21018

S/058/61/000/005/026/050
A001/A101

24.3500 (1138, 1137, 1147)

AUTHOR: Rebane, L.A.

TITLE: On concentration quenching in the NaCl-Ag phosphor

PERIODICAL: Referativnyy zhurnal. Fizika, no 5, 1961, 181-182, abstract 5V386 ("Tr. In-ta fiz. i astron. AN EstSSR", 1960, no 12, 49-66, Engl. summary)

TEXT: The author investigated spectral characteristics and quantum yield of emission in NaCl-Ag phosphors with different content of activating admixture. He shows that in NaCl-Ag phosphors there are centers of two types, which include different number of activator ions. He shows also that the main part in the observed process of concentration quenching in this case plays the competition between centers of the 1st and 2nd types in absorption of quanta of the excitation light.

[Abstracter's note: Complete translation.]

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20824
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B104/B201

24,3500 (1138, 1137, 1395)

AUTHOR: Rebane, L.A.

TITLE: Concentration and temperature extinction of luminescence in some alkali halide phosphors activated with silver

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, v. 25, no. 3, 1961, 345 - 346

TEXT: This is a reproduction of a lecture delivered at the 9th Conference on Luminescence (Crystal Phosphors), which took place in Kiyev from June 20 to 25, 1960. The author studied the phosphors NaCl-Ag and NaBr-Ag, a characteristic feature of which is the complete solubility of the activator salt in the basis. Phosphor KCl-Ag in which the limit solubility of AgCl at room temperature does not exceed 0.2 mole% was taken for a comparison. As was shown by a study of the absorption coefficient as a function of the activator concentration in the two abovementioned phosphors, the shortwave bands must be assigned to centers containing an Ag^+ ion (centers of the 1st kind). The longwave bands must be assigned to centers

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containing two Ag$^+$ ions (centers of the 2nd kind). The centers of the 1st kind prevail a low activator concentrations. The centers of the 2nd kind grow in number with increasing activator concentration, and the maximum of the band shifts toward the longwave region. As may be seen from the diagrams in Fig. 1 showing the radiation yield as a function of the activator concentration, this yield is dependent upon λ_{exc} and differs for different centers. The competitive behavior of the centers of 1st and 2nd kind are inferred in a discussion of the diagrams shown in Fig. 1a. The drop of the total radiation yield is explained by the competition with centers in the stage of a temperature extinction. The study of temperature extinction in silver-activated phosphors is rendered more difficult by the strong temperature dependence of absorption. Thus, absorption rises to the 3.8-fold at a temperature rise from 20 to 370°C. Moreover, the ratio of absorption in centers of 1st and 2nd kind varies with temperature, which holds true especially at high concentrations. The temperature extinction of the centers of 1st kind follows the Mott formula. In a discussion which followed the lecture under consideration, Z.L. Morgenshtern stated that the shortwave bands in the phosphors dealt with pro-

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Concentration and temperature ...

bably belonged to the pure lattice, and not, as assumed by the author, to centers filled with silver. F.D. Klement and N.N. Vasil'yeva are mentioned. There are 1 figure, 1 table and 5 references: 3 Soviet-bloc.

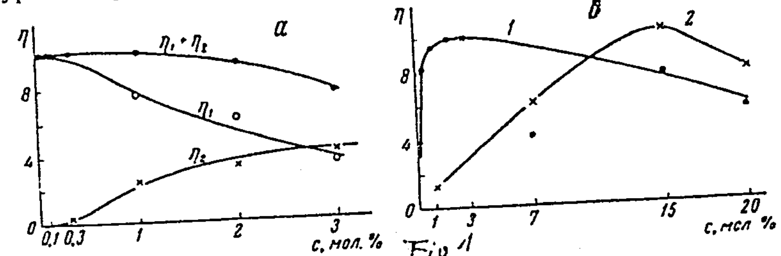

Fig 1

Legend to Fig. 1: 1a) radiation yield of NaCl-Ag phosphor as a function of activator concentration at λ_{exc} = 218 mμ, 1b) the same for λ_{exc} = = 228 mμ (Curve 1) and λ_{exc} = 240 mμ (Curve 2).

Card 3/3

REBANE, L.Ye.

Role of bronchoscopy in operations for tuberculosis of the lungs. (MIRA 14:2)
Khirurgiia 37 no.1:87-93 Ja '61.

1. Iz khirurgicheskogo otdeleniya i otorinolaringologicheskogo kabineta Leningradskogo nauchno-issledovatel'skogo instituta tuberkuleza (dir. - prof. A.D. Semenov, nauchnyy rukovoditel' - prof. I.S. Kolesnikov i kand.med.nauk M.Ye. Pavlenko).
(TUBERCULOSIS) (BRONCHOSCOPY)

L 20675-65 EWT(1)/T IJP(c)/SSD/ASD(a)-5/AFWL/BSD/AS(mp)-2/AFETR/RAEM(j)/
ESD(gs)/ESD(t)
ACCESSION NR: AP5001579 S/0054/64/000/004/0026/0036

B

AUTHOR: Rebane, T. K.

TITLE: Method of varying the vector potential in calculations of the magnetic properties of molecules 21

SOURCE: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 4, 1964, 26-36

TOPIC TAGS: diamagnetic susceptibility, diamagnetism, paramagnetism, vector potential, polarization, magnetic property

ABSTRACT: A method proposed by the author earlier (ZhETF v. 38, 963, 1960) for calculating the diamagnetic susceptibility of the single-electron ground state of a molecule by varying the vector potential is generalized to include many-electron systems. The theoretical principles of the method and its connection with other methods of calculating magnetic properties of the molecules are

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also considered. The method is extended to the case of a system of N electrons on the basis of a generalized 3N-dimensional gauge transformation. The principal equations of perturbation theory are used to calculate linear (relative to the magnetic field) corrections to the wave function and to the current. The concept of precession current and polarization current, into which a current linear in the magnetic field can be resolved for a fixed choice of vector potential, is introduced. The "natural vector potential," for which the polarization current vanishes together with the associated polarization correction to the energy, is defined. A simple connection is established between the function of the generalized gauge transformation, which leads to the natural vector potential, and the first-order correction to the wave function in the magnetic field. It is shown that the vector potential for $N \leq 2$ has no singularities, and that the energy correction in the magnetic field is always diamagnetic. When $N > 2$, owing to the singularities of the vector potential, the energy correction may be both diamagnetic

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and paramagnetic. The general theory is applied to the case of an anisotropy harmonic oscillator in a magnetic field. It is noted in conclusion that the method of variation of the vector potential is closely related with the hydrodynamic model of diamagnetic currents proposed by McLachlan and Baker (Molec. Phys. v. 4, 254, 1961), and to the variational method of Guy and Tillieu (Compt. rend. v. 239, 1203, 1283, 1954; v. 240, 1402, 1955; 242, 1279, 1436, 1956). Orig. art. has: 60 formulas.

ASSOCIATION: None

SUBMITTED: 15Feb64 ENCL: 00

SUB CODE: EM, NP NR REF SOV: 002 OTHER: 009

Card 3/3

REBANE, T.K.

21 537.311.33

2232. APPLICATION OF THE LATTICE MODEL TO SEMICONDUCTORS OF THE LEAD SULPHIDE TYPE. T.K.Rebane. Zh. eksper. teor. Fiz., Vol. 31, No. 2(8), 353-4 (1956). In Russian.

The lattice model as applied by Coulson (Abstr. 9433/1954) to metals, graphite and boron nitride is applied to semiconductors of the PbX type (X = S, Se, Te). Two possible models are considered. In this way the width of the forbidden gap and the effective masses of electrons and holes are calculated. Comparison between theory and experiment is made and the agreement is thought to warrant further work with this model.

W.Bardsley

Leningrad State U.

REBANE, T. K

24 1 3

Application of the network model to semiconductors of the lead sulfide type. T. K. Rebane. Soviet Phys. JETP 4, 273-4(1957)(English translation).—See C.A. 51, 840i. B. M. R.

PM mt

Rebane, T.K.

2
4E3d
4E4c

Continuity conditions in metallic molecule model. T. K. Rebane. *Vestnik Leningrad. Univ.* 12, No. 10, *Ser. Fiz. i Khim.* No. 2, 11-20(1957); cf. Ruedenberg and Scherr, *C.A.* 47, 11820*i*.—The continuity conditions of the derivs. of the wave functions in the junction region were investigated. A new variational method was developed, and for the 1st time the continuity conditions were obtained for a mol. in a magnetic field. The results are applicable to the 3-dimensional model of solids. A. Kremheller

REBANE, T.K.

3

539.19

3436. THE CALCULATION OF THE MAGNETIC PROPERTIES OF MOLECULES USING THE METAL MODEL METHOD.

T.K.Rebane.

