D_{kk'}(\tau-\tau') = \delta_{k,-k'} D_k^{jj'}(\tau-\tau') = \langle T\varphi_k(\tau)\varphi_{k'}(\tau')U(\beta)\rangle_c$. (8), the polarization operator satisfies the Dyson equation $\Pi_k^{jj'}(\tau-\tau') = \Pi_{ik}^{jj'}(\tau-\tau') + \Pi_{ik}^{jj'}(\tau-\tau')$, (9) whose components are explicitly given. The variational theorems for Ψ are obtained as $\frac{\delta}{\delta D_k}\langle U(\beta)\rangle_c = 0$ and $\frac{\delta}{\delta \Pi_k}\langle U(\beta)\rangle_c = 0$. There are 4 figures. The

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Crystal lattice ...

S/181/63/005/002/031/051
B102/B186

Most important English-language references are: A. A. Maradudin et al. Ann. Phys. 15, 337, 360, 1961; T. Matsubara, Progr. Theor., Phys. 14, 351, 1955; J. M. Luttinger, J. C. Ward, Phys. Rev. 118, 1417, 1960; A. Klein, Phys. Rev. 121, 950, 957, 1961.

ASSOCIATION: Institut fiziki i matematiki AN MSSR, Kishinev (Institute of Physics and Mathematics AS MSSR, Kishinev)

SUBMITTED: September 17, 1962

Card 3/3

S/020/63/148/002/017/037
B191/B102

AUTHOR: Moskalenko, V. A.

TITLE: Consideration of Coulomb interaction in superconductivity thermodynamics

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 148, no. 2, 1963, 307-310

TEXT: Since Coulomb interaction between the electrons has hitherto not been considered explicitly, a study is made here of its effect on certain parameters of a superconductor. Starting from the Hamiltonian

$$H = H_0 + H_i; \qquad H_i = \sum_\sigma \int d\mathbf{x} \psi^+(\mathbf{x}\sigma)\psi(\mathbf{x}\sigma)\Phi(\mathbf{x});$$

$$H_0 = \sum_{k\sigma} T(k) a^+_{k\sigma} a_{k\sigma} + \sum_q \omega_q b^+_q b_q + H_b; \qquad \Phi(\mathbf{x}) = g\varphi(\mathbf{x}) + e\chi(\mathbf{x}).$$

as previously derived (DAN 147,6,1962), the quantum field assumed to obey the condition

$$D_b(x - x') = \langle T\chi(x)\chi(x')\rangle = -v(\mathbf{x} - \mathbf{x}')\delta(\tau - \tau'). \qquad (5)$$

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Consideration of Coulomb interaction ...

is introduced, whereupon the Dyson relations for G(x-x') and P(x-x') are derived from the single-electron Green functions. For one of the Green vertex functions the mass and polarization operators are obtained explicitly in Dyson representation. These conditions lead to an expression for the thermodynamic potential. After introducing the pulse representation, the simplest form of the vertex operator Γ is used for making approximate calculations (Λ and Δ being assumed to be zero). The usual designations are employed. An equation is obtained from which $\Sigma(k_F\ 0)$ is derived as a function of the parameters β and $\tilde{\rho}$. $\tilde{\rho}$ is given by

$$\tilde{\rho} = \frac{k_F^2}{2\pi^2}(\xi_F')^{-1}\bar{B}(k_F k_F|0), \qquad \tilde{\rho}\ln\tilde{\omega} = \sum_{l=1}^{\infty} F_l(k_F|0). \tag{20}$$

This equation leads to $\Sigma(k_F\ 0)$ for $\beta = \infty$ (temperature of absolute zero)

$$\Sigma(k_F|0) = 2\tilde{\omega}\exp(-1/\tilde{\rho}). \tag{23}$$

from which

$$\frac{1}{\beta_c} = kT_c = \frac{\tilde{\omega}}{2}\exp\left(-\frac{1}{\tilde{\rho}} - \int_0^{\infty}\frac{\ln t}{\mathrm{ch}^2 t}\,dt\right) \approx 1{,}134\,\tilde{\omega}\exp(-1/\tilde{\rho}). \tag{24}$$

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is obtained for $\Sigma = 0$ (critical temperature). These expressions are analogous to formulas obtained without considering Coulomb interaction and hold for positive and sufficiently small values of $\tilde{q}$.

