

NIKITIN, Ye.N.

Investigation of semiconducting properties in the system
silicon - manganese. Fiz. tver. tela 1 no.2:340-343 F '59.
(MIRA 12:5)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Silicon--Electric properties)
(Manganese--Electric properties)
(Semiconductors)

NIKITIN, YE. N.

81951
S/181/60/002/04/13/034
B002/B063

24.7600

AUTHOR:

Nikitin, Ye. N.

TITLE:

Investigation of Semiconducting Properties in the
Silicon - Cobalt System

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 4, pp. 633-636

TEXT: Specimens of the various cobalt silicides were prepared from commercial high-purity materials $K-O$ (K-O) and $Kp-O$ (Kr-O). Electrical conductivity and thermoelectromotive force were measured by means of a recording electronic potentiometer (Fig. 1). Peaks of the conductivity curve and values of the photo-emf curve that deviate very little from zero correspond to the compounds Co_3Si , Co_2Si , $CoSi$, and $CoSi_2$. The compound $CoSi$, however, has a lower conductivity, and its photoelectromotive force attains $-60 \mu v/degree$. The temperature dependence of the electrical conductivity σ and the thermoelectromotive force α was examined for pure $CoSi$, $CoSi$ with a slight hydrogen excess, and $CoSi$ with a slight silicon excess (Fig. 2). For pure $CoSi$, σ and α decrease with rising temperature;

Card 1/2

24.7600 (1035, 1043, 1158)

86419

S/181/60/002/011/003/042
B006/B056

26.2532

AUTHOR: Nikitina, L. I.

TITLE: Thermoelectric Properties of the Silicon-Chromium System

PERIODICAL: Fizika Tverdogo Tela, 1960, Vol. 2, No. 11, pp. 2685 - 2688

TEXT: The author investigated the thermoelectric properties of the silicon-chromium system for the purpose of finding the composition that has optimum thermoelectric parameters. The following chemical compounds were detected in the system: Cr_3Si , Cr_2Si , Cr_3Si_2 , $CrSi$, and $CrSi_2$. The electrical conductivity σ and the thermo-emf α of samples of various compositions were measured by a compensation method; the temperature dependence of these quantities was measured with a recording electron potentiometer. Fig. 1 shows σ and α as a function of the silicon content, and Fig. 2 shows σ and α as a function of temperature. $CrSi_2$ with a silicon deficiency was found to have optimum thermoelectric properties: a thermo-emf of $110 \mu v/degree$ and a conductivity of $700 \text{ ohm}^{-1} \cdot \text{cm}^{-1}$ (both measured at room temperature). At $350^\circ C$, the former attains its maximum, and the

X

Card 1/1

Thermoelectric Properties of the Silicon-Chromium System

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S/181/60/002/011/003/042
B006/B056

latter its minimum. An addition of 0.5% boron increases the conductivity, but a larger boron addition reduces it. Silver impurities greatly affect the thermoelectric properties (cf. tables). All numerical data of these measurements are given in two tables. Karshakov is mentioned. There are 2 figures, 2 tables, and 11 references: 8 Soviet, 4 US, 1 British, and 1 German.

ASSOCIATION: Institut Fizicheskoy Khimii AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: May 7, 1960

Legend to Table 1: Thermoelectric parameters of $CrSi_2$ with boron and silver impurities; 1) impurity percentage; 2) α , $\mu v/degree$;

3) σ , $ohm^{-1} \cdot cm^{-1}$; 4) heat conductivity, $cal/degree \cdot cm \cdot sec$.

Legend to Table 2: Thermoelectric parameters of the $CrSi_2$ - $MnSi_2$ system.

1) $CrSi_2$, % by weight; 2) $MnSi_2$, % by weight; 3) α , $\mu v/degree$;

4) σ , $ohm^{-1} \cdot cm^{-1}$, heat conductivity, $cal/degree \cdot cm \cdot sec$.

Card 2/4

32078

24,7700 (1035, 1158, 1559)

S/181/61/003/012/013/028
B104/B:02

AUTHORS: Nikitin, Ye N., Bazanov, V. G. and Tarasov, V. I.

TITLE: Thermoelectric properties of a solid Mg_2Si-Mg_2Sn solution

PERIODICAL: Fizika tverdogo tela, v. 3, no. 12, 1961. 3645 3649

TEXT: Experiments were made for the purpose of obtaining a material on the basis of a solid Mg_2Si-Mg_2Sn solution with good thermoelectric properties. Mg sublimed in vacuo, high-purity tin and silicon with a resistivity of 10 ohm-cm were used as starting material. Samples were melted in corundum crucibles in an argon atmosphere. The temperature dependence of electrical conductivity and thermo-emf was determined by a method described by Ye. N. Nikitin (ZhTF, XXVIII, 23, 1958). The heat conduction coefficient and the Q-factor were established by T. C. Harman's method (J. Appl. Phys., 29, no. 9, 1373, 1958) (see Fig. 1). Since deviations from Pisarenko's formula were established, the notion of "optimum carrier concentration" had to be introduced. According to these data, the alloys

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Card 1/2

32078

S/181/61/003/012/013/028
B104/B102

Thermoelectric properties ...

