Country   :   CZECHOSLOVAKIA
Category   :   Forestry. Forest Cultures.   K

Abs Jour   :   Rzh3iol., No 6, 1959, No 24742

Author   :   Kriz, V.; Chlebek, M.; Pekar, M.
Inst   :   —
Title   :   Glandular Ailanthus from Seed-Growing and
                Forest-Culture Point of View.
Orig Pub   :   Lesn. prace, 1957, 36, No. 3, 116-118

Abstract   :   Experiments on the preservation and sowing of
                ailanthus seeds in Czechoslovakia indicated
                that the highest germination is attained at
                the vernal sowing of stratified (84 days)
                seeds. The preservation of the seeds in win-
                tertime in small bags in a cool place produces
                no positive results. Good results were obtai-
                ned by the autumnal sowing of the seeds imme-
                diately after the harvest. — M. K. Bush

Card   :   1/1

PEXAR, N.A.

USSR/Electricity - Resistance of Metals   Apr 52

"Resistance of Metals at High Current Density in a Pulse System," L. A. Ignat'yeva
and S. G. Kalashnikov

"Zhur Eksper i Teoret Fiz" Vol XXII, No 4, pp 395-399

Elect resistance of thin wires of gold, silver, copper, platinum and tungsten was
studied for current pulses of duration of the order of tens of microseconds, and
for current densities up to 5.10^6 A/sq cm, depending on energy introduced into
the wires. It was found that in the case of gold, silver and copper the
resistance coincides with that down to low currents. In case of platinum
and tungsten for current densities over 1.10^6 A/sq cm the resistance increases
rapidly. The rise increases with a lowering of temp. Indebted to N. N. Sobolev and
N. A. Pekar. Received 20 Jul 51.

                                                          215T21

KLEBANOV, M.A., prof. (Kiyev); Prinimali uphastiye: BEREZITSKIY, A.V. (Kiyev);
PEKAR', P.P.; SAVENKOV, D.I.; TARANENKO, M.I.; MELAMED, M.A.;
BORSHCHEVSKIY, M.L. (Odessa); VIL'NYANSKIY, L.I. (Khar'kov);
SOKOLOVA, Yu.I. (Khar'kov); ABERMAN, A.A.; KULAKOVA, S.A. (Simoferopol');
FUKS, R.A. (Dnepropetrovsk); BEZNOSOVA, Zh.A, (Vinnitsa); KUKLINA,
N.P. (Zhitomir); SIDORENKO, G.P. (Chernovitsy); D'YACHENKO, N.S.
(Stanislav).

Reduction in the periods of therapeutic pneumothorax following its
use in combination with antibacterial therapy. Vrach. delo no.12:
36-40 D '60.   (MIRA 14:1)

1. Ukrainskiy institut tuberkuleza imeni F.G.Yanovskogo (for Klebanov).
2. Dispanser Yugo-Zapadnykh zheleznykh dorog (for Aberman).
       (PNEUMOTHORAX)   (TUBERCULOSIS)

PEKAR', P.P., starshiy nauchnyy sotrudnik; SHEVCHENKO, L.A. (Bobrinets)
GUN', S.I. (Genichesk); RYBINA, N.A. (Novo-Ukrainka);
PASECHNIKOVA, I.G. (Bereznigovatoye); MATVEYEVA, Ye.M.
(ARBUZINKA); PODOL'SKIY, L.G. (Starokazatskoye); GMISHAYEVA,
A.P. (Peschanoye); PYATOVA, A.S. (Varvarovka)

Efficacy of artificial pneumothorax in pulmonary tuberculosis
patients under rural conditions. Probl. tub. no.8:71-75'62.

(MIRA 16:9)

PEKAR', P.I.

22063   Pekar', P. I.   Effektivnost' Vosstanovlennogo pnevmotoraksa. Uchen. Za iski
Nauch Issled. In-ta tuberkuleza v Odesse, Ch. 7, 194?, r 63-66.

SO: Letopis' Zhurnal'nykh Statey, No. 7,   oslva, 1949.

PEKER', A.I.

22064   Peker', A.I. Effektivnost' Sanatornogo Rezhima i Kollapsoterapi. ... ochu.o.o
tuberkuleza. (Kratkoye Soderzhaniye Dano. dissertatsii,. ... Me'kn. ... La'ishi
Nauch--issled. In-ta tuberkuleza v Odessa, 7h. 2, 194?, s 111-?..

SC: Letopis' Zhurnal'nykh Statey, No. 29, Moskva, 194?.

PEKAR', P. P.

"A Recovered Pneumothorax Case," Prob. Tuber., No. 2,

1949. Cand. Med. Sci., Uzbek Sci. Res. T. B. Inst.,

-c1949-.

PETAR, P.P.

Length of therapeutic application of unilateral artificial pneumothorax.
Probl. tuberk., Moskva no. 5:41-45 Sept-Oct 1952.   (CLML 23:5)

1. Candidate Medical Sciences. 2. Of Odessa Scientific-Research In-
stitute for Tuberculosis (Director -- Candidate Medical Sciences M. A.
Brusnikin).

ROZENBERG, G.I., kand.med.nauk; PEKAR', P.P., kand.med.nauk;
ZELENKO, Ye.F., kand.med.nauk; SOBOLEVA, L.I., nauchnyy sotrudnik;
LUCHINSKAYA, L.V., nauchnyy sotrudnik

Treatment of pulmonary tuberculosis with metazid and larusan.
Pat.,klin.i terap.tub. no.8:126-130 '58.   (MIRA 13:7)

1. Iz Kiyevskogo i Odesskogo nauchno-issledovatel'skikh insti-
tutov tuberkuleza.
          (TUBERCULOSIS)   (ISONICOTINIC ACID)

TARANENKO, M.I.; LUCHINSKAYA, L.V.; PEKAR', P.P.; TSITKO, T.M.

Effectiveness of the treatment of tuberculosis, with antibacterial
and hormone preparations according to clinical and experimental
data. Probl. tub. 42 no.12:39-44 '64.

(MIRA 18:8)

1. Kafedra tuberkuleza (zav. - dotsent M.I.Taranenko) Odesskogo
meditsinskogo instituta imeni N.I.Pirogova i Odesskiy nauchno-
issledovatel'skiy institut tuberkuleza (direktor M.A.Brusnikin).

USSR/Human and Animal Morphology - Normal and Pathological.   S
                Circulatory System.

Abs Jour   : Ref Zhur Biol., No 11, 1958, 50251

Author   : Pekar', B.A.

Inst   : Stalinabad Medical Institute

Title   : On the Problem of Fields of the Overlapping of Blood
               Vessels in the Basal Ganglia and the Internal Capsule.

Orig Pub   : Tr. Stalinabadsk. med. in-ta, 1955, 14, 75-79

Abstract   : A study of cerebral blood vessels in men ranging in age
               from 16 to 70 years was carried out by means of simulta-
               neous injection of variously stained gelatino-glycerin
               mass into the anterior (ACA), medial (MCA) and posterior
               (PCA) cerebral arteries. Branches of ACA are distribu-
               ted in the capitulum of the caudatum and in the anterior
               part of the lenticular nucleus, branches of MCA in the

Card 1/2

PEKAR, L., inzh.-fizik

Three mysteries of light. Znan. ta pratsia no.10:22-23 O '62.
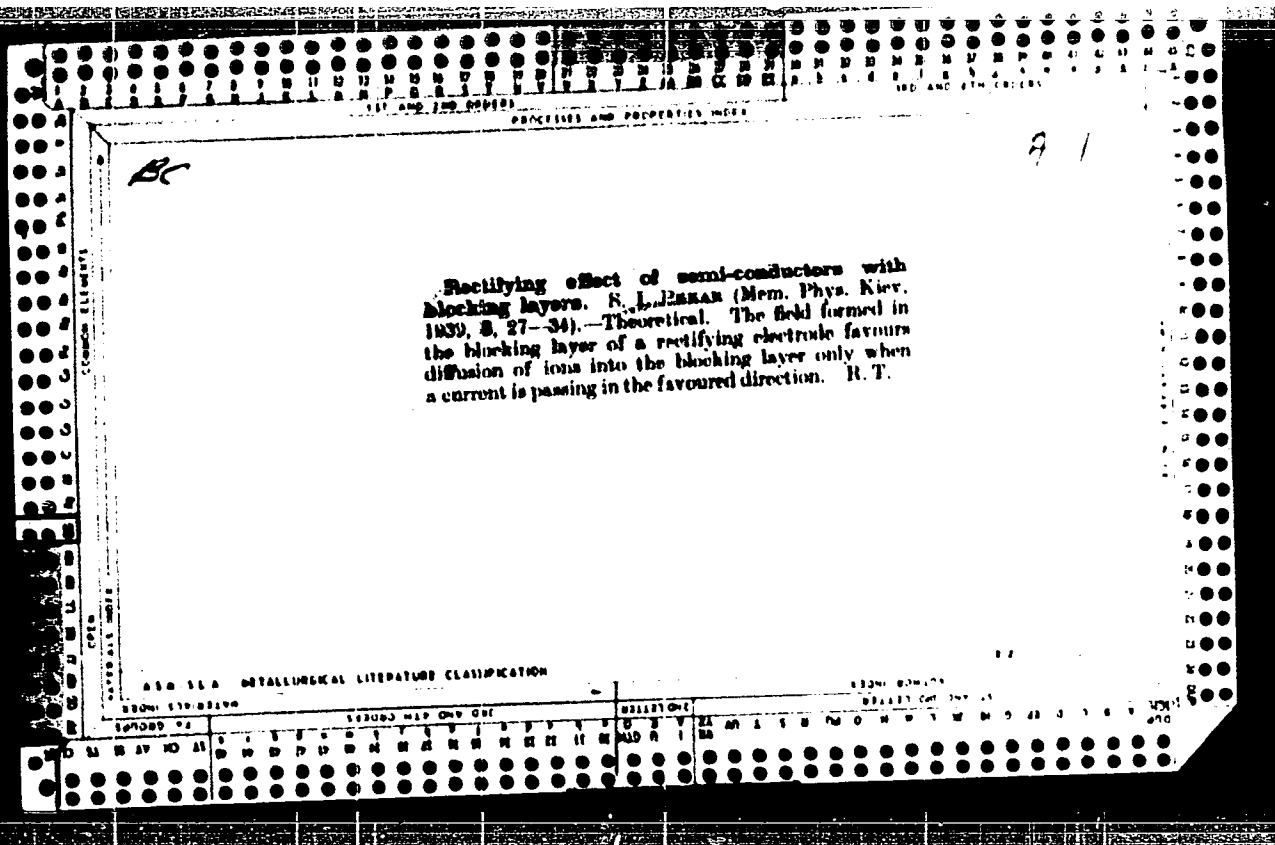   (MIRA 15:10)

(Optics, Physical)

Distribution of electron velocities in the plasma of a discharge. S. I. Pekar. Bull. acad. sci. U. R. S. S., Classe sci. math. nat., Sér. phys. 1940, 167-73 (in English, 173-4). The case of an ideal homogeneous plasma is considered. Influence of the walls (recombination, diffusion, etc.) is not taken into consideration. Under plasma conditions Coulomb's interaction of the electrons leads to Maxwell's distribution of electron energies. The inelastic collisions of electrons with atoms distort somewhat this distribution of energies creating a shortage of high-speed electrons on a surplus of low-speed electrons. Elastic collisions of electrons with atoms and with ions are not essential to the energy distribution. At sufficiently high pressures the elastic collisions render the function of impulses more symmetric. In the future it is proposed to take up the case of linear increase of the probability with the energy of the electron.   W. R. Henn

A S D · S C A   METALLURGICAL LITERATURE CLASSIFICATION

Rectifying effect of semi-conductors with blocking layers. S. I. Pekar (Mem. Phys. Kiev, 1939, **3**, 27–34).—Theoretical. The field formed in the blocking layer of a rectifying electrode favours diffusion of ions into the blocking layer only when a current is passing in the favoured direction.   R. T.