Vestnik Leningrad. Univ. Ser. Fiz. Khim. No. 3 (1957), No. 16, 19-31. In Russian.

The author establishes the form of a one-dimensional Hamiltonian for the metallic model of a molecule in the case of a uniform magnetic field and then, using the continuity conditions at the lattice junctions, derives a method of calculating the magnetic properties of π-electrons in aromatic molecules. The method is shown to lead to results close to those obtained by the molecular-orbit method.

C.R.S.Manders

REBANE T.K.

54-4-9/20

AUTHOR: Rebane, T. K.

TITLE: On the Calculation of the Magnetic Properties of the Molecules by Means of the Free Electron Model. II (K raschetu magnitnykh svoystv molekul po metodu metallicheskoy modeli. II).

PERIODICAL: Vestnik Leningradskogo Universiteta Seriya Fiziki i Khimii, 1957, Vol. 22, Nr 4, pp. 70-75 (USSR).

ABSTRACT: In one of the earlier works, based on investigations, the unidimensional free electron model (metal model) has been suggested for the calculation of the diamagnetic anisotropy of aromatic organic molecules. The present work attempts the realization of the above mentioned calculation method and its comparison with the molecular-orbital theory. As a result an approximate equivalence of both methods at the calculation of the diamagnetic anisotropy of non-excited molecules has been found. A theoretic verification of a formerly suggested empirical rule for the determination of the form of the unidimensional potential in conjugated molecules containing hetero atoms is given.
There are 8 references, 3 of which are Slavic.

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On the Calculation of the Magnetic Properties of the Molecules 54-4-9/20
by Means of the Free Electron Model. II.

SUBMITTED: February 1, 1957.

AVAILABLE: Library of Congress.

Card 2/2

REBANE, T.K.

20-2-28/64

UTHOR REBANE, T.K.

ITLE Computation of the Anisotropy of the Diamagnetic Suceptibility of the Aromatic Molecules with the Aid of the Method of the Metallic Model of the Molecule.
(Raschet anizotropii diamagnitnoy vospriimchivosti aromaticheskikh molekul po metodu metallicheskoy modeli molekuly-Russian)

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 114, Nr 1, pp 70-72 (U.S.S.R.)

ABSTRACT The paper under review corrects an alleged error contained in the method of computation employed by M.V.Vol'kenshteyn, L.A.Vorobinskiy, Dokl.Akad.Nauk, Vol 85, Nr 5, pp 977(1952), and suggests the utilization of a new methodfor the computation of the diamagnetic anisotropy of the aromatic molecules in the framework of the metallic model without application of the perturbation theory. The unidimensional Hamiltonian, which describes the behavior of the π-electrons in the magnetic field, had been chosen in the above-mentioned previous paper in the following form: $H = -(1/2)d^2/ds^2 - (i/c)A_s d/ds + A_s^2/2c^2$. (The coordinate s was computed along the bond. Furthermore, the units 6=m=h=1 were employed). In the computations contained in the above paper, only the third term in this Hamiltonian was used as perturbation operator. The paper under review, on the other hand, maintains that in the second perturbation-theoretical approximation also the contribution of the second term must be taken into consideration. But the problem of the energy spectrum and of the wave functions of the π-electrons in the metallic model of the molecule permits in the case of a homogeneous magnetic field an

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REBANE, T. K., Cand Phys-Math Sci -- (diss) "Concerning the computation of diamagnetic susceptibility of the 1-electronic shells of aromatic molecules ~~with the assistance~~ by means of a model containing free electrons." Len, 1958. 9 pp. (Leningr Order of ~~kxxkxxx~~ Lenin State Univ im A. A. Zhdanov), 100 copies. (KL, 9-58, 113)

51-4 -3-18/30

AUTHOR: Rebane, T.K.

TITLE: Choice of the Initial Single-Electron Wave-Functions for the Solution of Self-Consistent Field Equations with Exchange (O vybore iskhodnykh odnoelektronnykh volnovykh funktsiy pri reshenii uravneniy samosoglasovannogo polya s obmenom)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol.IV, Nr.3, pp.398-400 (USSR)

ABSTRACT: The method of self-consistent field with exchange first given by V.A. Fok (Fock) in 1930 (Ref.1) makes it possible to find the best wave-function for a multi-electron system with full separation of the variables of separate electrons. In this method the ground-state wave-function of an n-electron system is given in the form of a determinant consisting of single-electron functions φ_i. Since the wave-function and all the physical properties of an n-electron system are invariant under unitary transformations of the single-electron wave-functions φ_i, one may use

Card 1/2 orthogonal combinations of the φ_i functions as new

51-4 -3-18/30

Choice of the Initial Single-Electron Wave-Functions for the Solution of Self-Consistent Field Equations with Exchange

single-electron functions ψ_i. The author derives a condition for choice, from all possible orthogonal combinations $\psi_i^{(0)}$ of the initial single-electron functions, of that function which is the best initial approximation to a solution of the self-consistent field equation which involves ψ_i. There are 3 references of which 2 are Soviet and 1 German.

ASSOCIATION: Leningrad State University. (Leningradskiy gosudarstvennyy universitet.)

SUBMITTED: June 4, 1957.

1. Electron waves--Theory 2. Electron waves--Functions
3. Transformations

Card 2/2

AUTHORS: Adamov, M. N., Veselov, M. G., SOV/48-22-9-1/40
Rebane, T. K.

TITLE: The Electric and Magnetic Properties of Molecules With Complicated Structure Calculated on the Basis of the Free-Electron Model (Raschety elektricheskikh i magnitnykh svoystv slozhnykh molekul na osnove modeli svobodnykh elektronov)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 9, pp 1015 - 1018 (USSR)

ABSTRACT: The authors succeeded in computing the polarizability and the diamagnetic susceptibility of π-electrons on the basis of the simple model of the free electrons. The polarizability α of atoms and molecules usually is computed by perturbational methods. For the computation of the π-electron longitudinal polarizability of the polyenes $C_{2n}H_{2n+2}$ the formulae

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$$\alpha_n(\omega) = \frac{4E_n}{L\omega^4}\left[p_n \frac{(-1)^n - \cos p_n L}{\sin p_n L} + \frac{(-1)^n - \cos q_n L}{\sin q_n L}\right] - \frac{1}{\omega^2} \quad (2)$$

and

$$\alpha_n(0) = \frac{L^4}{12\pi^4 n^2}(15 - \pi^2 n^2) \quad (3)$$

were employed. The results, together with the results obtained by Bolton (Ref 1), are listed in table 1. The polarizability of the electrons was also determined for the case of a ring-shaped and a hexagonal molecule. A simple mathematical scheme was worked out, which allows to determine the wave function and the energy spectrum of the π-electrons in the magnetic field very exactly. If the one-dimensional potential of the conjugate bonds is everywhere equal to zero, the problem is represented by the determination of the eigenvectors

The Electric and Magnetic Properties of Molecules With SOV/48-22-9-1/40
Complicated Structure Calculated on the Basis of the Free-Electron Model

of the Hermitian matrix. The energy spectrum of the π-electrons in the magnetic field and their diamagnetic susceptibility are determined according to the secular equation det W = 0. This computation method of the diamagnetic susceptibility can be extended also to the case of a variable one-dimensional potential. The method allows to consider the influence of the intramolecular periodic field as well as the deviations from the periodicity. Starting from the matrix-formulation of the problem the connection between the methods of the free electrons and of the molecular orbits was investigated. The agreement of the energy spectra shows by means of the results obtained by the semi-empirical method due to Pariser, Parr and Pople (Ref 4)that the depth of the potential well in the place where the atom j is situated is given by the equation

$V_j = \frac{1}{2}\left[(2 - q_j)I_j + q_j\varepsilon_j\right] - N_j\beta$. This equation validates

Card 3/4 the semi-empirical formula suggested by Veselov and

The Electric and Magnetic Properties of Molecules With SOV/48-22-9-1/40
Complicated Structure Calculated on the Basis of the Free-Electron Model

Rekasheva (Ref 5). This formula describes the relation between the shape of the bottom of the potential well in conjugate molecules which contain hetero-atoms, and the potentials of the electron affinity and the ionization of single atoms. There are 2 tables and 5 references, 2 of which are Soviet.

ASSOCIATION: Leningradskiy gos. universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

Card 4/4

SOV/51-6-1-4/30

AUTHOR: Rebane, T.K.