$Mg_2Si_{0.8}Sn_{0.2}$ and $Mg_2Si_{0.7}Sn_{0.3}$ possess the least thermal conductivity, relatively high mobility, and efficiency at room temperature. The carrier mobility remains unchanged when the two components are dissolved. Experiments of A. V. Petrov have shown that the carrier mobility quickly drops with increasing content of antimony. The thermoelectric efficiency of the alloy $Mg_2Si_{0.7}Sn_{0.3} + 3 \text{ mg/g Sb}$ (m. p. about 900°C) (Fig. 4) between 200 and 600°C amounts to $0.7 \cdot 10^{-3} \text{ deg}^{-1}$. The thermoelectric coefficient is not deteriorated by heat treatment in a neutral atmosphere or in vacuo up to 720°C . There are 4 figures, 1 table and 15 references, 4 Soviet and 11 non Soviet. The four most recent references to English language publications read as follows: C. Celent Electron Industr. 7, 65 (1959); R. D. Renid, R. G. Morris, G. C. Daulson Phys. Rev. 109, 1916 (1958); Semiconductors, Ed. by N. B. Hannay, New York, 426, (1959); J. F. Miller, R. C. Himes, J. Electrochem. Soc. 11, 915, (1960).

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors AS USSR Leningrad)

Card 2/6

S/120/63/000/001/038/072
EC52/1314

AUTHORS: Nikitin, Ye.N., Bazanov, V.G. and Tarasov, V.I.

TITLE: Determination of the temperature-dependence of the resistivity and thermoelectric power of semiconducting materials

PERIODICAL: Pribory i tekhnika eksperimenta, no. 1, 1965, 146 - 148

TEXT: Fig. 1 shows the apparatus used to determine the resistivity and thermoelectric power at temperatures up to 1 000 °C. All the metal parts are made of stainless steel and are suspended from two vertical porcelain tubes. The measurements may be carried out either in vacuum or in an argon atmosphere. The basic circuit employed in the determination of the above two parameters is shown in Fig. 4. The accuracy is better than 5%, the main source of error being in the determination of the temperature (about 1 °C at 500 °C). All the contacts in the apparatus are spring-loaded (as opposed to soldered). The thermoelectric power of alumel at 20, 100, 200, 300, 400, 500, 600 and 700 °C was found to be -16.5, -16, -16, -16, -18, -20, -21.5 and -26.5 $\mu\text{V}/^\circ\text{C}$,
Card 1/3

Determination of

S/120/63/000/001/036/072
E032/E314

respectively. The resistivity at these temperatures was 30.5, 27.0, 24.0, 22.5, 21.5, 20.3, 19.5 and 18.2 $\text{ohm}^{-1}\text{cm}^{-1}$, respectively. There are 4 figures and 1 table.

ASSOCIATION: Institut poluprovodnikov AN SSSR (Institute of Semiconductors of the AS USSR)

SUBMITTED: April 12, 1962

Legend to Fig. 1: 1 - metal screen; 2 - heater; 3 - thermocouple (hot end); 4 - contact rods; 5 - specimen; 6 - contacts for determination of resistivity; 7 - thermocouple (cold end); 8 - tantalum springs; 9 - screen; 10 - vacuum seal; 11 - metal rod; 12 - tube; 13 - cooling fins (heat sink).

Legend to Fig. 4: 1 - specimen; 2 - standard resistance; 3 - switch; 4 - potentiometer; 5 - current switch.

Card 2/3

L 13107-66 EWT(m)/T/EWP(t)/EWP(b)/ENA(c) IJP(c) JD

ACC NR: AP5025789 SOURCE CODE: UR/0363/65/001/009/1526/1529

AUTHOR: Nikitin, Ye. M.; Zaytsev, V. K.

26
B

ORG: Institute of Semiconductors, Academy of Sciences SSSR (Institut poluprovodnikov Akademii nauk SSSR)

TITLE: Preparation of a higher manganese silicide by a gas transport reaction

27 27

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 9. 1965, 1526-1529

TOPIC TAGS: manganese compound, silicide, thermal emf

ABSTRACT: $MnSi_{1.77}$ was synthesized by a gas transport reaction, i. e., was obtained in the solid state from the gaseous phase. The melting process and the defects associated with crystallization and peritectic reaction were thus eliminated. $MnCl_2$ --the transporting agent--was reacted with pure silicon in sealed ampoules at 10^{-5} mm Hg and $700^{\circ}C$. X ray diffraction of $MnSi_{1.77}$ showed a well formed crystal structure without silicon phase impurity. Thermal emf measurements showed that the silicide obtained by the gas transport reaction has the same degree of purity as a single crystal obtained by oriented crystallization. The

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UDC: 546.71'281

Card 1/2

L 13107-66

ACC NR: AP5025789

deficiency of silicon in the sublattice of the silicide as compared to the bisilicide is not due to the crystallization process but to the physicochemical nature of the compound formed. Orig. art. has: 2 figures, 2 tables.