PROCESSES AND PROPERTIES INDEX

A 53

283. Rectifying effect of semiconductors with blocking layers. S. Pekar. *J. of Exp. and Theor. Phys. U.S.S.R.,* 9, 8, pp. 834–839, 1939. *In Russian.* — The author develops a theory of the rectifying action of semiconductors with blocking layers. The distribution of potential and space charge in a semiconductor carrying a current is discussed, and the characteristic curve and coefficient of rectification are deduced. The order of magnitude of the frequency at which frequency dependence of rectification should occur is calculated. The theory is found to agree well with experiment.   D. S.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

Ca

3

Distribution of electron velocities in the discharge plasma. S. I. Pekar, J. Expl. Theoret. Phys. (U. S. S. R.) 9, 1015-25(1939); cf. C. A. 33, 07(Kp.—P. derives a distribution function for the electron velocities in an ideal homogeneous plasma, and integrates the kinetic equation for the stationary case, taking into account the Coulomb forces of interaction of the electrons, the elastic and inelastic collisions of electrons with atoms, and the electric field.   F. H. Rathmann

Chair of Electrophysics and Theoretical Physics, Kiev State U.

537.311.33   1210

The Metal-Semiconductor Contact and the Contact Potential Drop.- S. I. Pekar. (*Bull. Acad. Sci. U.R.S.S., sér. phys.*, 1941, Vol. 5, Nos. 4/5, pp. 422-433. In Russian with English summary.) A theory of the metal-semiconductor contact is considered which differs from those previously given by Mott and Johnson by taking into account the redistribution of the concentration of conducting electrons in a semiconductor caused by the passage of the current. Contact potential differences and their dependence on current density could thus be calculated. The experimental data of Lyaschenko, Tschernikova & Trivaschova (1210 above) confirm the theory.

PEKAR, S. I.

"A Theory of the Jahn-Teller Effect in a Contact between Semi-Conductors...,"
Zhur. Eksper. i Teoret. Fiz., 11, No. 1-3, 1 11.

State University, Kiev.

PEKAR, S. I.

"The Electric Conductivity of Thin Semi-Conductor Plates in the ...,"
Zhur. eksper. i teoret. fiz., 11, ..., 1941.

Inst. Physics, AS, Ukr SSR, Kiev.

PEKAR, S. I.

"Application of ... ... a Dielectric," Izv. ... ...,

... ...

PA 54T90

PEKAR, S.

USSR/Physics   Jul/Aug 1946
    Crystals
    Electrons

"Local Quantum States of an Electron in an Ideal Ionic
Crystal," S. Pekar, Inst Phys, Acad Sci Ukrainian SSR;
Kiev State U, 6 pp

"Journal of Physics USSR" Vol X, No 4

Study of the local states of an electron in an ideal
crystal: proof of stability; calculation of basic
parameters, energy of heat dissociation and long-wave
limit of photoeffect. Received, 19 Nov 1945.

54T90

PA 54T87

PEKAR, S.

USSR/Physics   Jul/Aug 1946
    Polarization
    Dielectrics

"Autolocalization of an Electron in an Inertially
Polarizing Dielectric Medium," S. Pekar, Inst Phys,
Acad Sci Ukrainian SSR; Kiev State U, 4 pp

"Journal of Physics USSR" Vol X, No 4

Study of the stationary local quantum states of
electrons in a homogeneous, continuous, inertially
polarizing dielectric, in which states the potential
well is due to the dielectric polarization of the
medium by the electron itself. Equations for the
ground state of the electron and the Eigenfunction.
Received, 19 Nov 1945.

54T87

PEKAR, S. I.

"The Method of Effective Mass for the Electron Motion in Crystals," Journal of Experimental and Theoretical Physics, 1?, No 6, 1946

Phys. Inst., AS Ukr SSR, and Kiev State U.

PEKAR, S.   PA 13747

USSR/Dielectrics   Apr 1946
    Electrons

"Auto-localization of the Electron in a Dielectric
Inertially Polarizing Medium," S. Pekar, 8 pp

"Zhur Eksp i Teor Fiz" Vol XVI, No 4

Discussion of quantum stationary local states of
electrons in a homogeneous continuous dielectric
polarizable medium, and determination of the energy
and psi-function of the ground state of the electron.

                                                13T47

PA 13T48

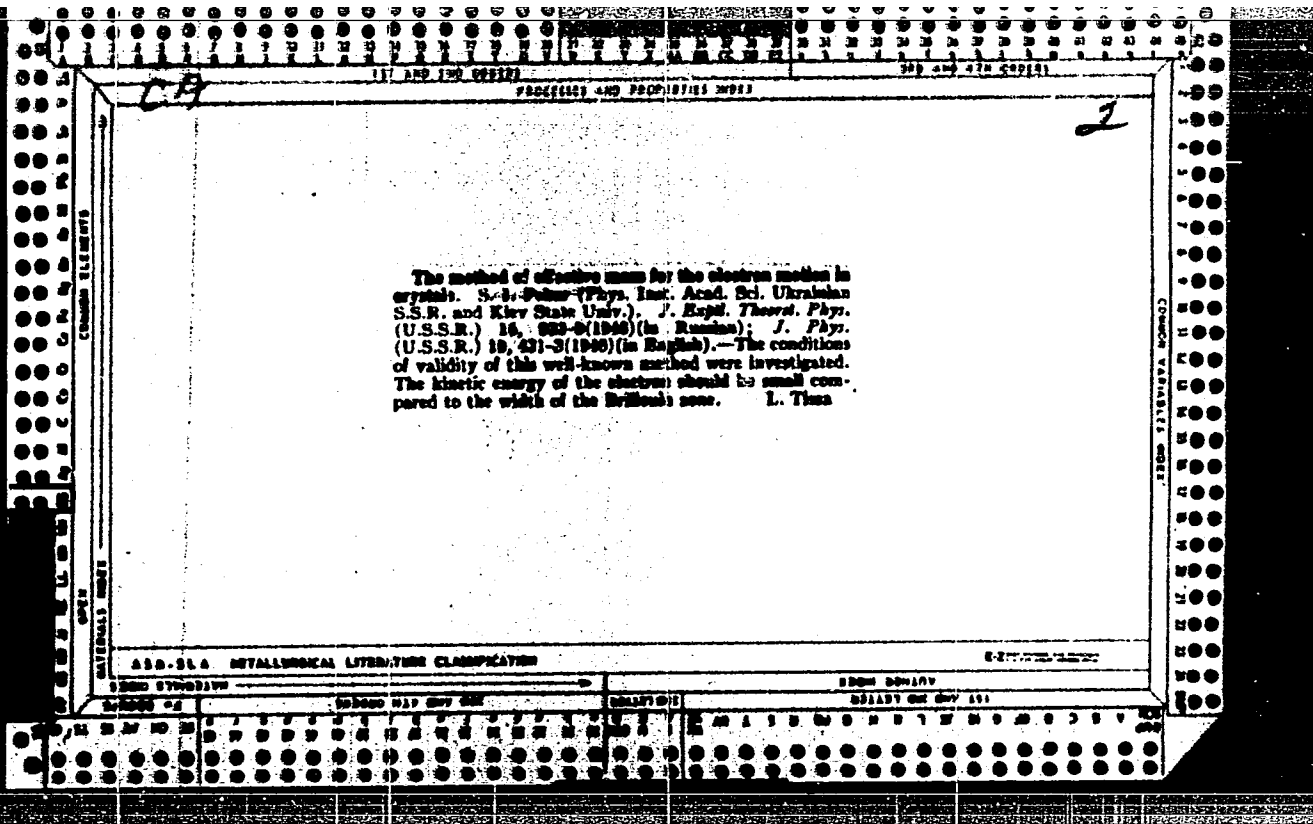PEKAR, S.

USSR/Electrons

Apr 1946

    Crystals - Measurements

"Local Quantum States of Electrons in an Ideal Ion Crystal," S. Pekar, 8 pp

"Zhur Eksp i Teor Fiz" Vol XVI, No 4

Discussion of local states of electrons in an ideal crystal, demonstration of the self-consistent states, and computation of parameters, the energy of thermal dissociation, and the red boundary of the photo-electric effect.

13T48

The method of effective mass for the electron motion in crystals. S. I. Pekar (Phys. Inst. Acad. Sci. Ukrainian S.S.R. and Kiev State Univ.). *J. Expd. Theoret. Phys.* (U.S.S.R.) 16, 933-9(1946)(in Russian); *J. Phys.* (U.S.S.R.) 10, 431-3(1946)(in English).—The conditions of validity of this well-known method were investigated. The kinetic energy of the electron should be small compared to the width of the Brillouin zone. L. Tisza

Theory of colored crystals. S. I. Pekar. *Zhur. Eksptl. Teoret. Fiz.* 17, 868(1947).—The F-centers formed by irradiation or additively are treated as electrons localized in a crystal in the neighborhood of a lattice point vacated by a halide ion, with the addnl. potential well arising as a result of dielec. polarization of the crystal by the localized electron itself. Considerations of the energy spectrum and the wave function of an electron in an F-center corresponding to that model show that, in the absorption of light in the F-band, the electron passes to a discrete level of the energy spectrum, and not into the cond. zone, as is commonly accepted. This point of view is supported both by facts unrelated to the particular model chosen, and by conclusions drawn from that model. The 1st group includes the sharp drop of the photocond. of colored crystals on deep cooling, with the absorption remaining unchanged; the nearly sym., Gaussian shape of the absorption spectrum curve, and the small width of the spectrum as compared with the red limit; and the great estd. width of the cond. zone, 5 e.v. for KCl, as compared with the narrow F band (~ 0.4 e.v.). The model gives for the oscillator strength of the most strongly absorbing transition $1s - 2p$, for the polaron 0.93, and for the F-center, 0.8 and 0.73, at $n^2 = 4$ and 3, resp., in agreement with the exptl. 0.8 and 0.7 for NaCl and KCl, resp. The model further accounts for the absence of line structure in the F-band, and provides a qual. interpretation of the photocond. and its temp. dependence. The theoretically calcd. ratio of the thermal dissocn. energy and the quantum at the max. of the F-absorption band is in fair agreement with the data of Smakula (*C.A.* 29, 3236[8]) for alkali metal halides. The effective mass of the electron can be estd. from the position of the max. of the F-absorption band. The electronic cond. of ionic crystals can be interpreted with the polaron assumed to be the main carrier.