TITLE: On the Electron Absorption Spectra of Aliphatic Polysulphides (Ob elektronnykh spektrakh pogloshcheniya alifaticheskikh polisul'fidov)

PERIODICAL: Optika i Spektroskopiya, 59, Vol 6, Nr 1, pp 24-27 (USSR)

ABSTRACT: The ultraviolet absorption spectra of aliphatic polysulphides are very sensitive to the number of atoms of sulphur in the polysulphide chain: as the chain lengthens the absorption spectra are displaced towards longer wavelengths. The author attempts to find the reason for this displacement by applying quantum-chemical principles to the electron spectra of aliphatic polysulphides. He shows that this displacement is due to splitting of the 3p- and 4s-levels of sulphur atoms in the polysulphide chain. Quantum-mechanical calculation of the displacement by the method of molecular orbits produces a satisfactory agreement with experiment as shown in a table on p 27, where col 2 gives the experimental (from Refs 1-2) and col 3 the theoretical positions of the absorption maxima in aliphatic polysulphides.

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SOV/51-6-1-4/30

On the Electron Absorption Spectra of Aliphatic Polysulphides

The paper is entirely theoretical. The author thanks Ye.N. Gur'yanova for her advice. There are 1 table and 4 English references.

SUBMITTED: March 17, 1958

Card 2/2

SOV/51-6-2-35/39

AUTHOR: Rebane, T.K.

TITLE: On the Paper by L.A. Borovinskiy "On Conditions of Joining of Functions in a Unidimensional Metallic Model of a Molecule" (Po povodu stat'i L.A. Borovinskogo "Ob usloviyakh sshivaniya funktsiy v odnomernoy metallicheskoy modeli molekuly")

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 2, pp 266-267 (USSR)

ABSTRACT: Borovinskiy (Ref 1) has expressed a view that in unidimensional metallic models of molecules it is not necessary to preserve continuity of wave-functions at the branching points. The present author (Rebane) questions Borovinskiy's separation of variables when dealing with a "ring with a projection" model (Fig 2 in Ref 1). The author also criticizes Borovinskiy's method of joining wave-functions, which does not allow for interaction between π-electrons of various members of biphenyl and benzene-type molecules. Borovinskiy (Ref 1) has discussed the "ring with a projection" model, when the projection length approaches zero. A node of the unidimensional wave-function is then found at

Card 1/2

SOV/51-6-2-35/39

On the Paper by L.A. Borovinskiy "On Conditions of Joining of Functions in a Unidimensional Metallic Model of a Molecule"

the point where the projection was formerly attached to the ring. Borovinskiy suggested that this node is due to joining of wave-functions at the branching point. The present author (Rebane) ascribes the node to the special conditions (an infinitely high potential barrier) at the outer end of the projection. There is 1 Soviet reference.

SUBMITTED: May 16, 1958

Card 2/2

Rebane, T.K

PHASE I BOOK EXPLOITATION SOV/4186

Akademiya nauk SSSR

Stroyeniye veshchestva i spektroskopiya (Structure of Matter and Spectroscopy) Moscow, Izd-vo AN SSSR, 1960. 113 p. Errata slip inserted. 2,300 copies printed.

Ed.: K. V. Astakhov, Professor; Tech. Ed.: T. P. Polenova.

PURPOSE: This collection of articles is intended for physicists and chemists interested in spectroscopic methods of research on the structure of molecules and related problems.

COVERAGE: The articles contained in this collection were taken from the editorial files of the Zhurnal fizicheskoy khimii (Journal of Physical Chemistry) and are concerned with spectroscopic methods in research on the structure of molecules, the hydrogen bond, isotopic effects, problems in magnetochemistry, the structure of aqueous solutions of electrolytes, and the chemistry of complex compounds. References accompany individual articles.

The author thanks the following for having participated in determining the density of deuterocompounds: V. G. Golov, P. N. Nikolayev, V. I. Kucheryavyy, Ye. Z. Zhuravlev, V. I. Murzin, and L. S. Zhilkin. He thanks A. I. Brodskiy for his discussion of the results.

Ar'yev, A. M., and M. B. Al'tshuler [Novocherkasskiy politekhnicheskiy institut (Novocherkassk Polytechnic Institute)]. Problem of Change in the Structure of Polyethylene at Plane-Radial Extension 69

Rabinovich, I. B., V. M. Salov, Ye. I. Novikova, S. D. Razikovich, and V. M. Nikolayev [Gor'kiy State University imeni N. I. Lobachevskiy]. Isotopic Effect on the Viscosity of Deuteroalcohols 73

Vasiliu, M. I., V. N. Yeremenko, and V. V. Pesenko. Investigation of Surface Tension of Liquid Metal Solutions. I. Surface Tension of a Lead-Silver System 78

Veynberg, T. I. Coordination Equilibria of Nickel Ions in $K_2O - PbO - SiO_2$ System Glasses 84

Kolesova, V. A. [Institut khimii silikatov (Institute of the Chemistry of Silicates)]. Structure of Spodumene Glass 93
V. I. Aver'yanov is thanked for having plotted the curves for α- and β- spodumene and for the crystallization product of spodumene glass.

Rebane, T. K. [Physicochemical Institute imeni L. Ya. Karpov]. Calculation of Excess π-Electron Diamagnetic Susceptibility of Certain Molecules Containing the Six-Member Carbon Ring With the Aid of the Free Electrons Model 96
The author thanks I. N. Kalachevaya and B. Ye. Samosudov for the numerical calculations, and Ye. N. Gur'yanova and M. N. Adamov for their suggestions.

Samoylov, O. Ya., and M. N. Buslayeva [Institut obshchey i neorganicheskoy khimii im. N. S. Kurnakova (Institute of General and Inorganic Chemistry imeni N. S. Kurnakov)]. Temperature Dependence of Coordination Numbers of Alkali Metal Cations in Aqueous Solutions 102

Yesin, O. A. [Ural'skiy politekhnicheskiy institut im. S. M. Kirova [illegible] (Ural Polytechnic Institute imeni S. M. Kirov, Sverdlovsk)]. Form of Surface Tension Isotherms 111

AVAILABLE: Library of Congress

JA/dwm/ec
10-20-60

Card 1/6

S/051/60/008/02/026/036
E201/E391

AUTHORS: Baranov, V.M. and Rebane, T.K.

TITLE: On the Semi-empirical Calculation of the Ionization Potentials of Aliphatic Compounds

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 2, pp 268 - 270 (USSR)

ABSTRACT: Using Fok and Hartree's self-consistent field method (Ref 1), Hall suggested a semi-empirical method of calculating the ionization potentials of similar molecules (Ref 2). The method is simplest when applied to aliphatic molecules. Structure of the latter is assumed to be such that all the carbon atoms lie in one plane. Calculations are greatly simplified if antisymmetry of the ionized molecular orbits with respect to reflection in the molecular plane of symmetry is assumed. Then individual groups of atoms in a molecule (e.g. CH_2) can be represented by parameters calculated from the experimental values of the ionization potentials. For normal paraffins, C_nH_{2n+2}, Hall obtained the following formula for calculation of the first ionization potentials (Ref 3):

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On the Semi-empirical Calculation of the Ionization Potentials of Aliphatic Compounds

$$I(n) = -a - 2b \cos \frac{\pi n}{n + 1} \qquad (1)$$

where "A" is a parameter which describes the CH_2 groups and the end groups CH_3 (CH_2 and CH_3 are assumed to be equivalent) and "B" is a parameter which describes interacting of neighbouring groups. The parameters "a" and "b" were found by Hall from the experimental values of the ionization potentials of normal paraffins. Similar calculations but with different parameters were carried out by Franklin (Ref 4). The present authors used the above equation and various values of "a" and "b" to carry out the same calculations. They found it impossible to approximate satisfactorily the ionization potentials of molecules of the whole paraffin series using Eq (1). No improvement was obtained by introducing

Card2/4

S/051/60/008/02/026/036
E201/E391

On the Semi-empirical Calculation of the Ionization Potentials of Aliphatic Compounds

a correction to the parameter "a" allowing for the non-equivalence of the CH_2 and CH_3 groups. If, however, we assume that for some reason the ionization potentials of methane and ethane cannot be represented by Eq (1), then for the remaining members of the paraffin series we obtain good agreement with experiment (Table 1) for "a" = -14.06 eV and "b" = -2.02 eV deduced from the experimental values of the ionization potentials of propane and butane. The present authors calculated also the ionization potentials of free aliphatic radicals (C_nH_{2n+1}). To describe a group with free valence and its interaction with neighbouring groups the authors used two new parameters determined from the mean experimental values:

$$I_{CH_3} = 9.96 \text{ eV} \quad \text{and} \quad I_{C_2H_5} = 8.72 \text{ eV} .$$

The results are given in Table 2. They agree quite well

Card3/4

S/051/60/008/02/026/036
E201/E391

On the Semi-empirical Calculation of the Ionization Potentials of Aliphatic Compounds

with those reported by Stevenson (Ref 6).
There are 2 tables and 6 references, 5 of which are English and 1 German.