SUB CODE: 07/ SUBM DATE: 17Apr65/ ORIG REF: 005/ OTH REF: 004

Card 2/2

L 3605-66 EWT(1)/I/EWA(h) LJP(-) AT

ACCESSION NR: AP5021364

UR/0120/65/000/004/0203/0205
621.317.33:621.315.592.2

48
45
B

AUTHOR: Nikitin, Ye. N.; Zaytsev, V. K. 44.85

TITLE: A device for the determination of electrical conductivity of semiconducting materials in liquid and solid phase 71.44.85

SOURCE: Pribery i tekhnika eksperimenta, no. 4, 1965, 203-205

TOPIC TAGS: semiconductor conductivity, semiconducting material, silicon semiconductor, germanium conductor

^{55.27}
ABSTRACT: This paper describes a device for the high-temperature synthesis as well as for the contactless measurement of the electrical conductivity of semiconductor materials. During the process of synthesis the instrument can check the electrical conductivity of solid and liquid semiconductor substances within the crucible and can follow the temperature dependence of the conductivity with an accuracy of some 10 - 20%. Curves in Fig. 1 of the Enclosure illustrate the operation of the device. Orig. art. has: 3 figures and 1 table.

Card 1/3

3

L 3605-66

ACCESSION NR: AP5021364

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors,
AN SSSR)

55,44

SUBMITTED: 22 June 64

ENCL: 01

SUB CODE: SS, EM

NO REF SOV: 004

OTHER: 004

Card 2/3

L 3605-56

ACCESSION NR: AP5021364

ENCLOSURE: 01

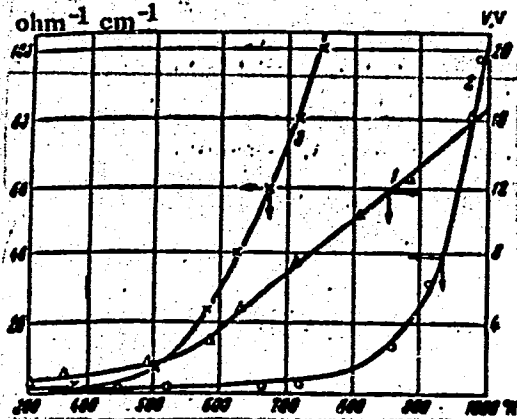


Fig. 1. Temperature dependence of the electrical conductivity: 1 - Silicon, contactless method, in voltmeter scale units; 2 - for the same sample of silicon, using the probe method, in ohm⁻¹ cm⁻¹; 3 - germanium, contactless method, in ohm⁻¹ cm⁻¹.

mlr
Card 3/3

SAYBEL', A.G.; NIKITIN, Ye.P.

Properties of radio pulse range finders equipped with one integrator.
Izv. vys. ucheb. zav.; radiotekh. no.3:348-355 My-Je '56.

(MIRA 11:7)

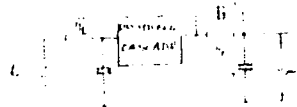
1.Rekokendovana kafedroy Moskovskogo ordena Lenina aviatsionnogo
instituta im. Sergo Ordzhonikidze.
(Radar)

ACQUISITION:

PERIOD:

PERIODICITY:

APPROVAL:



Case 1/1

$$\begin{aligned}
 & \frac{1}{(A - \lambda)^2} = \frac{1}{(A - \lambda)} - \frac{1}{(A - \lambda)^2} \\
 & \frac{1}{(A - \lambda)^2} = \frac{1}{(A - \lambda)} - \frac{1}{(A - \lambda)^2}
 \end{aligned}$$

where

$$t_M[n] = K_M t[n] + M_1[n] + A_1(t[n] - t_M[n])$$

where $t_M[n]$ is the mean value of $t[n]$ at time nT .

$$t_M[n+2] - [1 - \lambda - K_1(1 - \lambda) - K_2] t_M[n+1] + \lambda(1 - K_2) t_M[n]$$

$$A_1 = K_1(1 - \lambda) t_M[n+1] + K_2 t_M[n] \quad (1)$$

where

$$K_1 = K_A K_M K_y; K_2 = K_A K_M K_z A_1$$

where K_A is the gain of the amplifier, K_M is the gain of the motor, and K_y is the gain of the feedback loop.

where

where K_z is the gain of the feedback loop, and A_1 is the gain of the feedback loop.

GLINSKIY, Boris Aleksandrovich; GRYAZNOV, Boris Semenovich;
DYNIN, Boris Semenovich; NIKITIN, Yevgeniy Petrovich;
MAGNUS-SOMENSKIY, V.S.; Eds.

[Modeling as a scientific research technique; agnosec-
logical analysis] Modelirovaniye kak metod nauchnogo issle-
dovaniya, gnoseologicheskiy analiz. Moskva, Izd-vo Mosk.
univ., 1965. 246 p. (MIRA 18:8)

NIKITIN, Ye. S.

Nikitin, Ye. S. "The comparison of compensating calculations in the interpolation of series between two solid sides according to the method of N. A. Urmayev and D. A. Larin," Trudy Mosk. in-ta inzhenerov geodezii, aerofotos"- yemki i kartografii, Issue 2, 1949, p. 37-48, with tables.

So: U-3736, 21 May 1953, (Letopis 'zhurnal 'nykh Statey, No. 17, 1949).

NIKITI', Ye.V. (Moskva)

Laboratory assignment "Measuring the pressure of liquids at various depths by means of a manometer." Fiz.v shkole 21 no.3:63-64. Vy-
Je '61. (MIRA 14:8)

(Liquids) (Manometer)

KARDYSH, V.G.; NIKITIN, Ye.V.; OKMYANSKIY, A.S.