N. Thon

PEKAR, S. I.

Thermionic emission from metals coated with a thin layer of semiconductor. S. I. Pekar and O. F. Tomase-vich. Zhur. Tekh. Fiz. 17, 1305-6(1947).—Theoretical paper. The thermionic emission from a thin layer of an electronic semiconductor lying on a metallic substrate is calcd. by using Richardson's formula. The existence of important elec. fields in the semiconductor is recognized. As a result of these fields, dipole layers are induced on the semiconductor, and there is a corresponding change in the work function. In the presence of strong fields there is an ampere-voltage characteristic which is independent of the transparency coeff. of the semiconductor-vacuum boundary. ————————————————— W. L. Roth

2.

New conception of the electronic conductivity of ionic crystals. S. I. Pekar (Kiev State Univ.). *J. Exptl. Theoret. Phys.* (U.S.S.R.) 18, 105 9(1948)(in Russian); cf. C.A. 41, 334d. Basic carriers of the cond. in ionic semiconductors are not electrons in the cond. zone but "polarons," i.e. self-localized electrons maintained in their state by the dielec. polarization of the crystal under the influence of the field of the localized electron. Transition from the zonal to the polaron state is accompanied by a gain of energy. In the elec. field, polarons move like neg. charges. Theoretical calcn. of the mobility u of the polaron leads to an expression from which the numerical value of u for NaCl is estd. at 3.0 sq. cm./v. sec., consistent with u < 8.3 from the Hall effect and the photocond. (Evans, C.A. 34, 2245⁹). Values of u for CuO, MoO₂, u-Ag₂S, and δ-Ag₂O, from exptl. data of elec. cond. and the Hall const., being in numerical agreement with those theoretically calcd. for polarons, corroborate the predominance of the role of the latter over that of zonal electrons.

N. Thon

Inst. Phys., AS Ukr. SSR.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PEKAR, S. I.

"Theory of mobility and the Hall effect allowing for the field of charged impurity ions."

report submitted for Intl Conf on Physics of Semiconductors, Paris, 19-24 Jul 64.

PEKAR, S. I.; RASHBA, E. I.; SHEKA, V. I.

"Combined resonance on impurity centers and in inhomogeneous magnetic fields."

report submitted for Intl Conf on Physics of Semiconductors, Paris, 19-24
Jul 64.

PEKAR, S. I.   PA 7/49T87

USSR/Nuclear Physics - Electron Theory   May 48
      Nuclear Physics - Polaron

"Effective Mass of the Polaron," L. D. Landau, S.I.
Pekar, Inst Phys Problems, Acad Sci USSR; Phys
Inst, Acad Sci Ukrainian SSR, 5 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 5

The conductor of current in an ionic lattice is not
the zonal conductance electron but a polaron. The
conservative motion of the polaron is studied as a
whole unit. The energy dependence of the system is
given as a function of the alternating motion of the
polaron and equation of motion of the polaron in an
external field.

                                      7/49T87

PEKAR, S. I.

IA 40706

Jun 48

USSR/Physics
   Crystallography
   Quantum Mechanics

"Quantum States and Optical Transitions of Electrons in Polarons and the Color Centers of Crystals," S. I. Pekar, M. F. Deygen, Kiev State U, Inst of Phys, Acad Sci Ukrainian SSR, 6 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 6

Studies polarons and electrons, autolocalized in ideal ion crystals and color centers in alkali-halide crystals, using as sample one previously developed by authors. Energy levels, ψ functions of

6/49795

Jun 48

6/49795

USSR/ Physics (Contd)

the electron, and oscillator strength of optical transitions were calculated.

PEKAR, S. I.

IA 6/49798

Jun 49

USSR/Physics
    Crystals
    Electron Theory

"Crystal as a Multi-Electron Problem and Its Uni-Electron Approximation," S. I. Pekar, Inst of Phys, Acad Sci Ukrainian SSR, 6 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 6

Shows that not every solution of Hartree-Fook equation has physical significance since it has a considerably larger number of solutions than the comparatively exact Schrodinger equation. Known self-consistent solution of type ψ_k (r) = U_k (r)

6/49798

USSR/Physics (Contd)   Jun 48

...kr in majority of cases was found to have no physical significance. A crystal is examined as a multi-electron problem.

6/49798

PEKAR, S. I.

62/49T99

USSR/Nuclear Physics - Polarons   Sep 49

"The Theory of Polarons," S. I. Pekar, Phys Inst,
Acad Sci Ukrainian SSR, 10 pp

"Zhur Eksper i Teoret Fiz" Vol XIX, No 9

Considers a polaron in an ionic crystal.
Considers the oscillations of the ions from
the standpoint of quantum mechanics. Calcu-
lates the mass of a polaron in rectilinear motion.
Obtains waves of polaron states. Waves have
a continuous energy spectrum. Discusses
scattering of polaron waves by optical
oscillations of ions, and calculates the cor-
responding free path and mobility of the

62/49T99

USSR/Nuclear Physics - Polarons
                    (Contd)
                                     Sep 49

polaron. With respect to magnitude, the cal-
culated mobilities correspond with the measured
mobilities of current carriers in semiconductors.
Submitted 11 Apr 49.

62/49T99

PEKAR, S. I.

155T63

USSR/Physics - Electrons, Conduction   Mar 50
                Luminescence

"Recombination of Conduction Electrons on Color
Centers in Crystals," S. I. Pekar, Yu. Ye. Per-
lin, Phys Inst, Acad Sci Ukrainian SSR, 3 pp

"Zhur Eksper i Teoret Fiz" Vol XX, No 3

Applies theory of recombination to colored al-
kali-haloid crystals. Calculates displacement
of photoelectron, i.e., average path traversed
by electron in direction of electrical field up
to moment of its recombination on color center.
Compares calculated displacement with experi-
mental measurements. Submitted 31 Oct 49.

155T63

PEKAR, S. I.

155T88

USSR/Physics - Semiconductors   Mar 50
              Electrons, Conduction

"The Theory of Recombination of Electrons in
Semiconductors," S. I. Pekar, Phys Inst, Acad
Sci Ukrainian SSR, 6 pp

"Zhur Eksper i Teoret Fiz" Vol XX, No 3

Discusses recombination of conduction electrons
in charged and neutral centers. Makes quanti-
tative study of case where probability of local-
ization of electron close to a center is suffi-
ciently large and therefore velocity of recom-
bination is limited and is determined by speed

USSR/Physics - Semiconductors (Contd)   Mar 50

155T88

of electron diffusion to the center of recombin-
ation. Calculates coefficient of recombination,
average displacement of electron in external
field, and electrical conductivity due to irradi-
ation of crystal by light, X-rays, gamma rays,
or charged particles. Submitted 31 Oct 49.

155T88

PEKAR, S. I.

PA 163T89

USSR/Physics - Lattices
           Conductivity, Hole   Jun 50

"The Theory of F-Centers," S. I. Pekar, Inst of
Phys, Acad Sci Ukrainian SSR

"Zhur Eksper i Teoret Fiz" Vol XX, No 6, PP 510-522

Considers ionic lattice in which a conductance elec-
tron has been localized close to a vacant node of
the lattice vacated by a negative ion. Calculates
energy levels and wave-functions of localized elec-
tron and ions. Obtains F-band of light absorption
with characteristic "bell-shaped" form. Theory
agrees with experience: It explains well the form

163T89

USSR/Physics - Lattices (Contd)   Jun 50

of absorption band, its widening and shift toward
red side when a crystal is "warmed up," and leads
to correct value of energy of thermal dissociation
of an F-center. Submitted 22 Dec 49.

163T89

PEKAR, S.I.; PERLIN, Yu.Ye.

Lifetime of excited F-centers. Zhur. eksp. i toer. fiz. 43 no.3:
1108-1110 '62.
(MIRA 15:10)

1. Institut poluprovodnikov AN UkrSSSR.
    (Ionic crystals)   (Quantum theory)

L 11067-63   EWT(1)/EWG(k)/BDS/EEC(b)-2--AFFTC/ASD/ESD-3--Pz-h--AT/IJP(C)
ACCESSION NR: AP3000604   S/0181/63/005/005/1297/1303

AUTHOR: Yerezhepov, M. Ye.; Pekar, S. I.

TITLE: Theory of electrical conductivity of semiconductors with due consideration for the field of charged impurity centers

SOURCE: Fizika tverdogo tela, v. 5, no. 5, 1963, 1297-1303

TOPIC TAGS: semiconductors, impurity centers, free path of electrons

ABSTRACT: The current in semiconductors is computed by solution of a 3-dimensional equation of electrical conductivity and diffusion, in which the coulomb shielded fields of ion impurities are considered together with the external field. A new member is obtained in the expression for current, defined by the combined effect of external field and fields of ion impurities. As a result, the macroelectroconductivity in an impure semiconductor proves to be less than in pure semiconductors with the same mobility and concentration of current carriers. This investigation is entirely theoretical. It is calculated that the dependence of mobility (resulting from the above considerations) on concentration of impurity centers diminishes. The authors state that this should not be confused with the long known effect of dissemination of charged impurities on mobility. Such dissemination may be properly assumed only when the electron free path relative to lattice oscillations

Card 1/2

L 11067-63
ACCESSION NR: AP3000604

is greater than the reciprocal of the shielding coefficient. The present study
investigates the case where the free path is less than this value. Both are
actually effective. Orig. art. has: 39 formulas.

ASSOCIATION: Kiyevskiy gosudarstvenny*y universitet im. T. G. Shevchenko (Kiev
State University)

SUBMITTED: 28Nov62

SUB CODE: PH

DATE ACQ: 11Jun63

NO REF SOV: 00

ENCL: 00

OTHER: 002

cs/ur
Card 2/2

PEKAR, S. I

3

Pekar, S. I.: Issledovaniya po elektronnoi teorii kristal-
lov (Studies on the Electron Theory of Crystals). Moscow:
Gosudarst. Izdatel'stvo Tekh.-Teorit. Lit., 1951. 256 pp.

PEKAR, S. I.