SUBMITTED: July 6, 1959

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Card 4/4

S/051/60/008/04/005/032
E201/E691

AUTHOR: Rebane, T.K.

TITLE: Calculation of the Polarizability of Conjugated Molecules, with Allowance for the Electrostatic Interactions of π-Electrons

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 4, pp 458-464 (USSR)

ABSTRACT: The author considers the effect of the electrostatic interaction of π-electrons on the polarizability of molecules with conjugated single and double bonds. Perturbation theory formulae are obtained for the self-consistent field method. The theory developed is applied to molecules of ethylene and benzene employing simplifying assumptions which are used in the semi-empirical variant of the self-consistent molecular orbit method. It is found that the electrostatic interaction of π-electrons lowers considerably the π-electron polarizability of conjugated molecules. In conclusion the author points out that the polarizability of conjugated molecules may be altered also by interactions of π-electrons with, say, σ-electrons. The paper is entirely theoretical. There are 13 references, 6 of which are Soviet and 7 English.

Card 1/1

SUBMITTED: July 20, 1959.

REBANE, T.K.

Variational principle for the calculation of the correction to the energy of an electron in a molecule, quadratie with respect to the magnetic field strength. Zhur.eksp.i teor.fiz. 38 no.3:963-965 Mr '60. (MIRA 13:7)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova. (Electrons)

86036

S/020/60/135/003/016/039
B019/B077

11,4600

AUTHOR: Rebane, T. K.

TITLE: The Relation Between the Number of π Electrons and the Characteristics of the Magnetic Susceptibility of a Type of Aromatic Molecules

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 3, pp. 568-570

TEXT: Here those conditions are examined by which the contribution χ_{π} of the interatomic π electron currents to the susceptibility of aromatic molecules have a paramagnetic and not a diamagnetic characteristic. In simple electron approximation $\chi_{\pi} = \sum_{p} \nu_p \chi_p$ (1) an approximation of the disturbance theory yields

$$\chi_p = \chi_p^{(1)} + \chi_p^{(2)} = \frac{e^2\beta}{h^2c^2} \sum_{k,l} (c^*_{pk}c_{pl} + c^*_{pl}c_{pk}) S^2_{kl}\eta_{kl} - \frac{2e^2\beta^2}{h^2c^2} \sum_{q \neq p} \frac{\left|\sum_{k,l} (c^*_{qk}c_{pl} - c^*_{ql}c_{pk}) S_{kl}\eta_{kl}\right|^2}{\varepsilon_p - \varepsilon_q}$$

Card 1/2

REBANE, T.K.

Effect of the degree of complanarity of a molecule on the signs of conjugation of π-electrons. Zhur.fiz.khim. 35 no.8:1681-1690 Ag '61. (MIRA 14:8)

1. Fiziko-khimicheskiy institut imeni L.A. Karpova.
(Molecular rotation—Models)
(Electrons)

ADAMOV, M.N.; REBANE, T.K.; EVARESTOV, R.A.

Variational estimation of values computed in the second approximation of the perturbation theory. Teoret. i eksper. khim. 1 no.5: 588-594 S-O '65 (MIRA 19:1)

1. Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta. Submitted June 23, 1965.

L 04759-67 EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6025967 SOURCE CODE: UR/0051/66/021/001/0118/0120

AUTHOR: Rebane, T. K.

54

53

B

ORG: none

TITLE: New variational principles for dynamic and static polarizability

SOURCE: Optika i spektroskopiya, v. 21, no. 1, 1966, 118-120

TOPIC TAGS: electric polarization, dielectric polarization, nonlinear functional operator, variational method, hydrogen

ABSTRACT: The application of variational principle for the analysis of the upper limit of dynamic and static polarizability in systems with an arbitrary number of electrons is discussed. In addition, the formulation of variational principles for the lower and upper limits of polarizability in excited states is provided. The dynamic polarizability of an n-state discrete spectrum of the energy operator H is given by

$$\alpha_n(\epsilon) = \beta_n(\epsilon) + \beta_n(-\epsilon).$$

in an electric field with the potential

$$w(\mathbf{r}, t) = W(\mathbf{r}) \cos\left(\frac{\epsilon t}{\hbar}\right)$$

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L 04759-67

ACC NR: AP6025967

Operator H, its eigenfunctions ϕ_n and function $W(r)$ are real. The value $\beta_n(\mu)$, where $\mu = \pm\varepsilon$ equals

$$\beta_n(\mu) = -\int u_n(\mathbf{r};\ \mu)\, W(\mathbf{r})\, \psi_n(\mathbf{r})\, d\tau,$$

where $u_n(r;\mu)$ satisfies

$$(H - E_n + \mu)\, u_n(\mathbf{r};\ \mu) + W(\mathbf{r})\, \psi_n(\mathbf{r}) = 0$$

and the boundary conditions common for wavefunctions, u_n can be expanded into the following series

$$u_n(\mathbf{r};\ \mu) = \sum_k \frac{\langle k \mid W \mid n \rangle \psi_k(\mathbf{r})}{(E_n - E_k - \mu)}.$$

By applying variational techniques to u_n and the functional

$$K_n(u;\ \mu,\ \Delta) = \int \left\{ \frac{[(H - E_n + \mu)\, u + W\psi_n]^2}{\Delta} - u\, [(H - E_n + \mu)\, u + 2W\psi_n] \right\} d\tau,$$

the author arrives at the expressions

$$\beta_n(\mu) = \min K_n(\tilde{u};\ \mu,\ \Delta). \quad \text{and} \quad \beta_n(\mu) = \max K_n(\tilde{u};\ \mu,\ \Delta).$$

L 04759-67
ACC NR: AP6025967

which are in accordance with the variational principle. An example of utilization of this method for calculation of static polarizability for the 1s-state of ϕ_1 hydrogen atom in a homogeneous field $W(r) = z$ is included. Orig. art. has: 15 formulas.

SUB CODE: 20/ SUBM DATE: 27Dec65/ ORIG REF: 004/ OTH REF: 006

kh

Card 3/3

ACC NR: AP6036952 (A, N) SOURCE CODE: UR/0181/66/008/011/3173/3176

AUTHOR: Adamov, M. N.; Ledovskaya, Ye. M.; Rebane, T. K.

ORG: Leningrad State University im. A. A. Zhdanov (Leningradskiy gosudarstvennyy universitet)

TITLE: Variational calculation of the polarizability of the F-center in alkali halide crystals (point lattice approximation)

SOURCE: Fizika tverdogo tela, v. 8, no. 11, 1966, 3173-3176

TOPIC TAGS: F center, alkali halide, variational method, ground state

ABSTRACT: In order to calculate atomic shifts and frequencies of local oscillations in crystals with defects, it is necessary to estimate the static polarizability α of the defects and ions of the crystal base; this was done both from above and from below. A variational method of the perturbation theory was used to find, in the point lattice approximation, the narrow interval in which is located the value of the polarizability of the F-center corrresponding to the model potential V(r). The following wave function was used to describe the ground state of the F-center:

$$\phi_{1s} = \sqrt{\frac{\gamma^3}{7\pi}} e^{-\gamma r}(1 + \gamma r).$$

Optimum values of parameter γ for NaCl crystals were determined from the requirement

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ACC NR: AP6036952

of minimum energy of the electron described by this function and located in the field of a nonpolarizable point lattice with an anion vacancy. The excitation energy $\epsilon = E_{1p} - E_{1s}$ was found to be

$$\frac{1}{6}\gamma^2 \leqslant \varepsilon \leqslant \frac{5}{18}\gamma^2.$$

The estimate from above gave $\alpha \geqslant \frac{15.523}{\gamma^4}$, and the estimate from below, $\alpha \leqslant \frac{15.556}{\gamma^4}$

The two sets of estimates for various alkali halide crystals are tabulated. It is concluded that the variational calculation gave a precise value of the polarizability of the ground state of the electron moving in a field with potential V(r). Since, however, the model potential V(r) describes the F-center only approximately, the results of the calculation may differ from the actual value of the polarizability of the F-center, being probably somewhat high. The numerical calculations were performed with a BESM-2 computer, and the program for calculating the optimum value of parameter γ was written by B. Ya. Frezinskiy. Authors are grateful to I. V. Abarenkov for discussing the work. Orig. art. has: 1 table and 11 formulas.

SUB CODE: 20/ SUBM DATE: 08Feb66/ ORIG REF: 005/ OTH REF: 003

Card 2/2

L 12003-66 EWT(1)/EWP(m)/EPF(n)-2

ACC NR: AP5022857 SOURCE CODE: UR/0051/65/019/003/0313/0318

44,55

AUTHOR: Rebane, T. K.