Methods for drilling shallow holes in friable rocks. Razved. i
okh. nedr 29 no.11:30-35 N '63.

(MIRA 17:12)

KARDYSH, V.G.; NIKITIN, Ye.V.; OKMYANSKIY, A.S.

Present status and future development of drilling procedures for shallow wells in incoherent rocks. *Biul.tekh.-ekon.inform.Sov. nauch.-issl.inst.nauch.i tekh.inform* 17 no.11:14-19 N '6.

(MIRA 18:1)

L 21838-66 EWT(m)/EWP(t) IJP(c) JD/JG

ACC NR: AP6003502

SOURCE CODE: UR/0364/66/002/001/0112/0115

AUTHOR: Fayzullin, F. F.; Nikitin, Ye. V.

34
B

ORG: Kazan State University im. V. I. Ul'yanova-Lenin (Kazanskiy gosudarstvennyy universitet)

TITLE: Anodic oxidation of gallium in KOH solutions

11

SOURCE: Elektrokhimiya, v. 2, no. 1, 1966, 112-115

TOPIC TAGS: gallium, anodic oxidation, electrochemistry

ABSTRACT: The present article was written to fill a gap in the literature on the anodic oxidation of gallium in alkaline solutions. The investigation was based on the automatic recording of galvanostatic curves and polarization curves. The structure of anodic oxide films was studied by electron diffraction. In these investigations, 0.1 N KOH was used. The oxygen was removed by purging solutions with nitrogen. Each experiment was conducted in a freshly prepared electrolyte at 25°C. Polarization measurements showed that the formation of the primary oxide at negative potentials is preceded by cathodic liberation of hydrogen, followed by its subse-

UDC: 541.138.2 : 546.681

2

Card 1/2

L 21838-66

ACC NR: AP6003502

0

quent desorption from the electrode surface. When the potential is changed to a value more positive than -1.1 v vs the normal hydrogen electrode, a sharp increase in the polarization curve occurs, thus indicating the active anodic dissolution of gallium. Starting from -0.25 v, lowering of the polarization current occurs; this is associated with passivation of the gallium electrode due to formation of the anodic oxide film. The electron diffraction studies identified this film as Ga_2O_3 . Several distinct regions are distinguishable on potentiostatic curves: a) formation of the primary oxide film; b) dissolution of the primary oxide film by alkali; c) anodic dissolution of gallium via the primary oxide film with formation of gallate ions, formation of oxide film by hydrolysis of gallate ions along with the chemical dissolution of this film all take place simultaneously; d) direct anodic oxidation of the gallium electrode. Anodic liberation of oxygen takes place at high potentials (10-30 v). Orig. art. has: 3 figures.

SUB CODE: 11, 07 SUBM DATE: 27May65/ ORIG REF: 004/ OTH REF: 013

Card 2/2 nst

ACC NR: AP7C04492

(A)

SOURCE CODE: UR/0364/67/003/001/0120/0122

AUTHORS: Fayzullin, F. F.; Nikitin, Ye. V.; Gudina, N. N.

ORG: Kazan State University im. V. I. Ul'yanov-Lenin (Kazanskiy gosudarstvennyy universitet)

TITLE: On the mechanism of the formation of anode films on liquid gallium

SOURCE: Elektrokimiya, v. 3, no. 1. 1967, 120-122

TOPIC TAGS: gallium, electrode, electrode potential, mercury alloy, mercury compound, potassium compound, electric impedance, electrolyte, electric resistance, electric capacitance, gallium compound, OXIDE FORMATION, LIQUID METAL

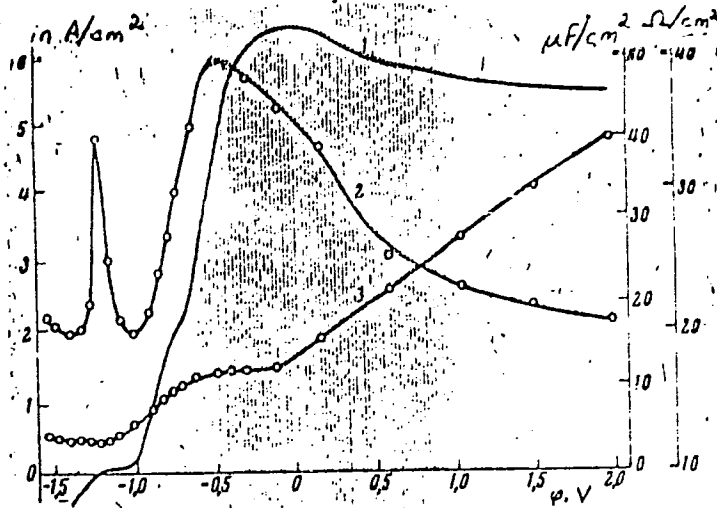
ABSTRACT: The mechanism of the formation of anode oxide films on a liquid gallium electrode in alkali solutions is studied. The electrode design is described by T. I. Lezhava, A. T. Vagranyan (Izv. AN SSSR, Ser. khim., No. 3, 435, 1964). The purity of the gallium was 99.9998%. A mercury-mercurous oxide electrode served as the comparison electrode. The KOH solutions were prepared by dissociation of potassium amalgam in doubly distilled water; all tests were at 32C. Polarization potentiostatic curves were plotted (see Fig. 1). Alternating current of 100—20 000 cycles was applied to the gallium electrode and to a platinum-plated platinum disk over the surface of the electrode under study. The electrode impedance was also measured. It was found to be probable that active dissolution of the gallium electrode and the formation and growth