189T84

USSR/Physics - Crystallography,   Jul 51
Conduction Electron

"States of a Conduction Electron in an Ideal
Homeopolar Crystal," M. F. Deygen, S. I.
Pekar, Phys Inst, Acad Sci Ukrainian SSR

"Zhur Eksper i Teoret Fiz" Vol XXI, No 7, pp
803-808

Studies possibility of elastic local deforma-
tion of crystal by fld of an electron and
stationary location of electron close to de-
formation. Shows that such a self-conformal
local electron state does not exist in the

LC   189784

USSR/Physics - Crystallography,   Jul 51
Conduction Electron (Contd)

crystal-continuum approximation, but exists in
more detailed (atomic) model of a crystal, if
a suitable crit inequality is satisfied. In
last case self-localized state is more favor-
able for energy than free state of electron in
the zone of conduction. Submitted 24 Jun 50.

LC

189784

PEKAR, S. I.

USSR/Physics - F-Centers

Nov 51

"Theory of F-Centers," S. I. Pekar, O. F. Toma-
sevich, Kiev State U

"Zhur Eksper i Teoret Fiz" Vol XXI, No 11
pp 1218-1222

A model of F-center is represented by 2 electrons
moving in the field of a pos point charge (vacancy
of neg ion or excess pos ion in interstice) in
inertially polarizing dielec medium. Computes
energy and psi-function of ground state of F-
center, energy of its thermal dissociation and
criterion of its stability. Submitted 26 Oct 50.

204T91

PEKAR, S. I.

Investigations on the Electron Theory of Crystals. Glavpoligrafizdat, Main Poly-
graphic Publishing House, 256 pp, 1952.

PEKAR, S.I.

Electronic semiconductors of metallic type. S. I. Pekar and N. A. Krivoglaz, *Zampill Sergeya Ivanovicha Vavilova, Akad. Nauk S.S.S.R.* 1952, 334-41.—The ultimate object of this article is the investigation of the effect of the concn. of donors on the metallic cond. of semiconductors. PbS carrying excess Pb is chosen as a typical example. By assuming the polaron theory of elec. cond. and by using the available data, the following conclusions are reached: When the concn. of donors is very high the concn. of the current carriers is independent of temp. until thermodissocn. takes place. The elec. cond. decreases with temp. because of decreased mobility. When the concn. of donors decreases the energetic spectrum of current carriers splits into 2 zones. In the lower zone the concn. of the current carriers depends exponentially on the distance between the atoms of the excess metal; in the upper zone the carriers move as free polarons in an ideal crystal. At low temp. the greatest concn. of current carriers is in the lower zone where it is practically independent of the temp., while in the upper zone it varies exponentially with temp. If the excess metal centers have 2 valence electrons we have a quasi-dielec.; if they have one, a quasi-metal. As the concn. of donors further decreases the motion of the carriers in the lower zone becomes impossible, while in the upper zone nothing changes basically and the crystal becomes a semiconductor of an ordinary donor type.   N. Goldowski

PEKAR, S.I.

USSR.

Excitons in ionic crystals. L. M. Dykman and S. I. Pekar. Trudy Inst. Fiz. Akad. Nauk Ukr. S.S.R. No. 3, 92-124(1952); cf. following abstr.—Excitons of large radius are studied for the case in which a conducting electron and a vacancy which are formed by the absorption of a light quantum, move like 2 quasi-particles related by their Coulomb attraction. The inertia polarization of the crystal by the av. field of the electron and the vacancy is taken into consideration. It is shown that 2 excitons, which differ qualitatively, are possible depending upon the crystal parameters: (1) excitons not causing inertia polarization of the crystal, and (2) excitons which create a local, self-consistent inertia polarization of the crystal.   J. Rovtar Leach

PEKAR, S. I.

USSR/Physics - Ionic Crystals   Mar/Apr 52

"Fundamentals of the Theory of Electrical and Optical Phenomena in Ionic Crystals," S.I. Pekar

"Iz Ak Nauk SSSR, Ser Fiz" Vol XVI, No 2, P 231

Brief contents of the monograph, "Study of Electron Theory of Crystals," 1951. Author and associates developed in 1945 the theory of polarons and F-centers. The incorrectness of considering the inter-action of electron with polarizing waves as a small distortion and the nonsuitability of Bloch functions for zero approximation were demonstrated. The

effective mass of polarons, as current carriers, was detd. F- and F'-centers were computed and theoretical F-bands and absorption bands were in agreement with exptl data.

220T102

220T102

PEKAR, S. I.

USSR/Physics - Luminescence   Jun 52

"The Theory of Luminescence and of Light Absorption by Admixtures in Dielectrics," S. I. Pekar, Acad Sci Ukrainian SSR

"Zhur Eksper i Teoret Fiz" Vol XXII, No 6, pp 641-657

Discusses phototransitions of electrons in admixt "centers" of dielectrics and semiconductors. Takes into consideration the interaction of the optic electron with oscillations of crystal ions, leading

to a drift of equilibrial positions of ions as a result of phototransition. Presents theoretical explanation and refinement of Levshin's law of enantiosymmetry (mirror symmetry) (cf Zs f Phys, 72, 368, 382, 1951; Acta phys chim URSS, 1, 685, 6, 1935) as well as the limits of its applicability. Received 23 Oct 51.

217T93

217T93

PEKAR, S.I.

USSR/Physics – Zone Theory   Jun 52

"Criticism, Partial Explanation and Limits of Applica-
bility of the Zone Theory of Electrons in Crystals,"
S. I. Pekar

"Zhur Tekh Fiz" Vol XXII, No 6, pp 1062-1075

On suggestion of the editors of "Zhur Tekh Fiz" a re-
view on electron zone theory in crystals is written.
Analyzes wave-functions of V. A. Fok (cf: Zs f Physik,
61, 1930)and criticizes some inaccuracies in appli-
cations of conformablefields referring to his previous
works (cf. S. I. Pekar, "Zhur Eksper i Teoret Fiz" 18,
525, 1948; ibid. "Investigations of Electron Theory

219T94

cf Crystals," 1951). Received 18 Mar 52. Cites
work by M. F. Deygen and Pekar, "Zhur Eksper i Teoret
Fiz" Vol XXI, 803, 1951.

219T94

PEKAR, S. I.

USSR/Physics - Exitons, Luminescence   21 Apr 52

"Exitons in Ionic Crystals," I. M. Dykman, S. I. Pekar

"Dok Ak Nauk SSSR" Vol LXXXIII, No 6, pp 825-828

Investigates the exiton taking into account its strong interaction with the oscillations of ions. Considers the case where the radius of the electron's orbit or of the hole is so big that the interaction between them can be taken as the interaction between 2 opposite point charges and application of the method of effective mass is valid. States that if polarizing exitons are formed during absorption of light quanta then induction in the finite state does not equal zero; the spectra of absorption and luminescence in this case are reflected in the rather wide bell-shaped curves. Submitted by acad A. F. Ioffe 23 Feb 52.

223T91

223T91

PEKAR, S. I.

KRIVOGLAZ, M.A.; PEKAR, S.I.

Spectral pattern of mixed light absorption and luminescence
in dielectrics. Trudy Geof.inst. no.4:37-70 '53. (MLRA 7:12)
(Dielectrics--Spectra) (Absorption spectra) (Luminescence)

PEKAR, S. I.

USSR

/CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE
4737   AEC-tr-3136
ON THE EFFECT OF LATTICE DEFORMATION BY
ELECTRONS ON THE OPTICAL AND ELECTRICAL
PROPERTIES OF CRYSTALS. S. I. Pekar. Translated
from Uspekhi Fiz. Nauk 50, 197-252(1953). 92p.
Available from Morris D. Friedman ([Trans. No.] D193575),
West Concord, Mass.

The microtheory of the electron state in crystals is
presented and the influence of micro-factors on interpreta-
tions of the phenomenological theory of the influence of
electrons on optical and electrical properties of crystals
is considered. (C.H.)

PEKAR, S.I.

The Committee on Stalin Prizes (of the Council of Ministers USSR) in the fields of science and inventions announces that the following scientific works, popular scientific books, and textbooks have been submitted for competition for Stalin Prizes for the years 1952 and 1953. (Sovetskaya Kultura, Moscow, No. 22-40, 20 Feb - 3 Apr 1954)

Name	Title of work	Nominated by
Pekar, S.I.	"Research on the Electron Theory of Crystals"	Institute of Physics, Academy of Sciences Ukrainian SSR

SO: W-30604, 7 July 1954

PEKAR, S. I.

"Studies in Electron Theory of Crystals," translated into German under the sponsorship of the German (Soviet Zone) Government in 1954.

B-84049, 7 Apr 55

PEKAR, S. I.

USSR/ Physics - Spectral analysis

Card 1/1   Pub. 43 - 42/62

Authors   : Pekar, S. I.

Title   : Form and thermal dependence of additional light and luminescence absorption
            bands in solid and liquid dielectrics and semiconductors

Periodical : Izv. AN SSSR. Ser. fiz. 18/6, 712-713, Nov-Dec 1954

Abstract   : Theoretical data are presented regarding the form and thermal dependence of
            light and luminescence absorption bands observed during the study of solid
            and liquid dielectrics and semiconductors. Mathematical formulas establish-
            ing the form and the thermal dependence of the absorption bands are presented.
            Thirteen references: 10 USSR and 3 English (1931-1954). Table.

Institution : Acad. of Sc., Ukr. SSR, Phys. Inst.

Submitted : .....

PEKAR, S. I.

A123. Theory of strong coupling of a particle (nucleon) with the meson field. S. I. PEKAR. Zh. éksp. teor. Fiz., 27, No. 4 (10) 392-410 (1954) In Russian.

A theory developed by the author previously in a series of papers discussing polarons is formulated, but not applied, in this paper which is the first of a new series. The meson field is divided into a low- and a high-frequency part, and the former part is considered to form a potential well in which the nucleon moves. The period of the nucleon is assumed small compared to the period of the low-frequency meson field, so that an adiabatic approximation can be used in which the nucleon equation is to be solved with a given meson field and the meson equation with a given nucleon field, in a type of self-consistent field approach.   G. E. BROWN

PEKAR S.I.

Free-moving nucleons. S. I. Pekar. Zhur. Eksptl. i Teoret. Fiz. 27, 411-20(1954).—A nucleon is considered in strong interaction with a field of charged and neutral mesons. An approx. wave function and the energy of the system are found. Then are derived the meson-field mass of the nucleon for various isobaric states, the meson-field moment of inertia of the nucleon and the quasi-moment of inertia, characterised by the motion under a "charged" degree of freedom. A relation is obtained between the progressing and rotating motion of the nucleon.   Werner Jacobson

FD-983

USSR/Nuclear Physics - Meson field

Card 1/1   Pub. 146 - 7/20

Author   : Pekar, S. I.