44

55

B

ORG: none

21,44,55

TITLE: Perturbation theory in the Hartree-Fock method

SOURCE: Optika i spektroskopiya, v. 19, no. 3, 1965, 313-318

TOPIC TAGS: Hartree Fock method, perturbation theory, wave function, variational method

ABSTRACT: The author examines the calculation of higher-order corrections to the energy of a many-electron system, using the Hartree-Fock method, the applicability of which for calculations of not only unperturbed atom-molecular systems, but also systems that are perturbed by an external electric and magnetic field, has been enhanced by recent progress in computational techniques. A general expression for corrections to the energy of order (2s + 1) and 2s is derived, in terms of corrections to the one-electron self-consistent wave functions of order not higher than s. The uniqueness of the selection of the appropriate single-electron functions is demonstrated. It is also shown that the perturbed self-consistent wave functions possess certain properties that are similar to the properties of perturbed exact wave functions. It is noted in the conclusion that the results can be extended to apply in the case of a two-electron perturbation operator, which is of interest in connection with investigations in which self-consistent functions are constructed in the form of series in

Card 1/2 UDC: 539.182

L 12003-66

ACC NR: AP5022857

44,55 9

terms of inverse powers of the charge of the nucleus. Author thanks Yu. N. Demkov who pointed out the possibility of applying the variational principle to the problem, and M. N. Adamov and M. G. Veselov for a discussion and comments. Orig. art. has: 34 formulas. 44,55 44,55

SUB CODE: 20/ SUBM DATE: 03Jul64/ OTH REF: 006

HW

Card 2/2

REBANE, T.K.

Variational principles in steady-state perturbation theory.
Vest.LGU 20 no.22:20-28 '65.
(MIRA 18:12)

REBANE, T.K.

Comment on the approximate formula of Mulliken in the case of interaction between energy equivalent states. Zhur. strukt. khim. 6 no.1:176 Ja-F '65.

(MIRA 18:12)

1. Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta imeni A.A.Zhdanova. Submitted July 6, 1964.

[illegible]

Semiempirical method for determining the electrostatic potential of the nuclear electron shell in a molecule. Opt. i spektr. 17 no. 1:29-31 Jl '64 (MIRA 17:9)

REBANE, T.K.

Molecular gyromagnetism. Zhur. eksp. i teor. fiz. 47 no.4:1342-1344
O '64. (MIRA 18:1)

1. Leningradskiy gosudarstvennyy universitet.

REBANE, T.K.

Semiempirical method for determining the electrostatic potential of the electron shell of atomic nuclei in a molecule. Part 2.
Opt. i spektr. 17 no.6:825-831 D '64. (MIRA 18:3)

REBANE, T.K.

Simple model for the rotary magnetic moment of a molecule. Vest. LGU 20 no.4:30-35 '65. (MIRA 18:4) [illegible], [illegible]

Use of the vector potential variation method in calculating the magnetic properties of molecules. Vest. LGU 19 no.22:[illegible]-76 '64.
(MIRA 18:1)

L 12955-65 EWT(1)/EWT(m)/EPF(c)/EWP(b) Pr-4 JD

ACCESSION NR: AP4041832 S/0054/64/000/002/0031/0039

AUTHORS: Adamov, M. N.; Kagan, V. K.; Rebane, T. K.

B

TITLE: Calculation of the Stark effect in the hydrogen atom

SOURCE: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 2, 1964, 31-39

TOPIC TAGS: Stark effect, hydrogen atom, perturbation theory, Laguerre's polynomial, Laplaci's transformation

ABSTRACT: So far the correction to the wave function in the first approximation of the perturbation theory has been obtained only for the ground state of the hydrogen atom. The authors show that the solution of this problem for any state of hydrogen can be obtained in closed form by means of Laplace transformation. The general form for the correction function in parabolic coordinates is obtained by the recurrent formula for Laguerre polynomials. The wave functions for the ground and the lowest existing states in an electric field are computed. Orig. art. has: 42 equations.

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L 12955-65
ACCESSION NR: AP4041832

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ASSOCIATION: None

SUBMITTED: 07Aug63

ENCL: 00

SUB CODE: GP, MA

NR REF SOV: 002

OTHER: 001

Card 2/2

L 14736-65 EWT(1)/T AS(mp)-2/ESD(gs)/IJP(c) S/0051/64/017/006/0825/0831
ACCESSION NR: AP5000544

AUTHOR: Rebane, T. K.

B

TITLE: Semi-empirical method of determining the values of the electrostatic potential of the electron shell of a molecule in atomic nuclei. II. Calculation of the values of the potential of nuclei in several diatomic molecules

SOURCE: Optika i spektroskopiya, v. 17, No. 6, 1964, 825-831

TOPIC TAGS: electron shell, electrostatic potential, diatomic molecule

ABSTRACT: The semi-empirical method proposed in the first part of the article (Opt. i spektr. v. 17, 3, 1964) is applied here to the diatomic molecules LiH, BeH, BH, CH, NH, OH, FH, NaH, NB, OBe, FLi, NC, OB, FBe, OC, FB, ON, H_2, N_2. The differences in the values of the electrostatic potential of the electron shells of the nuclei

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L 14736-65
ACCESSION NR: AP5000544

2

were calculated for 17 diatomic molecules, and the potentials of the electron shells of 21 individual nuclei were calculated for 14 different diatomic molecules. The results are tabulated. It is pointed out that the method makes it possible to get along without knowledge of the electronic wave functions of the molecules. When used in conjunction with the method for approximately determining the paramagnetic part of the nuclear magnetic screening constant (S. I. Chan and T. B. Das, J. Chem. Phys. v. 37, 1527, 1962), this method can be used to determine the total nuclear magnetic screening constants from data on the energies and equilibrium internuclear distances of the diatomic molecules only. The method can be extended in principle to polyatomic molecules, but the experimental data on the total energies of iso-electronic polyatomic molecules are still scanty. "The author thanks M. G. Veselov and Yu. N. Demkov for valuable remarks made during the discussion of the work." Orig. art. has: 2 tables.

L 14736-65

ACCESSION NR: AP5000544

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ASSOCIATION: None

SUBMITTED: 30Oct63

ENCL: 00

SUB CODE: NP, GP

NR REF SOV: 004

OTHER: 007

Card 3/3

L 13493-65 EWT(1)/T IJP(c)/AFWL/AS(mp)-2/ASD/ESD(t)
S/0056/64/047/004/1342/1344

ACCESSION NR: AP4047901

B

AUTHOR: Rebane, T. K.

TITLE: On molecular 2 gyromagnetism

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 4, 1964, 1342-1344

TOPIC TAGS: diatomic molecule, diamagnetic molecule, magnetic moment, gyromagnetism, molecular gyromagnetism

ABSTRACT: Since the connection between the theory of rotational magnetic moments of diamagnetic molecules and the adiabatic approximation has not been discussed in the literature in detail, the authors show, using a rotating diatomic diamagnetic molecule with identical nuclei as an example, that the electronic contribution to the rotational magnetic moment is essentially determined by the non-adiabatic nature of the coupling between the electronic

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L 13493-65
ACCESSION NR: AP4047901

and the nuclear motions. In addition, the author points to a methodological error made by Ch. K. Mukhtarov (ZhETF v. 45, 185, 1963) in his analysis of the electronic contribution to the magnetic moment of a molecule. Orig. art. has: 10 formulas.

ASSOCIATION: Leningradskiy gosudarstvenny*y universitet (Leningrad State University)

SUBMITTED: 27Feb64 ENCL: 00

SUB CODE: EM NR REF SOV: 001 OTHER: 002

Card 2/2

ACCESSION NR: AP4042975 S/0051/64/017/001/0003/0007

AUTHOR: Rebane, T. K.

TITLE: Semiempirical method of determining the electrostatic potential of the electron shell of a molecule at the atomic nuclei. I. Theory of the method for diatomic molecules

SOURCE: Optika i spektroskopiya, v. 17, no. 1, 1964, 3-7

TOPIC TAGS: electrostatic field, molecular structure, atomic ion, atomic charge

ABSTRACT: The author extends his previously proposed method (opt. i spektr. v. 16, 164, 1964) for determining the electrostatic potential of the electron shell at the nuclei of free atoms to include atomic nuclei in molecules. The method is based on an interpolation of the energies of the iso-electronic ions and on the use of the Hellman-Feynman theorem (H. Hellman, Einfuhrung in die Quantenchemie,

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ACCESSION NR: AP4042975

Edwards Bros., Ann Arbor, 1944; R. P. Feynman, Phys. Rev. v. 56, 340, 1939). The theoretical premises of the method are considered first for the case of isoelectronic diatomic molecules with a fixed sum of the nuclear charges. This is followed by study of molecules in which the charge of one of the nuclei is fixed, and for which much less experimental material is available. It is claimed that the accuracy of the semiempirical formula is not inferior to that of purely theoretical calculations in the first type of molecules, but the results are only approximate for the second type. The application of the proposed method to concrete molecules will be treated in the second part of the article. Orig. art. has: 19 formulas.