Card 1/2

UDC: 541.13

ACC NR: AP7004492

Fig. 1. Polarization potentiostatic curve of i versus ϕ (1) of liquid gallium electrode in 0.1-N KOH at 32C; and curves of capacitance C (2) and resistance R (3) versus electrode potential in same solution at 1000 cycles



of the passivating oxide are not controlled by diffusion of the reacting particles.
 Orig. art. has: 2 graphs.

SUB CODE: 07/ SUBM DATE: 04-Jul66/ORIG REF: 006/ OTH REF: 005

Card 2/2

KORST, N.N.; NIKITIN, Ye.Ye.

Relaxation in a double potential well. Teoret. i eksper. khim. 1
no.1:11-21 Ja-F '65. (MIRA 18:7)

1. Institut khimicheskoy fiziki AN SSSR, Moskva.

NIKITIN, Ye.Ye.

Statistical theory of endothermic reactions. Part 1: Bimolecular reactions. Teoret. i eksper. khim. 1 no.2:135-143 Mr-Apr '65.

Statistical theory of endothermic reactions. Part 2: Monomolecular reactions. Ibid.:144-150 (MIRA 18:7)

1. Institut khimicheskoy fiziki AN SSSR, Moskva.

NIKITIN, Ye.Ye.

Statistical theory of exothermic ion-molecular reactions.
Teoret. i eksper. khim. 1 no.4:428-435 '65. (MIRA 18:10)

1. Institut khimicheskoy fiziki AN SSSR, Moskva.

NIKITIN, Ye.Ye.

Average lifetime of active molecules and oscillator models of
monomolecular reactions. Kin. i kat. 6 no.1:17-22 Ja-F '65.
(MIRA 18:6)

1. Institut khimicheskoy fiziki AN SSSR.

BUKHOVITSKIY, V.S.; GIKHIN, Ye.Ye.

Charge exchange of multiply charged ions in collisions. Zhur.
Eksp. i teor. fiz. 48 no.5:1499-1507 May '65. (MIRA 18:7)

1. Institut Khimicheskoy fiziki AN SSSR.

B 63594-65 EWT(1) IJP(c)

ACCESSION NR: AP5010585

UR/0020/65/161/003/0637/0640

10
9
8

AUTHOR: Nikitin, Ye. Ye.

TITLE: Rotational relaxation of diatomic molecules

SOURCE: AN SSSR. Doklady, v. 161, no. 3, 1965, 637-640

TOPIC TAGS: rotational relaxation, rotational degree of freedom, translational degree of freedom, diatomic molecule, gas kinetics, molecular rotation

ABSTRACT: The calculation of the rate of energy exchange between rotational and translational degrees of freedom in a nonequilibrium gas is of interest in many kinetics problems. The article presents a derivation of the relaxation equations for the rotational distribution function of diatomic molecules colliding with a particle C (atom or electron) when $w\tau \ll 1$, w being the rotational frequency, and τ the time of collision. Setting $w \sim (B/B) \cdot \tau \sim (\mu B)^{1/2} / \kappa$, where $B = \frac{1}{2} I^2 / Mr_e^2$ is the rotational frequency of the molecule, $B = 1/kT$, μ is the reduced mass of AB and C, and $1/\kappa$ is the potential range (all energy dimensions are expressed in frequency units), one finds that $w\tau \sim \mu^{1/2} / M^{1/2} \epsilon r_0$. Thus, the condition $w\tau \ll 1$ is fulfilled either when the potential range is considerably less than the equilibrium interatomic distance AB, or when the mass ratio μ/M is small. The authors discuss several cases with the assumption that the rotation is semiclassical.

Card 1/2

E 63591-65

ACCESSION NR: AP5010585

Orig. art. has: 15 formulas.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical
Physics, Academy of Sciences, SSSR)

SUBMITTED: 01Sep64

ENCL: 00

SUB CODE: NP, TD

NO REF SOV: 002

OTHER: 005

Card

2/2

61513-65 EPA(w)-2/ENT(1)/EMA(m)-2 IJE(c) AT

ACCESSION NR: AP5012601

UR/0051/65/01B/005/0763/0767
539.194.001.127
24
BAUTHOR: Nikitin, Ye. Ye. *W, 85*

TITLE: Methods of calculating the probabilities of nonadiabatic transitions

SOURCE: Optika i spektroskopiya, v. 18, no. 5, 1965, 763-767

TOPIC TAGS: *21, 24, 85* electron transition, transition probability, energy band structure, nonadiabatic process