Title   : Criterion governing the applicability of the theory of strong bond of particles with the meson field

Periodical : Zhur. eksp. i teor. fiz., 27, No 5 (11), 579-589, Nov 1954

Abstract   : The author derives the conditions (inequalities) governing the applica-
bility of approximations that were earlier employed by the author (ibid.,
27 (1954), 398 and 411), in which he considered the nucleon localized at
a discrete level in a self-consistent meson-field potential well and mov-
ing in a translatory and rotary manner with the well. He considers some
quantities which were not taken into account in the previous works men-
tioned as small perturbations.

Institution: Institute of Physics, Academy of Sciences Ukrainian SSR

Submitted : January 18, 1954

FD-993

USSR/Physics - Polarons

Card 1/1   Pub. 146 - 17/20

Author   : Pekar, S. I.

Title   : Calculation of polarons by direct variational methods

Periodical   : Zhur. eksp. i teor. fiz., 27, No 5 (11), 651-653, Nov 1954

Abstract   : The author checked the calculations of Lee, Low and Pines (Phys. Rev., 90, 297, 1953) and persuaded himself that the number $H=-0.09$ ev obtained by them is in error; evidently they had employed the author's formula in his semiclassical theory of polarons (S. I. Pekar, Zhur. eksp. i teor. fiz., 16, 335, 341, 1946). The author shows the inapplicability of the direct variational method, particularly the method of Lee et alii, for calculating the effective mass of the polaron M; e.g. they obtained $M=1.9m$ in comparison with the author's and Landau's $M=150-400m$ etc. Ten references, 4 Western and 6 USSR (e.g. S. A. Tyablinkov, ZhETF, 25, 688, 1953).

Institution   : Institute of Physics, Academy of Sciences Ukrainian SSR

Submitted   : June 18, 1954

PEKAR, S. I.

USSR/Physics

Card 1/1   : Pub. 22 - 17/44

Authors   : Pekar, S. I.

Title   : Absence of discrete energy levels and coupling states of a particle with a half spin in a pseudo-scalar potential field

Periodical : Dok. AN SSSR 97/6, 1011-1012, Aug 21, 1954

Abstract   : A solution of Dirak's equation:
$$[-i\hbar c (\vec{\alpha}, \nabla) + Mc^2 \alpha_4 + V(r) \alpha_5] \psi = E\psi$$
is sought. It was found only for a particular case. Interpretation of this solution lead to the statement mentioned in the title. One reference (1952).

Institution : Institute of Physics of the Acad. of Scs. of the Ukr. SSR

Presented by: Academician L. D. Landau, April 12, 1954

PEKAR, S. I.

Abstract : Examination of the behavior of conduction electrons in the periodic field
of a crystal. Group methods are used to obtain a generalization of the known
Bloch equation:

$$T_m \psi_{\beta k_\alpha} = e^{-ik\,\alpha\,m} \times \psi_{\beta k_\alpha}$$

where T_m is the translation operator, and $\psi_{\beta k_\alpha}$ is the exact wave function
of the crystal, depending on the coordinates of all the electrons and of all
the oscillating nuclei. It is shown that in contradiction to the zone theory,
it is impossible to determine the energy spectrum of the entire system from
a rigorous solution of the problem on the basis of the translational symmetry
alone. An approximate method is given for studying the behavior of the con-
diction electron in a dielectric crystal, and the energy spectrum of a low-
energy electron in an ionic crystal is examined. It is shown that if the

Card   : 1/2

PEKAR, S. I.

537.311.33 : 537.223
The Present State of some Problems of the   3420
Theory of Semiconductors and Dielectrics, and
Directions of Further Development of the Theory.
S. I. Pekar. (Zh. tekh Fiz., Oct. 1955, V.1 25 No. 10,
pp. 2019-2043.) Shortened version of a paper read at a
conference on semiconductors held in Leningrad in
February 1955. The headings are : (a) phenomenological
theory of semiconductors; (b) kinetics of electrons in
the conduction band; (c) thermal (radiationless)
electron transitions; (d) photo-transitions of electrons;
(e) methods of calculating the quantum stationary states
of a crystal.

PEKAR, S. I.

21

Conference on the Theory of Semi-Conductors. G. E. Pikus and Yu. A. Firsov (Zhur. Tekh. Fiz., 1955, 25, (12), 2381-2394). [In Russian]. A detailed account of a meeting held in Leningrad on Feb. 1955 under the auspices of the Semi-Conductor Commission of the Academy of Sciences. The introductory lecture by S. Pekar on "Some Problems in the Theory of Semi-Conductors and Dielectrics and Ways of Further Advancement of the Theory" is published separately (Ref., (12), 2036; M.A., 24, 241). The subjects discussed included: (i) "Theory of Polarons": The effective mass $m^* \simeq 400\; m$, according to Pekar, compared with $m^* \simeq 2m$, according to Lie, Low, and Pines ($Phys.\; Rev.$, 1953, [ii], 90, 297). Radio-spectroscopic methods show that polarons in various ionic crystals had a mobility and hence could act as charge carriers. Magnetic-resonance methods gave the line width $\Delta H \simeq 0.02-0.05$ gauss for polarons as against 100-200 gauss for F centres. S. I. Ikigen showed how polaron theory explained the observed behaviour of certain soln. of metals in dielectrics: as the concentration of metal increased, the crystal properties changed from dielectric to semi-conductor and then to metallic. I. M. Dykman discussed photo-emission from alkali halides contg. F centres. (ii) "Multi-Electron Theory of Semi-Conductors" continued the discussion on the new results brought out by polaron theory. V. L. Bonch-Bruevich introduced new methods of second quantisation into polaron-exciton theory. He described new ways of taking into account the interaction of electrons and holes with lattice vibrations. Departures from the Fermi function were discovered.

PIKUS, G.E.   FIRSOV, YU. A.

including a temp. dependence of n, similar to that of E_g. Interactions of charge carriers with polarized vibrations give a finite number of charge carriers in an intrinsic semi-conductor at 0° K. (~10^3 – 10^{13}/c.c.). (iii) "Magnetic Properties of Semi-Conductors": L. L. Korenblit et al. showed how measurement of the temp. dependence of the susceptibility of semi-conductors gave important results on the nature of the chem. binding and the temp. dependence of E_g. The high diamagnetism of semi-conductors was ascribed to excitons. A method was described for treatment of magnetism by quasi-particles on a multi-electron model. (iv) "Theory of Excitons", A. I. Ansel'm and Yu. A. Firsov calculated the free path of a non-localized exciton in various lattices showing it to ∝ $1/T$ and to depend on dielectric const., m^*_p, m^*_n, and the interaction between p- and n-charge carriers and the lattice vibrations. The abs. magnitude of exciton free paths ranges from ~$\frac{1}{2}$-10 electron free paths. (v) "Theory of Conductivity, Thermo- and Galvano-Magnetic Effects", T. A. Kenierova discussed why σ ∝ T^{-2} instead of $T^{-1/2}$ for multi-valence semi-conductors. M. I. Klinger discussed galvanomagnetic effects in polaron semi-conductors and also in semi-conductors with weak binding. (vi) "Theory of Liquid and Amorphous Semi-Conductors", A. I. Gubanov discussed the energy spectrum of an electron in a "crystal" with only short-range order in an attempt to explain why there is often little change in elect. properties at the m.p. I. M. Lifshits raised the complementary problem of the behaviour of an electron scattered by disturbances with long-range order. (vii) "Theory of Radiationless Transitions", M. A.

PIKUS G.E.   FIRSOV, YU.A.

Krivglaz spoke on thermal transitions, discussing the transitions between two levels of an electron from an impurity centre. (viii) "Theory of Rectification", X. B. Teltov discussed the distribution of carriers at a p-n junction and also (with E. I. Rashba) the voltage/current characteristics of a junction in the blocking direction taking into account the thermal motion and recombination of charge carriers in the region of space charge close to the junction. (ix) "Catalytic Action of Semi-Conductors", F. F. Vol'kenshtein gave results of his calculation of the chem. effects of electrons and holes on the surface of semi-conductors. These could act as free valences which could be taken up by adsorbed atoms or mol. (x) "Suggestions for Further Work"; The conference concluded by listing 14 topics worthy of further theoretical study. 23 ref.
                                                                    —A. F. B.

FD-3334

USSR/Nuclear Physics - Quantum States $\int \mathcal{P} \mathcal{E} \wedge \, \cdots$

Card 1/1   Pub. 146 - 6/28

Author   : Pekar, S. I.

Title   : Existence of quantum stationary states of point nucleons inter-
                acting with a mesonic field

Periodical   : Zhur. Eksp. i Teor. Fiz., 29, No 5, 599-604, 1955

Abstract   : The existence is questioned of stationary quantum states of a
                system consisting of point nucleons interacting with a field of
                neutral or charged mesons. Various operators of interaction of
                nucleons with a mesonic field are analyzed. In a nonrelativistic
                case of nucleon motion stationary states are inexistent in the
                case of pseudovectorial interaction. One USSR and 3 foreign
                references.

Institution : Physics Institute, Acad. Sci. Ukrainian SSR

Submitted   : May 22, 1954

PEKAR, S.I.

6

707*   Tamm's Bound States of Electrons on the Surface of
a Crystal and the Surface Vibrations of Atoms in the Lattice.
Tammovskie sviazannye sostoianiia elektronov na pover-
khnosti kristalla i poverkhnostnye kolebaniia atomov
reshetki. (Russian.) I. M. Lifshits and S. I. Pekar. Uspekhi
fizicheskikh nauk, v. 56, no. 4, Aug. 1955, p. 531-568.
Mathematical and theoretical study. Diagrams, graphs. 68 ref.

2.

2206
NUCLEOMESODYNAMICS IN STRONG COUPLING. II. THE
GROUND AND ISOBAR STATES, NUCLEON CHARGE AND
SPIN. V. N. Baier and S. I. Pekar (Institute of Physics,
Ukrainian SSR). Soviet Phys. JETP 3, 340-50(1956) Oct.
(In English). Zhur. Eksptl. i Teorst. Fiz. 30, 317-29(1956)
Feb. (In Russian)

A nucleon is considered that interacts strongly with a
pseudoscalar meson field. The interaction is assumed to be
of the symmetric pseudovector type. The eigenvalues of the
energy, charge and spin of the nucleon are determined, and
also the explicit form of the wave function of the system.
The ground and isobar states of the system are obtained.
(auth)

PEKAR, S I

USSR/Physical Chemistry - Crystals, B-5

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 60915

Author: Deygen, M. F., Pekar, S. I.

Institution: None

Title: Generalization of the Method of Effective Mass of Electron in the Case of Overlapping Zones and Several Interacting Conductivity Electrons

Original
Periodical: Tr. In-ta fiziki AN SSSR, 1956, No 7, 108-115

Abstract: The method of effective mass is extended to the instance when 2 lowest zones of conductivity are substantially overlapping and bottom of second energy zone is close to bottom of conductivity zone. Moreover this method is generalized for the instance of several interacting conductivity electrons. Considered are characteristics of energy spectra of electrons of local centers in the case of overlapping zones

Card 1/1

Pekar, S.I.