ASSOCIATION: None

SUBMITTED: 15Oct63

ENCL: 00

SUB CODE: NP

NR REF SOV: 002

OTHER: 005

2/2

ADAMOV, M. N.; KAGAN, V. K.; REBANE, T. K.

Calculating the Stark effect in the hydrogen atom. Vest. LGU
19 no.10:31-39 '64. (MIRA 17:7)

ACCESSION NR: AP4010232 S/0054/63/000/004/0035/0038

AUTHOR: Rebane, T. K.

TITLE: On alternation effect of carbon-carbon bond length on diamagnetic susceptibility caused by interatomic π-electron currents in the heptalene molecule

SOURCE: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, vyp. 4, 1963, 35-38

TOPIC TAGS: bond length, diamagnetic susceptibility, alternation effect, benzene, paramagnetic, heptalene molecule, electron current

ABSTRACT: The alternation effect of carbon-carbon bond length on $\chi_{\pi z}$ introduced by interatomic π-electron currents in the magnetic susceptibility of heptalene has been investigated. The heptalene structure is given in Fig. 1 on the Enclosure. The magnitude of $\chi_{\pi z}$ is determined from the London relationship

$$\chi_{\pi z} = -2\sum_{p=1}^{6}\left(\frac{\partial^2 \varepsilon_p}{\partial H^2}\right)_{H=0},$$

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ACCESSION NR: AP4010232

Calculations show that alternating bond lengths in heptalene maintain the "anomalous" paramagnetic character of $\chi_{\pi s}$ but significantly lower its numerical value. The magnitudes of $\chi_{\pi s}$ for heptalene $C_{12}H_{10}$ and naphthalene $C_{10}H_8$ yield magnitudes $-2.75\,\chi_{\pi s}^{(0)}$ and $2.185\,\chi_{\pi s}^{(0)}$ respectively, where $\chi_{\pi s}^{(0)}$ is the diamagnetic susceptibility of benzene and varies between -33.26 to -45.3×10^{-6} cm^3/mol. "The author is grateful to M. G. Veselov and G. N. Dmitriyeva for their help." Orig. art. has: 6 formulas and 1 figure.

ASSOCIATION: none

SUBMITTED: 08Apr63 DATE ACQ: 03Feb64 ENCL: 01

SUB CODE: GC NO REF SOV: 002 OTHER: 008

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ACCESSION NR: AP4010232

ENCLOSURE: 01

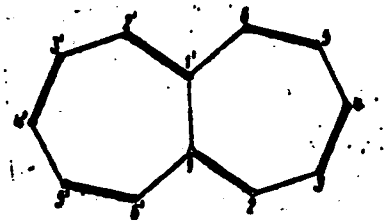

Fig. 1

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REBANE, T.K.

Semiempirical method for determining the electrostatic potential generated by electrons around an atomic nucleus. Opt. i spektr. 16 no.1:164-167 Ja '64. (MIRA 17:3)

REBANE, K.; REBANE, T., kand. fiz.-matem. nauk

Theory of Raman scattering of light by molecules. Izv. AN Est. SSR..Ser. fiz.-mat. i tekh. nauk 12 no.3:227-237 '63. (MIRA 16:11)

1. Institute of Physics and Astronomy of the Academy of Sciences of the Estonian S.S.R. and Leningrad State University. 2. Corresponding Member of the Academy of Sciences of the Estonian S.S.R. (for K. Rebane).

REBANE, T.K.

Generalization of the concept of alternant conjugate molecules. Vest. LGU 18 no.22:30-34 '63.

Effect of the alternation of carbon-carbon bond lengths on the diamagnetic susceptibility due to interatomic -electron currents in the heptalene molecule. Ibid.:35-38
(MIRA 17:1)

REBANE, T.K.

Variational method for calculating molecular magnetic susceptibility. Vest. LGU. 18 no.16:7-11 '63. (MIRA 16:11)

ACCESSION NR: AP4011503

S/0051/64/016/001/0164/0167

AUTHOR: Rebane, T.K.

TITLE: Semi-empirical method for determining the electrostatic potential produced by the electrons at an atomic nucleus

SOURCE: Optika i spektroskopiya, v.16, no.1, 1964, 164-167

TOPIC TAGS: electron potential, electron field, electron electrostatic potential, electron core potential, light atom, light ion, hydrogen, helium, lithium, carbon, beryllium, boron, nitrogen

ABSTRACT: Using the nonrelativistic wave function and ground state energy of an N-electron atom with nuclear charge Z, as given by the Schrodinger equation, an expression is derived for v(0), the electrostatic potential produced by the electron shell of the atom at the point of the nucleus. Use is then made of the semi-empirical formulas of other authors to arrive at a method for determination of the values of the electrostatic potential produced by the outer electrons of the nucleus of the atom. The values of the electrostatic potential for light atoms and ions from H through N^+, calculated by the proposed method, are tabulated and compared with

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ACC.NR: AP4011503

the theoretical values. The results indicate that the accuracy of the semi-empirical method where light atoms are concerned is not inferior to that of the self-consistent field method. However, before the semi-empirical method can be extended to heavier atoms there must be constructred the appropriate semi-empirical formulas for the total energy and means found for taking into account relativistic effects. "The author is grateful to M.G.Veselov for valuable suggestions." Orig.art.has: 10 formulas and 1 table.

ASSOCIATION: none

SUBMITTED: 13May63	DATE ACQ: 14Feb64	ENCL: 00
SUB CODE: PH	NR REF SOV: 002	OTHER: 009

Card 2/2

KOZLOV, B.A. (Moskva); REBANE, T.K. (Moskva)

Calculation of the π-eledtronic diamagnetic susceptibility of heteroatom-containing aromatic molecules using a one-dimensional model. Zhur. fiz. khim. 36 no.1:143-147 Ja '62. (MIRA 16:8)

1. Fiziko-khimicheskiy institut im. L.Ya. Karpova.
(Heterocyclic compounds)
(Diamagnetism)

REBANE, T.K.

Magnetic susceptibility of a two-dimensional anisotropic harmonic oscillator. Vest. LGU 18 no.10:24-26 '63. (MIRA 16:8)
(Quantum theory)

REBANE, T.K.

Calculating the effective electron mass in a one-dimensional periodic field. Vest LGU 16 no.22:21-25 '61. (MIRA 14:11)
(Electrons) (Wave mechanics)

ACC NR: AP7002413 SOURCE CODE: UR/0051/66/021/006/0661/0665

AUTHOR: Rebane, V. N.

ORG: none

TITLE: Influence of stimulated emission on the Hanle effect

SOURCE: Optika i spektroskopiya, v. 21, no. 6, 1966, 661-665

TOPIC TAGS: laser emission, stimulated emission, line width, spectral line, line intensity

ABSTRACT: The author proposes a theory which makes it possible to take into account the dependence of the Hanle line shape on the intensity of laser radiation, with particular application to a three-level system (energies $E_a > E_b > E_c$ with moments $J_a = 0$, $J_b = 1$, and $J_c = 0$; laser emission corresponds to transition b → c). The theory is based on expanding the density matrix in powers of the Larmor frequency, with rigorous determination of the dependence of the expansion coefficients on the amplitude of the light field in the laser. This yields the dependence of the Hanle line shape on the field intensity in the laser, and also the dependence of the total spontaneous emission (from the lower laser level) on the magnetic field. It is shown that the Hanle line broadens monotonically with increasing intensity of the spontaneous emission, and that turning on a weak magnetic field in the presence of a → b stimulated emission leads to an increase of the summary intensity of the b → c spontaneous emission. This effect of the magnetic field is a distinguishing feature of

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ACC NR: AP7002413

the Hanle effect in the presence of stimulated emission. The author thanks M. P. Chayka for suggesting the topic and for continuous interest, and V. I. Perel' for valuable remarks. Orig. art. has: 17 formulas.

SUB CODE: 20/ SUBM DATE: 14Mar66/ ORIG REF: 003/ ATD PRESS: 5113

L 18738-63 EWT(m)/BDS ASD RM/MAY

ACCESSION NR: AT3002200 S/2941/63/001/000/0084/0094

53

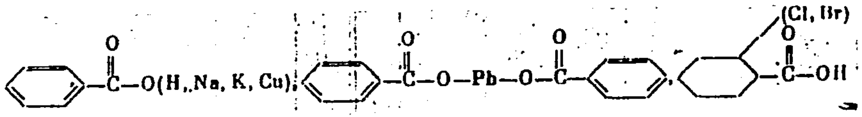
AUTHORS: Levshin, V. L.; Rebane, V. N.