ABSTRACT: Since there is apparently no general method at present for calculating the probability of nonadiabatic transitions between two electron states by going over into the complex plane, in the case when the adiabatic splitting function ($\Delta\epsilon$) has many zeroes, the author investigates a model in which it is possible to calculate the contribution of the remote zeroes of this function and the transition probability. Earlier particular solutions of the problem are briefly reviewed. The analysis begins with classical motion of the nuclei, for which the analytic properties of the function ($\Delta\epsilon$) are first determined. It is then shown that for quantum mechanical motion of the nuclei the analysis of the probability of the nonadiabatic transition reduces to determining certain coefficients in the quasi-classical formulas, which can be done by standard means. The effect of closeness of two zeroes of the function ($\Delta\epsilon$)² on the probability of the nonadiabatic transition is also

Card 1/2

51513-65

ACCESSION NR: AP5012601

3

analyzed. Certain shortcomings of earlier investigations are mentioned. "The author thanks N. D. Sokolov for a discussion of the work." Orig. art. has: 1 figure and 12 formulas. 44, 55

ASSOCIATION: none

SUBMITTED: 07Mar64

ENCL: 00

SUB CODE: NP, OP

NR REF SOV: 009

OTHER: 005

40
Card 2/2

L 5450-66 EWT(1)/EWT(a)/EWP(t)/EWP(b) - IJP(c) JD/JG

ACCESSION NR: AP5019749

UR/0051/65/019/002/0161/0170
539.184.26 + 539.186.3.001.1

AUTHOR: Nikitin, Ye. Ye. 44.55

TITLE: Nonadiabatic transitions between the fine-structure components of alkaline metal atoms during atomic collisions 27

SOURCE: Optika i spektroskopiya, v. 19, no. 2, 1965, 161-170 52
46
3

TOPIC TAGS: spectral fine structure, fluorescence, collision cross section, transition probability, alkaline metal

ABSTRACT: This is a continuation of earlier work by the author (with V. K. Bykhovskiy, Opt. i spektr. v. 17, 815, 1964), in which the cross section was derived for the nonadiabatic transition between two states of the quasimolecule Na*Ar, which leads to quenching of the sodium fluorescence. In the present paper the author derives an estimate of the cross section for inelastic collision of a metal atom M with atoms of an inert gas X, inducing a transition between the fine-structure components of the first-excited state M* (²P₁). An example of this reaction is Na(²P_{1/2}) + Ar(¹S₀) → Na(²P_{3/2}) + Ar(¹S₀). Since the conditions of the atomic collisions are quasiclassical and the energies imparted during the collision are much lower than the kinetic energies of relative motion, a semiclassical approximation is used, which reduces to the solution of three simultaneous equations

Card 1/2

0101884

L 5450-66

ACCESSION NR: AP5019749

6

for the probability amplitude. Two different approximations are used, one involving quantization along the molecular axis (molecular model) and the other quantization along an axis fixed in space (atomic model). The dependence of the cross section on the velocity and on the potential parameters is traced for three cases: slow rotation of the axis of the quasimolecule (Hund's case a), rapid rotation of the quasimolecules axis (Hund's case b), and rotation of the molecular axis at a speed comparable to the frequency. A value of $0.45 \times 10^{-14} \text{ cm}^2$ is obtained for the cross section. "The author thanks M. Ya. Ovchinnikova and N. D. Sokolov for a discussion." Orig. art. has: 2 figures and 33 formulas.^{44, 55}

ASSOCIATION: none

SUBMITTED: 11May64

ENCL: 00

SUB CODE: OP, NP

NR REF SOV: 006

OTHER: 003

Card 2/2. *ml*

NIKITIN, Ye.Ye., kandidat veterinarnykh nauk.

Effect of blood transfusion and blood substitutes on the composition of periphered blood. Veterinariia 33 no.8:34-35 Ag '56. (MLRA 9:9)

1. Leningradskiy institut usovershenstvovaniya veterinarnykh vrachey i Novocherkasskiy zooveterinarnyy institut.
(Blood--Anal, is and chemistry)

USSR/Diseases of Farm Animals. General Problems.

R

Abs Jour: Ref Zhur-Diol., No 15, 1958, 69462.

Author : Sen'kin, M.M.; Ostrovskiy, N.S.; Vasil'yev, M.A.;

~~Nikitin, Ye. Ye.~~

Inst : Novocherkassk Zootechnical Veterinary Institute.

Title : Suppurative-Putrescent Retroperitoneal Phlegmons
in Cattle and Their Treatment.

Orig Pub: Tr. Novocherkasskogo zootekhn.-vet. in-ta,
1957, vyp.10, 355-359.

Abstract: The suppurative-putrescent phlegmons in cattle
were treated successfully by the authors by means
of a wide incision in the abdominal wall, per-
mitting the complete removal of dead tissues and
putrescent fibrin from the retroperitoneal pyonecrotic
focus, as well as the drainage and washing of the

Card : 1/2

USSR / Human and Animal Physiology (Normal and Pathological).
Blood.

T-4

Abs Jour : Ref Zhur - Biologiya, No 13, 1958, No. 60201

Author : Nikitin, Ye. Ye.
Inst : Novocherkassk Zootechnical Veterinary Institute
Title : Use of Dehydrated Serum for Transfusions in Cattle
After Massive Blood Loss

Orig Pub : Tr. Novocherkasskogo zootekhn.-vet. in-ta, 1957,
Vyp. 10, 381-384

Abstract : The effect of the transfusion of an 8% solution of de-
hydrated serum (DS) in physiological solution was studied
in 15 cows after the withdrawal of 45 - 65% of the total
volume of the circulating blood. The serum was prepared
from the blood of cattle. Five control animals received
whole blood, and five, the native serum. After blood loss,
not exceeding 60% of the total volume of blood, the

Card 1/2

NIKITIN, Ye.Ye.