USSR/Theoretical Physics   B-6

Abs Jour   : Referat Zhur - Fizika, No 5, 1957, No 10930

Author   : Dykman, I.M., Pekar, S.I.

Inst   : Institute of Physics, Academy of Sciences, Ukraine, SSR.

Title   : Nuclomesodynamics in Strong Coupling. III. Translational
              Motion, Meson-Field Mass, and Magnetic Moment of the
              Nucleon.

Orig Pub   : Zh. eksperim. i teor. fiziki, 1956, 30, No 6, 1125-1141

Abstract   : The theory is constructed for an extended nucleon with
              non-relativistic form factor, strongly coupled with the me-
              son field (PS(PV)-variant of meson theory). The fundamen-
              tal results that can be obtained for a nucleon without al-
              lowance for the recoil are contained in the preceding in-
              vestigations (Referat Zhur Fizika, 1957, 173, 174).
              This work takes the motion of the nucleon into account

Card 1/2

Card 2/2

PEKAR, S. I.

548.7

1868.   THE RELATION BETWEEN THE PARAMETERS OF
LONGITUDINAL AND TRANSVERSE OPTICAL OSCILLATIONS OF
THE IONS IN A CRYSTAL / M. L. Krivoglaz and S. I. Pekar.
Zh. éksper. teor. Fiz., Vol. 31, No. 2(8), 343-6 (1956). In Russian.
    Oscillations with $10^{-1} < \lambda < 10^{-3}$ cm are considered so that the
field of the oscillating ions can be regarded as electrostatic. 2/
Relations between the proper frequencies are then derived which
then take a particularly simple form if there are only two ions
per cell.   A. L. Mackay

PEKAR, S.I.

G-3

·USSR/Electricity - Semiconductors

Abs Jour   : Referat Zhur - Fizika, No 5, 1957, 12172

Author   : Pekar, S.I.

Inst   : Institute of Physics, Academy of Sciences, Ukrainian SSR,
               Kiev.

Title   : Invalidity of the Fermi-Dirac Distribution for Electrons
               of Impurity Centers in Semiconductors and in Crystal-
               Phosphors.

Orig Pub   : Zh. eksperim. i teor. fiziki, 1956, 31, No 2, 351-353

Abstract   : Fermi distribution takes place under two essential assump-
               tions: (a) The energy of the one-electron state should
               not depend on the distribution of the electrons by states,
               and (b) an interaction between the electrons with another
               subsystem is possible, but it is essential that the antro-
               py of this subsystem not depend on the distribution of the

Card 1/3

SUBJECT   USSR / PHYSICS   CARD 1 / 2   PA - 1696
AUTHOR   PEKAR,S.I.
TITLE   Some Problems connected with the Theory of Semiconductors and
            Dielectrica, and Ways leading to a Further Development of the
            Theory.
PERIODICAL Usp. fis, nauk, 60, fasc. 2, 191-212 (1956)
            Issued: 12 / 1956

The phenomenological theory of semiconductors is in quite a satisfactory stage
of development as regards the case of not too strong fields. The situation is
somewhat less satisfactory with respect to the theory of processes in which
the local thermal equilibrium of conductivity electrons is destroyed. The
phenomenological theory of semiconductors should be further developed in the
following directions: Theory of semiconductor devices (rectifiers, triodes,
thermoelements, photoelements, etc.), generalization of the phenomenological
theory for the case of strong fields and currents, further development of the
problems of electric conductivity and diffusion of current carriers by
additionally dealing with thermal conduction problems, consideration of
exiton states, carrying out and computation of experiments for the separate
measuring of the parameters of semiconductors when studying elementary
phenomena.
The stage of development of the theory of the kinetics of electrons in the
conductivity zone of semiconductors is still unsatisfactory. Further develop-
ment is necessary in the following directions: Development of a method for

PRIKHOT'KO, A F

24(7)   p 3   PHASE I BOOK EXPLOITATION   SOV/1365

L'vov. Universytet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii. t. 1:
Molekulyarnaya spektroskopiya (Papers of the 10th All-Union
Conference on Spectroscopy. Vol. 1: Molecular Spectroscopy)
[L'vov] Izd-vo L'vovskogo univ-ta, 1957. 499 p. 4,000 copies
printed. (Series: Its: Fizychnyy zbirnyk, vyp. 3/8/)

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po
spektroskopii. Ed.: Jazer, S.L.; Tech. Ed.: Saranyuk, T.V.;
Editorial Board: Landsberg, G.S., Academician (Resp. Ed., Deceased),
Neporent, B.S., Doctor of Physical and Mathematical Sciences,
Pabelinskiy, I.L., Doctor of Physical and Mathematical Sciences,
Fabrikant, V.A.. Doctor of Physical and Mathematical Sciences,
Kornitskiy, V.G., Candidate of Technical Sciences, Rayskiy, S.M.,
Candidate of Physical and Mathematical Sciences, Klimovskiy, L.K.,
Candidate of Physical and Mathematical Sciences, Miliyanchuk, V.S.,
Candidate of Physical and Mathematical Sciences, and Glauberman,
A. Ye., Candidate of Physical and Mathematical Sciences.

Card 1/30

Card 9/30   132

AUTHOR: Pekar, S. I.

TITLE: Inapplicability of the Fermi-Dirac Distribution to Electrons of Impurity
            Centers in Semiconductors and Crystal Phosphors (Neprimenimost'
            raspredeleniya Fermi-Diraka k elektronam primesnykh tsentrov v
            poluprovodnikakh i kristallofosforakh)

PERIODICAL: Fiz. sb. L'vovsk. un-t, 1957, Nr 3 (8), pp 129-132

ABSTRACT: The statistical equilibrium distribution of electrons (E) on the energy
            levels of an impurity-type semiconductor is examined. It is noted that
            owing to the interaction of E their distribution may be different from
            the commonly used Fermi-Dirac distribution. Previously obtained
            results for crystals containing F and F' centers are generalized for
            the case of arbitrary impurity centers. The calculation is performed
            with the aid of the large canonical Gibbs distribution. It is shown
            that at moderate temperatures the number of E in a donor impurity
            center equals $N' = \{ 1 + \delta \exp [(\epsilon - \mu) / kT] \}^{-1}$ where ϵ is the
            change in the energy of the system during the transition of E from the

Card 1/2   fundamental donor state onto the bottom of the conductivity zone, μ is

SOV/137-58-11-23282
Inapplicability of the Fermi-Dirac Distribution to Electrons (cont.)

the chemical E potential, and δ is the ratio of the multiplicities of the degenera-
tion of the fundamental states of the ionic residue and of the neutral donor. The
distribution obtained coincides with the Fermi-Dirac distribution only when $\delta = 1$,
which is usually not the case in impurity semiconductors. If the donors are atoms
of a monovalent, bivalent, or trivalent element, then δ is equal to 1/2, 2, or 1/6
respectively. It is shown that the formulae for the number of conductivity E and
the thermoelectronic emission flux differ by a $\delta^{1/2}$ factor from the usual formulae
obtained from the Fermi-Dirac statistics.

M. K

Card 2/2

PEKAR, S.I.
2/

NUCLEON-BODYDYNAMICS IN STRONG COUPLING. III.
TRANSLATIONAL MOTION. MESON FIELD MASS AND
MAGNETIC MOMENT OF THE NUCLEON. L. M. Dykman
and S. I. Pekar (Academy of Sciences, Ukrainian SSR).
Soviet Phys. JETP 5, 882-84(1957) Jan.

An extended nucleon strongly interacting with the meson field is considered. The meson field is assumed pseudoscalar, and the interaction of pseudovector type. This paper is an immediate continuation of the work, in which the nucleon was assumed infinitely heavy (stationary). A method is developed which is based on the expansion of the solution in powers of the reciprocal of the nucleon mass, in zeroth approximation the result corresponds to an infinitely heavy nucleon and coincides with the previously found. The method is applicable only in the case of sufficiently slow (nonrelativistic) motion of the nucleon. The wave function of the system is calculated to the accuracy of terms of first order in the reciprocal of the nucleon mass. The meson field mass of the nucleon is calculated to the accuracy of terms quadratic in the reciprocal of the nucleon mass. In the limit of strong coupling, of the meson field with the nucleon, the nucleon magnetic moment is calculated to terms of an expansion in powers of the reciprocal of the nucleon mass. The first term of the series corresponds to the approximation of the infinitely heavy nucleon, and the following terms give a correction connected with the translational motion. The results obtained indicate that the difference of the magnetic moments of proton and neutron can be explained, not by taking into account the translation motion of the nucleon, but by renouncing the assumption of the limit of strong coupling. (auth)

PEKAR, S. I.