TITLE: On luminescence spectra of benzoic acid and its salts

SOURCE: Optika i spektroskopiye; sbornik statey. v. 1: Lyuminestsentsiya. Moscow, Izd-vo AN SSSR, 1963, 84-94

TOPIC TAGS: luminescence, benzoic acid, absorption, emission

ABSTRACT: A study has been made of the absorption and emission spectra, the laws of decay and relative yield of luminescence, and the effect of heavy atoms in benzoic acid, the Na_, K_, Cu_, Pb_ salts of benzoic acid and Cl_, Br_ substitutes at liquid nitrogen temperatures. The structure of the benzoic acid molecule is given:



From the spectral analysis it was shown that the spread and intensity of the absorption bands vary uniformly from one salt to another and that the introduction

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L 18738-63
ACCESSION NR: AT3002200

of Cl and Br significantly affects the electronic levels. The spectra of luminescence duration seems to vary from that of absorption, with emission bands strongly dependent on polarization media. Furthermore, the spectra of these salts show individual characters and change only slightly when heavy metallic atoms are present. Orig. art. has: 6 figures, 6 tables, and 6 formulas.

ASSOCIATION: none

SUBMITTED: 09Mar62 DATE ACQ: 19May63 ENCL: 00

SUB CODE: PH NO REF SOV: 004 OTHER: 003

Card 2/2

ACC NR: AP6033434 SOURCE CODE: UR/0051/66/021/004/0405/0412

AUTHOR: Rebane, V. N.

ORG: none

TITLE: Influence of an impurity gas on the polarization of resonance fluorescence

SOURCE: Optika i spektroskopiya, v. 21, no. 4, 1966, 405-412

TOPIC TAGS: fluorescence, collision cross section, polarized luminescence, excited state, kinetic equation, hyperfine structure

ABSTRACT: This is a continuation of earlier work (Opt. is spektr. v. 20, 185, 1966) where the effect exerted by collisions with atoms of an inert-gas impurity on the density matrix of the excited atoms of the investigated substance was considered. In the preceding paper the substance was in the state $^1P_1$. In the present paper these results are generalized to the case of an excited state with arbitrary electronic angular momentum in the adiabatic approximation. Kinetic equations are considered for the density matrix of the excited state. A solution is obtained for these equations in general form, in an approximation which linear in the pressure. In this approximation, the degrees of polarizations (unlike the Hanle line broadening) do not depend on the possible change in the lifetime of the excited state due to the collision. A numerical calculation is presented of the degrees of polarization of the resonance fluorescence and the Hanle line shape for different polarizations of the exciting light, in the presence of a hyperfine structure. The influence of the colli-

Card 1/2 UDC: 535.372 - 4

ACC NR: AP6033434

sions on the degree of circular polarization is found to be twice as large than their influence on the degree of plane polarization. The Hanle line broadening in circular polarization is 1.6 times larger than the broadening in the plane polarization. The relaxation of the density matrix after turning on the exciting light and the attenuation constants characterizing the fluorescence quenching at different polarizations are determined. The theory proposed can be refined by taking into account nonadiabatic collisions and by other approximations, but calls for availability of reliable experimental data on the depolarization of the resonance fluorescence under the influence of the impurity gas. The author is sincerely grateful to M. P. Chayka for continuous interest in the work and valuable remarks. Orig. art. has: 36 formulas.

SUB CODE: 20/ SUBM DATE: 19May65/ ORIG REF: 003/ OTH REF: 004

Card 2/2

AUTHORS: Levshin, V.L. and Rebane, V.N. SOV/51-7-2-14/34

TITLE: A Comparative Study of Light-Sum Storage and Temperature Quenching in a ZnS-Ag Phosphor Excited with β-Rays and Light (Sravnitel'noye izucheniye zapasaniya svetovykh summ i temperaturnogo tusheniya fosfora ZnS-Ag pri vozbuzhdenii β-luchami i svetom)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 7, Nr 2, pp 236-240 (USSR)

ABSTRACT: The paper was presented by M.D. Galanin at the VII-th All-Union Conference on Luminescence on July 1, 1958, in Moscow. The paper reports a study of thermoluminescence and temperature quenching of the phosphor ZnS-Ag-$MgCl_2$ (10^{-4} g/g of Ag and 10^{-2} g/g of $MgCl_2$) excited by means of light and β-rays. The phosphors were heated to $800^{\circ}C$ in air before measurements; they were prepared by V.I. Shchayenko. A mercury lamp PRK-4 was used in photo-excitation; the 365 mμ line was separated out by means of a filter. Beta-particles were from the following sources: P^{32} (maximum β-energy $E = 1.7$ MeV, mean energy $\bar{E} = 0.7$ MeV), Tl^{204} ($E = 0.783$ MeV, $\bar{E} = 0.261$ MeV) and S^{35} ($E = 0.167$ MeV and $\bar{E} = 0.055$ MeV). The phosphor was used in the form of a layer 0.25 mm thick. It was excited with light or with β-rays at the liquid-nitrogen temperature, the excitation then ceased and the phosphor was kept in darkness for 1 min. Next the phosphor was heated at the rate

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SOV/51-7-2-14/34

A Comparative Study of Light-Sum Storage and Temperature Quenching in a ZnS-Ag Phosphor Excited with β-Rays and Light

of 15 deg/min. The intensity of luminescence of the phosphor was recorded by means of a photomultiplier FEU-19 and a microammeter M-91. Two peaks were observed on the thermoluminescence curve of the photo-excited phosphor (Fig 1a); these peaks were at -150 to -165°C and at -75 to -80°C. The β-excited phosphor (Fig 1б-2) exhibited the same peaks. It follows, therefore, that for both types of excitation the same system of local levels was obtained. Filling of these levels depended on the type of excitation: when photo-excited the shallow levels were filled to a greater extent than deep levels, and on β-excitation the reverse was true. Filling of the local levels depends strongly on the intensity and duration of excitation. It was found that when the photo-excitation intensity was reduced by a factor of 10^4 (from 30 to 0.003 μW/cm^2) the rate of filling of the levels was the same on photo-excitation and on β-excitation from a 5.7 millicurie P^{32} source (Fig 3). It follows, therefore, that the peculiarities of β-excitation are entirely due to the low intensity of β-rays. Calculations showed that both a 0.003 μW/cm^2 light beam and a β-beam from a 5.7 millicurie P^{32} source deliver energy to the surface layer of the phosphor at the same rate of

A Comparative Study of Light-Sum Storage and Temperature Quenching in a ZnS-Ag Phosphor Excited with β-Rays and Light SOV/51-7-2-14/34

$\sim 10^{13}$ eV $cm^{-3}sec^{-1}$. The authors studied also the temperature quenching on photo- and β-excitation (Fig 4). It was found that at low excitation intensities the temperature quenching begins at lower temperatures than it does at higher excitation intensities. The temperature quenching curve recorded on excitation with β-rays from a 30 millicurie P^{32} source (dashed curve in Fig 4) is almost identical with the quenching curve obtained on photo-excitation at the rate of 0.3 $\mu W/cm^2$. Acknowledgment is made to M.D. Galanin for his interest. There are 4 figures and 3 references, 1 of which is Soviet and 2 English.

SUBMITTED: September 2, 1958

Card 3/3

TSATSKA, E.M.;REBANE, Ye.I.;GERASIMOV, V.S.;MAKAROVA, G.A.

Use of a centrifugal blower and tar extractor of the TsKTI-LPI type for the purification of crude gases. Gidroliz i lesokhim. prom. 12 no.7:19-23 '59 (MIRA 13:3)

1. Leningradskaya lesotekhnicheskaya akademiya (for TSatska, Rebane).
2. Vakhtanskiy kanifol'no-ekstraktsionnyy zavod (for Gerasimov, Makarova).
(Wood-using industries--Equipment and supplies)
(Gas purification)

REBANE, Yu. [Rebane, J.]

In the Estonian sky. Grazhd.av. 16 no.1:4 Ja '59. (MIRA 12:3)

1. Nachal'nik otdela transporta, dorozhnogo khozyaystva i svyazi Gosplana Estonskoy SSR.
(Estonia--Aeronautics, Commercial)

REBANES, A.

Estonian S.S.R. Avt.transp. 35 no.10:38 O '57. (MIRA 10:10)

1.Ministr avtomobil'nogo transporta i shosseynykh dorog Estonskoy SSR.
(Estonia--Transportation, Automotive)

REBAR, M.I

PHASE I BOOK EXPLOITATION SOV/5151

Leningrad. Universitet

Molekulyarnaya spektroskopiya (Molecular Spectroscopy) [Leningrad] Izd-vo Leningr. univ., 1960. 193 p. 4,700 copies printed.

Resp. Ed.: F. I. Skripov; Eds.: Ye. V. Shchemeleva and V. D. Piastro; Tech. Ed.: S. D. Vodolagina.