Drying of biological preparations by atomization. Trudy IEMC
no.7:151-161'60. (MIRA 16:8)
(ATOMIZATION) (BIOLOGICAL PRODUCTS—DRYING)

NIKITIN, Ye.Ye., kand.veter.nauk

Dry blood serum for the treatment of animals. Veterinariia 37
no.3:52 M^r '60. (MIRA 1616)

(Serum therapy) (Veterinary medicine)

SIKITIN, Ye.Ye., kand.veterin.nauk

Drying immune serums by the method of dispersion. Veterinariia
37 no.11:52-54 N '60. (MIRA 16:2)

1. Vsesoyuznyy institut eksperimental'noy veterinarii.
(Serum—Drying)
(Veterinary materia medica nad pharmacy)

NIKITIN, Ye.Ye., VLADIMIROV, A.G.; SERGEYEV, V.A.

Resistance of the foot-and-mouth disease and influenza viruses
to desiccation by the pulverization method. Vop.virus. 7
no.6:719-723 N-D '62. (MIRA 16:4)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut veterinarnoy
virusologii i mikrobiologii.
(FOOT-AND-MOUTH DISEASE) (INFLUENZA) (VACCINES)

NIKITIN, Ye. Ye.; SYURIN, V. N.

"K voprosu reaktivatsii virusa janninara i roli belizovogo virusa v etom protsesse."

report presented at Symp. on Virus Diseases, Moscow, 1-7 Oct 64.

Institut veterinarnoy virusologii, Moskva.

NIKILIN, Ye. Ye.; VLADIMIROV, A. M.

Survival of viruses in dried milk and food albumin. Veterinaria
42 no. 5:99-101 My '65. (MIRA 18:6)

1. Vsesoyuznyy nauchno-issledovatel'skiy yashchurnyy institut.

ACC NR: AP6030797

(A,N)

SOURCE CODE: UR/0346/66/000/009/0018/0020

AUTHOR: Nikitin, Ye. Ye, (Doctor of biological sciences); Kamalov, G. Kh. (Candidate of veterinary sciences); Sviridov, A. A. (Candidate of veterinary sciences); Kuchmasov, I. S. (Candidate of veterinary sciences); Uzyumova, N. N. (Veterinary doctor)

ORG: All-Union Foot-and-Mouth Disease Research Institute (Vsesoyuznyy nauchno-issledovatel'skiy yashchurnyy institut)

TITLE: Protective media for drying foot-and-mouth virus strains

SOURCE: Veterinariya, no. 9, 1966, 18-20

TOPIC TAGS: lyophilization, foot and mouth disease, virus disease, animal disease, *hoof and mouth disease*

ABSTRACT: Lyophilization has been found to be the best method of preparing virus preparations for long-term storage. The best protective medium for this purpose is an egg-white-gelatin-peptone mixture. The article discusses the preparation and properties of this and other mixtures. [WA-50; CBE No. 12]

SUB CODE: 06/ SUBM DATE: none/

Card 1/1

UDC: 619:616.988.43-095.162

NIKITIN, YEYE

6

Retardation and acceleration of cracking of paraffin hydrocarbons by addends of tetramethylethylene. A. S. Stepanovich and E. E. Nikitin (N. G. Chernomorskiy State Univ., Sugatser). *Doklady Akad. Nauk S.S.S.R.*, 165, 697-9 (1955).—Addn. of 20 mm. partial pressure of tetramethylethylene to propane followed by pyrolysis at 500° results in a great acceleration of cracking of propane; at 562° the acceleration appears after a 20 sec. induction period; at 545° the induction period extends to 60 sec. and at 522° retardation of cracking is evident. With isobutane at 573° a max. retardation occurs with 1% addend in the initial phases, after which acceleration takes place. At 548° retardation takes place, the degree of which varies with the amount of the addend, except for large concns. of the addend (over 1.5%) which cause a moderate acceleration of cracking. Tetramethylethylene alone shows decreased amount of decompn. in 548-73° range with increase of pressure from 2 mm. to 8 mm. G. M. Kosolapoff

DM

A. Nikitin, Ye. Ye.
STEPUKHOVICH, A.D.; NIKITIN, Ye.Ye.

Retarding and accelerating the cracking of paraffin hydrocarbons
by tetramethylethylene additions [with summary in English].
Zhur.fiz.khim.31 no.8:1677-1686 Ag '57. (MIRA 10:12)

1. Saratovskiy gosudarstvennyy universitet im. N.G.Chernyshevskogo.
(Cracking process) (Paraffins) (Ethylene)

Nikitin, Y. Y.