5) Nonapplicability of the Fermi-Dirac distribution to impurity states in crystal properties. (S. I. Pekar. Said English translation). —See Phys. J877 4, ... D. M. R.
C. 1. 51, 840.

~~~~~ PEKAR S ~~~~~ .

AUTHOR: KRIVOGLAZ,M.A., PEKAR,S.M.   PA - 2338
TITLE: The Trace Method for Conduction Electrons in Semiconductors, I.The
            Weak Interaction between Electrons and Oscillations. (Metod
            shpurov dlya elektronov provodimosti vpoluprovodnikakh. Slaboye
            vzaimodeystviye elektronov s kolebaniyami, Russian).
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 work shows that the method of weak binding (the de-
            composition according to powers of the constant of the interaction
            between conducting electrons and the oscillations of the lattice)
            does not at all necessitate restriction to low temperatures. In the
            case of ion crystals rather extremely high temperatures are
            favorable for the application of this method. With rising temper-
            ature the convergence of the analyzation of the theory of weak
            binding improves and the possibilities for the application of this
            theory become wider i.e. they also comprise crystals with binding
            of medium strength.

            By means of the here suggested method the sum of the states of the
            conduction electrons at any temperature can be computed. This method
            is here shortly called "trace-method"; it has the following main
            features: an operator is constructed, the trace of which (either
Card 1/3   the finite values of this trace and the coefficients of the

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.

Homoepolar crystals: For reasons of simplicity, a solid with iso-
tropic elastic properties is observed here, in which the
Card 2/3   effective mass of the conduction electrons is equal in all di-

$P \in K \, H \, R, \, \supset \, \underline{\mathcal{I}}.$

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 com-pute the sum of the states of the system and the other thermo-dynamic functions by means of this method at any desired temper-ature 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

Card 2/3   (effective) mass of the polaron. The here developed variation

PEKAR, S I.

PA - 2340

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

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

PEKAR, S.I.

AUTHORS: Pekar, S.I., Buymistrov, V.M.   57-11-32/33

TITLE: The Polaron Theory in the Case of Arbitrary Strength of the Bond
             Between the Electron and Optical Vibrations of the Lattice. (Teo-
             riya polyaronov pri proizvol'noy sile svyazi mezhdu elektronom i
             opticheskimi kolebaniyami reshetki)

PERIODICAL: Zhurnal Tekhn.Fiz., 1957, Vol. 27, Nr 11, pp. 2667-2669 (USSR)

ABSTRACT: Here the energy of the initial conditions of the polaron and the
             dependence of the energy on the momentum.is computed by a simple
             variation method. The disperion of optical oscillations is neglec-
             ted. The wave function is approximated, the characteristical parti-
             cularity here being the displacement of the equilibrium position of
             the normal coordinates from the electron coordinates. An analytical
             expression for the polaron energy is obtained, which in the critical
             case of a weak bond passes over into the exact result of the per-
             turbation theory and in the critical case of a strong bond into the
             result of the adiabatic approximation. The case of a strong bond
             has been investigated more closely. The energy of the fundamental
             polaron condition, which was computed according to the formula here
             quoted, lies in the intermediate zone ($a \sim 5$, a is the deviation of
             the square dependency of the energy on the momentum by at least
             7% below the energy obtained by R.P.Feynman (Phys.Rev.97,660,1955)
             (if the $\sim c^2$ -link of the energy-decomposition is positive in the
Card 1/2   paper of Feynman, as he assumes). This paper will be published

The Polaron Theory in the Case of Arbitrary Strength of the Bond 57-11-32/33
Between the Electron and Optical Vibrations of the Lattice.

in detail in the "Zhurnal eksperimental'noy teoreticheskoy fiziki".
There is 1 Slavic reference.

ASSOCIATION: Institute for Physics of the Academy of Sciences of the Ukrainian
SSR,Kiyev. (Institut fiziki AN USSR, Kiyev)

SUBMITTED: May 29, 1957

AVAILABLE: Library of Congress.

Card 2/2

PEKAR, S. I.

AUTHOR   BUYMISTROV, V.M., PEKAR, S.I.
TITLE   The Quantum States of Particles Which Are in Interaction with a   56-5-32/55
            Harmonically Oscillating Continuum, At Arbitrary Coupling Force.
            Part I: The Case Without Translation Symmetry.
            (Kvantovyye sostoyaniya chastits, vzaimodeystvuyushchikh s garmo-
            nicheski koleblyushchimsya kontinuumom, pri proizvol'noy sile svya-
            zi. I. Sluchay otsutstviya translyatsionnoy simmetrii-Russian)
PERIODICAL Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 5, pp 1193-1199
            (U.S.S.R.)

ABSTRACT   The systems examined in the paper under review are described by
            a Hamiltonian of the following kind:

$$H = -\sum_{i=1}^{N} \frac{\hbar^2}{2m_i} \Delta_i + \sum_{\chi t} (1/2)\hbar\omega_{\chi t}\left(q_{\chi t}^2 - \frac{\partial^2}{\partial q_{\chi t}^2}\right) + \sum_{\ell i t} q_{\chi t} q_{\ell t} \chi_{\ell}(\vec{r}_i) + V(\vec{r}_1 .. \vec{r}_N)$$

            The paper explains the significance of each of the terms of this
            Hamiltonian. Such a Hamiltonian is encountered in many physical pro-
            blems. First of all the author of the present paper develpps a ge-
            neral approximate method. In this context, the energy levels of the
            system are determined with the aid of a direct variational method,
            and this for arbitrary values of the coupling constants. In the
            boundary cases of weak and strong coupling the results obtained
            here go over into the generally known results of the perturbation
            theory of the strong coupling, respectively. The paper under review
            investigates such cases where the particles are localized in a po-
            tential pot formed by an outer field (no translation symmetry). A
            subsequent paper will deal with cases with translation symmetry.
Card 1/2   The first chapter of the paper under review deals with the selec-

            The second chapter of the present paper deals with the basic sta-
            te of the system. It is possible to obtain the energy of the basic
            state as an absolute minimum of a functional given here, and this
            with the aid of the direct variational method. The approximation
            mentioned ... ... results al-
            so in the range of medium-strong coupling. A defect of this ap-
            proximative method is the absence of the translation symmetry.
            This defect will be eliminated in a forthcoming scientific paper.
            (No reproductions)
ASSOCIATION Institute for Physics, Academy of Science of the Ukrainian SSR.
PRESENTED BY
SUBMITTED   16.7.1956
AVAILABLE   Library of Congress.
Card 2/2

PEKAR, S I

AUTHOR: Pekar, S.I.,

56-4-28/54

TITLE: The Theory of Electromagnetic Waves in a Crystal in Which Exitons are Produced (Teoriya elektromagnitnykh voln v kristalle, v kotorom voznikayut eksitony)

PERIODICAL: Zhurnal Eksperim. i Teoret.Fiziki, 1957, Vol. 33, Nr 4, pp. 1o22- 1o36 (USSR)

ABSTRACT: The light waves whose frequency lies in the domain of exitonlike light absorption in the crystal or near it are theoretically investigated. A dependence between the specific dipole moment of the polarization of the crystal and the electric field strength was found. This dependence may not be expressed by direct proportions as was hitherto assumed, but only by differential equations. Therefore Maxwell's equations are more difficult to solve than it follows from the phenomenological theory. It was possible to show that in the crystal a number of waves of equal frequency, polarization and direction exist whose index of refraction is different. This phenomenon differs from the two-ray refraction and even occurs in isotropically polarized crystals. The presence of strong electric transverse waves in the crystal is proved. The surface electron states are skirted. The following problems are treated: 1) Dependence of the specific polarization dipole moment on the electric field. 2) Influence of the crystal surface on the exiton states. Limiting conditions for the specific polarization dipole moment.Sur-

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The Theory of Electromagnetic Waves in a Crystal in Which Exitons   56-4-28/54
are Produced.

face exitons. 3) Plane, electromagnetic waves in the crystal: a)
orthorhombic crystals, b) tetragonal crystals c) cubic crystals.
There is 1 Slavic reference.

ASSOCIATION: Physics Institute AN Ukrainian SSR. (Institut fiziki Akademii nauk
Ukrainskoy SSR)

SUBMITTED: May 23, 1957

AVAILABLE: Library of Congress.

Card 2/2

SOV/56-34-3-?? '55

AUTHORS: Deygen, M.F., Pekar, S. I.

TITLE: Hyperfine Interaction and Spin-Electron Resonance in
Polarons and Excitons(Sverkhtonkoye vzaimodeystviye
i spin-elektronnyy rezonans v polyaronakh i eksitonakh.)

ABSTRACT: The present paper shows that in polarons and excitons the
correction of energy dependent on the hyperfine interaction
in first approximation is equal to zero. First the opera-
rator of the energy of hyperfine interaction of an electron
with the magnetic moments of the nuclei of the crystals is
put down: $U = \sum_l \hat{U}_l$; $\hat{U}_l = \dfrac{\mu \mu_l}{S I_l} \sum (\vec{S},\ \text{curl curl}\ \dfrac{\vec{I_l n}}{\rho_l n})$
Here the index l enumerates the nuclei and U_l - is the energy
operator of the hyperfine interaction of an electron with
the magnetic moments of the nuclei of the type l; n denotes
the number of the node of the l th sublattice; I_l and I_n and
the spin of the nucleus and its modulus; μ denotes

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Hyperfine Interaction and Spin-Electron Resonance in
Polarons and Excitons

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the Bohr magneton; μ_1 the magnetic moment of nucleus; ζ_{1R}
the distance from the $1n$ -nucleus to the electron. The
operation curl is carried out in the coordinates of the
electron. The Hamiltonian of the crystal may not contain
the spins of the nuclei in zero'th approximation. Then the
wave function of the crystal can be put down in form of the
product of the wave function χ of the nuclear spins with the
function $\psi(r,R)$ of the coordinates of all electrons (r) and
the coordinates of progressive motion of the nuclei (R).
The correction (first approximation of the energy) depend
on the hyperfine interaction is put down and the several
times transformed: $U_\ell = \frac{\mu\mu}{SI_\ell} Q_\ell P_\ell$; $P_\ell = \sum I_{\ell n_\ell}$ P_1 denot

the projection of the total spin moment   of all nuclei of
the ℓ type of the crystal. P_1 is actually equal to zero or
the average but in reality it slightly fluctuates. With
increasing volume of the base region of the crystal U_1 and
consequently also U tend to zero with $V^{-1/2}$. Therefore the
hyperfine interaction does not furnish any broadening in the

Card 2/3

Hyperfine Interaction and Spin-Electron Resonance in   SOV/56-34-7-22/55
Polarons and Excitons

case of polarons and excitons, and this fact makes possible
the experimental differentiation of polarons from local
electron centers. Then the authors shortly report on several
works dealing with the same subject. It would be interesting
to find out why by illumination of the crystal such a high
concentration of electrons can be produced that the spin -
-electronic absorption of radio waves by excitons can be
determined experimentally. The excitons which absorbed a
radion quantum have a much longer life with regard to
fluorescence than the usual excitons. There are 5 references
2 of which are Soviet.

ASSOCIATION: Institut fiziki Akademii nauk Ukrainskoy SSR (Institute for
               Physics AS Ukrainian SSR)

SUBMITTED: September 12, 1957

Card 3/3

AUTHOR: Pekar, S. I.   SOV/ 56-34-5-18/61

TITLE: The Dispersion of Light in the Exiton Absorption Region in
               Crystals (Dispersiya sveta v oblasti eksitonnogo pogloshcheniya
               v kristallakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958,
               Vol 34, Nr 5, pp 1176-1180 (USSR)

ABSTRACT: The theory of light waves in exiton absorbing crystals devel-
               oped by S.I. Pekar (Ref 1) on the basis of a new relation
               between the specific polarization and the electric field is
               applied to cubic crystals. This paper is the immediate con-
               tinuation of the above mentioned paper (Ref 1), it predicts
               several new effects which may be verified experimentally. In
               the first part of this paper the author calculates the indices
               of light refraction. According to the opinion of the author,