PURPOSE: This collection of articles is intended for scientific workers, instructors and students of physics and chemistry. It may also be used by engineers and technicians employing molecular spectroscopy.

COVERAGE: The collection of articles describes spectroscopic studies of liquids and solutions, and includes data on applied molecular spectroscopy. Individual articles deal with the molecular interaction in solutions, and specifically with the hydrogen bond problem. Works on the optimum utilization of spectral apparatus and on the analytical application of molecular spectroscopy are also included.

Aspects of the structure of high and low molecular compounds and of molecular complexes are also covered. The collection was published in honor of the 70th birthday of Professor Vladimir Mikhaylovich Chulanovskiy, Soviet specialist in molecular spectroscopy and spectral analysis. There are no references.

TABLE OF CONTENTS:

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REBAR, M.I

AL'TGAUZEN, A.Ya.; REBARBAR, R.Ya.

Laryngeal smear in diagnosis of cancer. Vest. otorinolar. 13 no.3:41-43 May-June 1951. (CIML 20:11)

1. Doctor Medical Sciences A.Ya. Al'tgauzen and R.Ya. Rebarbar (Khar'kov). 2. Of the Clinical Laboratory of the Ukrainian Roentgenological, Radiological, and Oncological Institute (Director--Docent Ye.A. Bazlov) and of the Ukrainian Scientific Research Institute for Diseases of the Ear, Throat, and Nose (Director--Prof. L.L. Frumin).

PEDANOV, V.V.; REBARBAR, V.M.; MOLCHANOV, A.S.

Continuously operating delay network using RC loops for
automatic sliver thickness control systems of drawing frames.
Izv.vys.ucheb.zav.; tekh.tekst.prom. no.5:130-137 '61.
(MIRA 14:11)

1. Moskovskiy tekstil'nyy institut.
(Spinning machinery) (Automatic control)

[illegible], R.

[illegible], R. Reorganization of marine fisheries in Slovenia. p. 251.

Vol. 3, No. 7, July 1956.
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Rijeka, Yugoslavia

So: East European Accession, Vol. 6, No. 2, February 1957

REBANDAR, Ya.N.; GALYNKER, E.I.; SOKOLOVA, V.N.

Use of digital computers for solving problems of automatic programming form the pattern in Jacquard weaving. Izv. vys. ucheb. zav.; tekh. teks. prom. no.3:130-136 '64. (MIRA 17:10)

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REBARBAR, Ya.M.; KHAVKIN, V.P.; VINTER, Yu.M.; MIL'MAN, Ya.V.

Selecting the optimum parameters of the mechanism for automatic jacquard card punching. Izv. vys. ucheb. zav.; tekh. tekst. prom. no.2:121-126 '65. (MIRA 18:5)

1. Moskovskiy tekstil'nyy institut, Vsesoyuznyy nauchno-issledovatel'skiy institut legkogo i tekstil'nogo mashinostroyeniya i TSentral'nyy nauchno-issledovatel'skiy institut promyshlennosti lubyanykh volokon.

REBARBAR, Ya.M.; GALYNKER, E.I.

Using the theory of image recognition for the automatic programming from a pattern in jacquard weaving. Izv. vys. ucheb. zav.; tekh. tekst. prom. no.6:152-158 '63 (MIRA 17:8)

1. Moskovskiy tekstil'nyy institut.

REBARBAR, Ya.M.; SUSLOV, D.A.

Photoelectric head for reading the design pattern in the automatic cutting of jackard punched cards for looms. Izv.vys.ucheb.zav.; tekh. tekst.prom. no.3:103-111 '63. (MIRA 16:9)

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(Jacquard weaving) (Punched card systems)

C-8

YUGOSLAVIA/Nuclear Physics - Nuclear Technology and Power

Abs Jour : Ref Zhur - Fizika, No 5, 1959, No 10210

Author : Peterlin A., Robaric M., Strnad J.
Inst : -
Title : Albedo and Transparency of Reflectors in One-Dimensional Two-Group Diffusion Theory

Orig Pub : Repts. "J. Stefan" Inst., 1957, 4, 29-42

Abstract : Description of a method of determining the scalar (φ) and vector (J) neutron fluxes at the boundaries of multiply-layered reflectors and the calculation of the critical equation with the aid of calculations of albedo and transparency of individual layers. Formulas are derived for the elements of the albedo matrix and of the transparency matrix for separate spherical, plane, and cylindrical layers (in the calculations use is made of the two-group constants). Approximation equations are used, by which the authors calculate the matrix element of the albedo for H_2O, D_2O, and C.

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YUGOSLAVIA/Nuclear Physics - Nuclear Technology and Power C-8

Abs Jour : Ref Zhur - Fizika, No 5, 1959, No 10210

The following limiting cases are considered: infinitesimally thin and infinitely thick reflectors. The albedo and transparency of a two-layer reflector are expressed in terms of the albedo and transparency of the individual layers. Analogous formulas are derived for a three-layer and multiple-layer reflector. A numerical example is given for a two-layer spherical reflector (layers of D_2O and C). The calculated matrices of the albedo and transparency were used to determine the relations between $\varphi(R_1)$ and $\varphi(R_2)$ or $\varphi(R_3)$ and also between $J(R_1$ and $J(R_2)$ or $J(R_3)$ on the boundaries of the individual layers of the reflector and inside multiple-layers reflector, obtained from the boundary conditions, expressed in the terms of the albedo of the internal and external reflectors. -- B.A. Levin

Card : 2/2

REBAS, A.Yu., inzh.; KULGVER, L.A., inzh.

Continuous asphalt-concrete plant with 50-60 ton per hour capacity. Avt. dor. 27 no.8:8-9 Ag '64. (MIRA 17:12)

REBAVA, Vera

Girls who make speedometers. Rab. i sial. 37 no. 5:10-11 My '61.
(MIRA 14:4)

(Czechoslovakia--Motorcycle industry)

REBAYN, Ya.

We are using new methods of building. Zhil.stroi. no.11:14-16 '59. (MIRA 13:4)

1. Glavnyy arkhitektor Rostova-na-Donu
(Rostov-on-Don---Building)

L 24271-66 EWT(1) IJP(c) WW/GG

ACC NR: AP6006991 SOURCE CODE: UR/0051/66/020/002/0185/0193

AUTHORS: Rebane, V. N.; Rebane, T. K.

51
49
B

ORG: none

TITLE: Effect of collision-induced transitions between the sublevels of the excited state on the depolarization of the resonance fluorescence of atoms in a magnetic field

SOURCE: Optika i spektroskopiya, v. 20, no. 2, 1966, 185-193

TOPIC TAGS: fluorescence, nuclear energy level, depolarization, collision cross section, excited state, adiabatic approximation, kinetic equation

ABSTRACT: The authors evaluate the effect of collisions between excited atoms in the $^1P_1$ state and the atoms of an added gas on the polarization of the resonance 21 fluorescence. The use of the adiabatic approximation leads to a simple expression for the effective cross

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L 24271-66

ACC NR: AP6006991 2

sections of the transitions between the substates of the $^1P_1$ states. It is shown in particular that when the condition for adiabatic collisions is satisfied and the trajectories are assumed to be straight lines, the effective cross section for the transitions between the substates does not depend on the detailed form of the interaction forces, on the impact distance, and on the velocity. Solution of the kinetic equations for the density matrix of the $^1P_1$ state and allowance for the selection rules for dipole emission leads to simple formulas for the dependence of the fluorescence polarization on the density of the added gas. Methods of improving the accuracy of the theory are briefly discussed. The authors thank M. P. Chayka for continuous interest and discussions, and Yu. N. Demkov for valuable advice. Orig. art. has: 45 formulas.

SUB CODE: 20/ SUBM DATE: 21Dec64/ ORIG REF: 003/ OTH REF: 001

Card 2/2 dda

L 24271-66 EWT(1) IJP(c) WW/GG

ACC NR: AP6006991 SOURCE CODE: UR/0051/66/020/002/0185/0193

AUTHORS: Rebane, V. N.; Rebane, T. K.

51

49

B

ORG: none

TITLE: Effect of collision-induced transitions between the sublevels of the excited state on the depolarization of the resonance fluorescence of atoms in a magnetic field

SOURCE: Optika i spektroskopiya, v. 20, no. 2, 1966, 185-193

TOPIC TAGS: fluorescence, nuclear energy level, depolarization, collision cross section, excited state, adiabatic approximation, kinetic equation

ABSTRACT: The authors evaluate the effect of collisions between excited atoms in the $^1P_1$ state and the atoms of an added gas on the polarization of the resonance fluorescence. The use of the adiabatic approximation leads to a simple expression for the effective cross

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Card 1/2 UDC: 539.186