ASSOCIATION: Institut fiziki i matematiki Akademii nauk MSSR (Institute of Physics and Mathematics of the Academy of Sciences MolSSR)

PRESENTED: June 25, 1962, by N.N. Bogolyobov, Academician

SUBMITTED: June 20, 1962

PALISTRANT, M.Ye.; MOSKALENKO, V.A.

Theory of the optical bands of F-centers. Opt. i spektr. 17 (MIRA 17:12)
no.5:728-733 N '64.

POLISTCHUK, M.Ye.; MOSKALENKO, V.A.

Variational principle in the thermodynamics of [illegible]
systems. Fiz. met. i metalloved. 17 no.6:827-833 [illegible]
(MIRA [illegible]

1. Institut fiziki i matematiki AN Moldavskoy SSR.

BELETSKAYA, I.P.; FEDOROV, L.A.; MOSKALENKO, V.A.; REUTOV, O.A.

Nuclear magnetic resonance spectrum of dibenzyl mercury. Izv. AN SSSR. Ser. khim. no.5:933 '65. (MIRA 18:5)

1. Moskovskiy gosudarstvennyy universitet im. Lomonosova.

MOSKALENKO, V.A., inzh.

Automatic digging of trenches and drains with a given inclination.
Stroi. i dor. mash. 10 no.3:6-9 Mr '65. (MIRA 18:5)

L 4507-66 EWT(1) IJP(c) GG

ACC NR: AP5024697 SOURCE CODE: UR/0056/65/049/003/0770/0780

AUTHOR: Moskalenko, V. A.; Palistrant, M. Ye.

ORG: Moscow State University (Moskovskiy gosudarstvennyy universitet); Mathematical Institute of the Academy of Sciences, Moldavian SSR (Matematicheskiy institut Akademii nauk, Moldavskoy SSR)

TITLE: Determination of the critical temperature of an impure superconductor by the use of the two-band model

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 3, 1965, 770-780

TOPIC TAGS: superconductor, impurity, critical temperature, energy band

ABSTRACT: A theoretical investigation was made of the influence of a nonmagnetic impurity on the superconducting transition temperature of a metal with overlapping energy bands. Since the single-band model approximation was not applicable, a method developed earlier by one of the authors (V. A. Moskalenko, FMM, 8, 503, 1959) and also by Suhl et al. (Phys. Rev. Lett. 3, 552, 1959) was applied. A weak electron-phonon coupling was assumed, and single-particle green-function elements which are nondiagonal to the band indices were neglected. It was demon-

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ACC NR: AP5024697

strated that, due to interband electron scattering on the impurity, a significant change occurs in the magnitude of the critical temperature. For the range of small impurity concentrations, a lowering of the transition temperature was predicted. The results can be applied to d- and s-band overlapping in transition metals and to s- and p-band overlapping in metals of the main groups in the periodic system. Orig. art. has: 44 formulas. [ZL]

SUB CODE: EM,NP/SUBM DATE: 18Nov64/ ORIG REF: 006/ OTH REF: 004

ATD PRESS: 4130

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0004

L 26630-66 EWT(m)/EWP(w)/T/EWP(t) JD/JG

ACC NR: AP5025326 SOURCE CODE: UR/0126/65/020/003/0465/0467

AUTHOR: Bol'shutkin, D. N.; Krot, Yu. Ye.; Moskalenko, V. A.

ORG: Physico-Technical Low Temperature Institute AN USSR (Fiziko-tekhnicheskiy institut nizkikh temperatur AN USSR)

TITLE: Study of lanthanum and neodymium hardness as a function of temperature between 77°K and 293°K

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 3, 1965, 465-467

TOPIC TAGS: Lanthanum, neodymium, hardness, temperature dependence, cryogenic effect, phase transition, liquid nitrogen, induction furnace, vacuum furnace

ABSTRACT: The system studied consisted of 99.3% lanthanum containing 0.3% Ce; 0.1% Nd; 0.2% Pr; 0.02% Fe, and neodymium containing 99.2% neodymium and $<0.5\%$ Pr, $<0.1\%$ Sm, $<0.002\%$ Ca, $<0.05\%$ Fe. Samples were prepared in a vacuum induction furnace. Measurements of hardness were made by means of Vikker's apparatus equipped with a low temperature modification. Liquid nitrogen was used to obtain temperatures in the range of 77-293°K. A heater was attached for the evaporation of liquid nitrogen. It was found that 40% deformation at room temperature increased the hardness of both metals by 60% as compared to the

UDC: 620.178.15

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