               all attempts to develop a theory of the dispersion of light
               lead to incorrect results. The author's new theory presents
               no such difficulties. First, Fresnel (Frenel')s formula is
               generalized for the boundary vacuum-crystal. Formulae are
               given for the coefficient of reflection of light by the sur-
               face of the crystal into the vacuum. The passing of the light

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The Dispersion of Light in the Exiton
Absorption Region in Crystals

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through the boundary vacuum-crystal is then investigated The
author investigates the following three cases separately in-
cident longitudinal wave, incident (+)-wave and incident (-)-
wave The next part of the paper deals with the passing of
light through a plane-parallel plate. In the case of a normal
incidence of the light there are no longitudinal waves in the
crystal. There are only four transverse waves, and formulae
are given for the electric fields of these waves. Also if the
refraction indices n_+ and n_- are complex quantities, there will
beho absorption of light in the plate. All the incident light
energy must be re-emitted by the crystal plate. The exciton
absorption of the light in the crystal is caused by transitions
of the system from the exiton states excited by the light to
any other states that are different from the initial state.
The exiton absorption of the light will be investigated in a
special paper This paper deals only with the cases with
negligibly small absorption. The theory discussed in the
paper may be verified by the following experiments (but this is
not a complete list of these experiments): 1) Determination

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of the cases in which the plate is transparent for light in
a considerable part of the spectrum. 2) Determination of the
dispersion curves by experimental determination of the re-
fraction indices of each of the 3 waves. Several ways of
carrying out such measurements are discussed
In this way three equations for n_1, n and μ are obtained and by
means of these equations it is possible to determine the re-
fraction indices. As an analog of Brewster (Bryuster)'s law
in the ordinary theory, also in the theory discussed in this
paper, there is an angle of incidence where the reflected
beam is exactly polarized in the s - direction. The exiton
absorption of light will be dealt with by a following paper
There are 4 figures and 2 references   which are Soviet

ASSOCIATION: Institut fiziki Akademii nauk Ukrainskoy SSR
               (Physics Institute, AS, Ukr.SSR)

SUBMITTED: November 27, 1957

Card 5/5

24 (2)
AUTHOR: Pekar, S. I.   SOV/56-35-2-38/60

TITLE: The Energy of Excitons at Extremely Low Quasi-Momenta
                 (Energiya eksitonov pri predel'no malykh kvaziimpul'sakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958,
                 Vol 35, Nr 2 (8), pp 522-523 (USSR)

ABSTRACT: The author divides the crystal into cubic regions and the
                 quasimomentum $\vec{k}$ of the exiton is assumed to be much lower
                 than $1/L$; L denotes the edge of the cube. The wave function
                 of the crystal is given as a linear combination of the
                 antisymmetrized products of the wave functions of the
                 partial regions. The exiton energy is deduced from this wave
                 function in the same way as also in the method developed by
                 Heitler (Gaytler) - London - Heisenberg (Geyzenberg). There
                 is only the following difference: The Heitler - London -
                 Heisenberg - method deals with the wave functions of the
                 elementary cells of the crystal, but the method discussed
                 in this paper deals with the wave functions of the above-
                 mentioned cubes. The energy of the exchange energy of the
                 electrons belonging to different cubes may be neglected. The
Card 1/3

The Energy of Excitons at Extremely Low Quasi-Momenta   SOV/56-35-2-38/60

corresponding expression for the energy is explicitly given. Calculations are discussed in short. The author deals only with the excited states for which the quasimomentum $\vec{P}$ is different from zero. If the excited state of the cube is not degenerated the only remaining coefficient c of the wave function is equal to 1. This occurs for all the excited states of a rhombic crystal and also, for instance, for those states of a tetragonal crystal for which the direction of $\vec{P}_1$ is parallel to "the fourth axis" (os chetvertogo poryadka) z. In this case, there are 2 sets of extremal values c_1, c_2 of the coefficients, and for a given direction of $\vec{a} = \vec{k}/k$, there are 2 exiton states. The corresponding expressions for the energy are given in an explicite form. The energy function $\mathcal{E}(\vec{k})$ has a discontinuity in the point $\vec{k} = 0$. Therefore one has to apply the corresponding correctures to many previous papers which are mentioned by the author. There are 4 references, 3 of which are Soviet.

ASSOCIATION: Institut fiziki Akademii nauk Ukrainskoy SSR (Physics
Card 2/3   Institute, Ukrainskaya SSR)

PEKAR, S. I.

24(4)   PHASE I BOOK EXPLOITATION   SOV/3140

Akademiya nauk Ukrainskoy SSR. Institut fiziki

Fotoelektricheskiye i opticheskiye yavleniya v poluprovodnikakh;
trudy pervogo vsesoyuznogo soveshchaniya po fotoelektricheskim
i opticheskim yavleniyam v poluprovodnikakh, g. Kiyev, 24-26
noyabrya 1957 g. (Photoelectric and Optical Phenomena in Semi-
conductors; Transactions of the First Conference on Photoelectric
and Optical Phenomena in Semiconductors....) Kiyev, 1959. 403 p.
4,000 copies printed.

Additional Sponsoring Agency: Akademiya nauk SSSR. Prezidium.
    Komissiya po poluprovodnikam.

Ed. of Publishing House: I. V. Kisin; Tech. Ed.: A. A. Matveychuk;
    Resp. Ed.: V. Ye. Lashkarev, Academician, Ukrainian SSR, Academy
    of Sciences.

PURPOSE: This book is intended for scientists in the field of semi-
    conductor physics, solid state spectroscopy, and semiconductor
    devices. The collection will be useful to advanced students in
    universities and institutes of higher technical training
    specializing in the physics and technical application of semi-
    conductors.

COVERAGE: The collection contains reports and information bulletins
    (the latter are indicated by asterisks) read at the First All-
    Union Conference on Optical and Photoelectric Phenomena in Semi-
    conductors. A wide scope of problems in semiconductor physics
    and technology are considered: photoconductivity, photoelectro-
    motive forces, optical properties, photoelectric cells and
    photoresistors, the actions of hard and corpuscular radiations,
    the properties of thin films and complex semiconductor systems,
    etc. The materials were prepared for publication by E. I.
    Rashba, O. V. Snitko, K. B. Tolpygo, A. F. Lubchenko and M. K.
    Sheinkman. References and discussion follow each article.

Photoelectric and Optical Phenomena (Cont.)   SOV/3140

Kiseleva, N. K., and B. T. Kolomiyets. The Role of Impurities
    in Internal Photoelectric Effect in CdTe and ZnTe

Snezhko, A.D. Investigation of the Photo conductivity of CdTe   99

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    2. The Theory of Excitons
Pekar, S.I. Theory of Electromagnetic Waves in Crystals in
    Which Excitons Occur   111

Dykman, I. M., and I. O. Zaslavskaya. Excitons in Ionic
    Crystals with Random Bond Energy   114

Moskalenko, S. A. Mott's Theory of Excitons in Ionic Crystals   121

Gribnikov, Z. S., and E. I. Rashba. The Diffusion of Excitons   123
    in a Nonhomogeneous Field

                3. Germanium
The Kinetics of Some Electron Processes in Semiconductors   132

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Card 7/16

14

AUTHORS: Vasil'yev, G.F., Politova, N.M., Shabel'nikova, A.E., SOV/109-4-4-24/24
Pervova, L.Ya. and Yasnopol'skaya, A.A.

TITLE: Interdepartmental Seminar on Cathode Electronics (The 11th Meeting) (Mezhduvedomstvennyy seminar po katodnoy elektronike) (11-e zasedaniye)

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 4, PP 731 - 732 (USSR)

ABSTRACT: A meeting of the seminar took place on December 1, 1958 at the Institut radiotekhniki i elektroniki AN SSSR (Institute of Radio-engineering and Electronics of the Ac.Sc.USSR). During the meeting 8 papers were read. Yu.G. Ptushinskiy read a paper entitled: "Kinetics of the Adsorption of Oxygen on the Surface of Tungsten". The second paper, by I.M. Dykman and S.M. Pekar, dealt with "The Admixture Photo-effect of Semiconductors in the Region of the Exciton Light Absorption". The paper by T.L. Matskevich was devoted to "The Problem of the Secondary Electron Emission of Fine Films of a Number of Organic Substances". The problem of "Surface Ionisation in a Strong Electric Field on a Surface with a Non-homogeneous Work Function" was considered by E.Ya. Zandberg and N.I. Ionov. I.N. Bakulina and N.I. Ionov read a paper entitled "Determination of the Electron Attachment Energy and of the Potentials of Atoms by the Method of Surface Ionisation". M.L. Yasnopol'skiy and A.P. Alekseyev dealt with the problem of "Passage of Steady-state Currents Through a Dielectric When the Current Carriers Are Introduced Through One of the Contacts by Means of Electron Bombardment". The lecture by D.A. Sanichev and K.G. Utkin discussed the following - "The Possibility of the Analysis of the Total-energy Distribution of Electrons in a Quasi-spherical Condenser". The work by M.L. Kapitsa, B.A. Fridrikhov and A.E. Shul'man dealt with an investigation of the secondary electron emission and the characteristic energy losses of a number of dielectrics (glass, mica, fluorite and alkali-haloid monocrystals).

Card1/2

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CBOXML-DC-69997

24(2)

AUTHOR: Pekar, S. I.   SOV/56-36-2-16/63

TITLE: Contribution to the Theory of Light Absorption and Dispersion
            in Crystals (K teorii pogloshcheniya sveta i dispersii v
            kristallakh)

ABSTRACT: The present paper is a continuation of two previous investigations
            (Refs 1, 2) as a result of which the author showed that in the
            range of the exciton absorption of light in crystals dispersion
            is characterized by a number of particular features; thus, the
            square of the refraction index may assume different values
            (as e.g. two values in the case of cubic crystals) for given
            propagation direction of the plane wave, given frequency and
            polarization. It was shown that longitudinal electric waves may
            exist in the crystal (which have no magnetic field and no
            electric induction). These waves propagate in anisotropic
            crystals in certain definite directions, while in cubic crystals
            they propagate in arbitrary directions. The results obtained by
            these earlier works are discussed in the introduction. The
Card 1/2   present paper generalizes the previously obtained results for

Contribution to the Theory
of Light Absorption and Dispersion in Crystals   SOV/56-36-2-16/63

the case of a finite lifetime of the excited state with respect
to thermal transitions. For an extremely long exciton wave the
dependence of its energy on the direction of propagation is
investigated. The author develops a general theory of
longitudinal polarized waves in crystals. In the transition to
the limit of infinite lifetimes of the excited state the author,
by taking the results he obtained previously (Ref 4) into
account, obtained exactly the same results as are mentioned in
reference 1. There are 5 Soviet references.

ASSOCIATION: Kiyevskiy gosudarstvennyy universitet (Kiyev State University)

SUBMITTED: May 19, 1958

Card 2/2

24(2), 24(4)

AUTHORS: Dykman, I. M., Pekar, S. I.   SOV/56-37-2-27/56

TITLE: Light Waves in Crystals in the Range of Exciton Absorption
                and the Impurity Photoeffect

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,
                Vol 37, Nr 2(8), pp 510-521 (USSR)

ABSTRACT: The aim of this paper is to estimate the amplitude of all five wave
                types generated in a crystal in comparison to the amplitude
                of the incident wave. The relations thus found are then used
                for the determination of the intensity and the frequency de-
                pendence of the impurity photoeffect, which in the range of
                exciton absorption have several singularities. In the first
                part the amplitudes of the electric field strength of the
                waves are calculated which occur in a cubical crystal illuminat-
                ed by monochromatic light. These calculations may be simpli-
                fied for the two following limiting cases: A) The absolute
                values of the refractive indices n_+ and n_- of the transverse

                waves are considerably in excess of unity. The general formulas
                found in a previous paper by S. I. Pekar can in this case be
Card 1/4   simplified considerably, and they are also given explicitly.