AUTHOR: Stepukhovich, A.D., Nikitin, Ye.Ye. 76-11-3/35

TITLE: On the Kinetics and the Mechanism of Tetramethylethylene Decay
(O kinetike i mekhanizme raspada tetrametiletilena)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1957, Vol. 31, Nr 11, pp. 2400-2402
(USSR)

ABSTRACT: A possible explanation for the anomalous decay kinetics of tetramethylethylene is given on the basis of the hypothesis of the heterogeneous radical, but not a chain-decay of tetramethylethylene. The facts stated concerning the decay of tetramethylethylene by means of the experiment can be explained by considering their decay to be a successive radical reaction with a heterogeneous forming of active centers. There are 5 Slavic references.

ASSOCIATION: Saratov State University imeni N.G.Chernyshevskiy (Saratovskiy gosuniversitet im. N.G.Chernyshevskogo)

SUBMITTED: August 8, 1955

AVAILABLE: Library of Congress
Card 1/1

NIKITIN, Ye. Ye.

20-4-16/51

AUTHOR: Nikitin, Ye. Ye.

TITLE: Note on the Deviations From Boltzmann's (Bol'tsman) distribution in the Decomposition of Diatomic Molecules (Ob otkloneniyakh ot Bol'tsmanovskogo raspredeleniya pri raspade dvukhatomnykh molekul).

PERIODICAL: Doklady AN SSSR, 1957, Vol. 116, Nr 4, pp. 584-587 (USSR).

ABSTRACT: The decomposition velocity of diatomic molecules is determined in the case of the reaction $AB \rightarrow A + B$ with binary collisions by the probability of the transition of the molecule from the bounded state into the range of states with a continuous spectrum and by the distribution function of the oscillation energy. In the attempt to explain the influence of the disturbance of the Boltzmann distribution on the decomposition velocity, the author employs several simplifying assumptions: Let the diatomic molecules AB which are destined for a decomposition, be assembled in a heat trough consisting of the molecules C. Then the collisions of the molecules AB with each other may be neglected. The molecules AB begin to decompose because of the collisions AB with C. The probability of a non-elastic collision of AB with C connected with a transition of the molecule AB from the quantum state n to the state n' is proportional to the square of the matrix element of the oscillation coordinate of the molecule AB for the corresponding tran-

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Note on the Deviations From Boltzmann's (Bol'tsman) Distribution 20-4-16/51
in the Decomposition of Diatomic Molecules.

sition. Here the author investigates as a model of the diatomic molecule a quantized molecule with a number $n_0 + 1$ of discrete approximately equidistant levels with a negative energy and a continuous spectrum with positive energy. On the transition from the discrete spectrum to the continuous spectrum the matrix element of the coordinate decreases considerably on an increase of the transition energy. Therefore it can be assumed, that the transition to the continuous spectrum takes place only from the higher level. From these considerations, the relaxation and the decomposition of a system of oscillators, which are assembled in a heat through are characterized by the probabilities of the transition to a neighbouring level $P_{n,n+1} = P_{0,1} (n+1)$ and by the probability of the dissociation from the last level P_n .

A relation is given between the activation probability and the deactivation probability. The solution of this system is given here in the form of the superposition of the terms $x_n = \frac{1}{n} (\mu) \exp(ZP_{1,0} \mu t)$.

The eigenvalues of the above relation determine the velocity of the relaxation process and of the dissociation. An expression is also given for the constant of the decomposition velocity. If $P_n/P_{1,0}$

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is small, the distribution function $x_n(t)$ differs only little from

Note on the Deviations From Boltzmann's (Bol'tsman) Distribution 20-4-16/51
in the Decomposition of Diatomic Molecules.

Boltzmann's (Bol'tsman)-function $x_n = A e^{-\epsilon_n / kT}$. If P_n is large, the equilibrium distribution is disturbed to such an extent, that the presence probability of the molecule AB in the upper level almost equals zero. The main disadvantage of the molecule model employed here consists in the disregarding of its anharmonic properties. There are 5 references, 1 of which is Slavic.

ASSOCIATION: Institute for Chemical Physics AN USSR (Institut khimicheskoy fiziki Akademii nauk SSSR).

PRESENTED: April 12, by V. N. Kondrat'yev, Academician.

SUBMITTED: April 9, 1957.

AVAILABLE: Library of Congress.

Card 3/3

MIRNIK, Ye. Ye., Cand Phys-Math Sci --(diss) "On the theory of the thermal excitation and dissociation of two-atom molecules." 138, 1 fig. 10 pp (Inst of Chem Physics of the Acad Sci USSR) 139 so inst. Bibliography at end of text.(12 titles) (IL, 2, - 1, 115)

NIKITIN, Ye.Ye.

[Theory of thermal excitation and dissociation of diatomic molecules; abstract of dissertation presented for the degree of candidate of physicomathematical sciences] K teorii termicheskogo возбуждения i dissotsiatsii dvukhatomnykh molekul; avtoreferat dissertatsii, predstavlennoi na soiskanie uchenoi stepeni kandidata fiziko-matematicheskikh nauk. Moskva, 1958.
9 p. (MIRA 12:8)

(Molecular dynamics)

20-119-3-37/65

AUTHOR: Nikitin, Ye. Ye.

TITLE: On the Computation of the Decomposition Velocity of Diatomic Molecules (O vychislenii skorosti raspada dvukhatomnykh molekul)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 3, pp. 526-529 (USSR)

ABSTRACT: The author computed in a previous work (Ref 1) the constant of the velocity of the thermal decomposition of diatomic molecules and the function of the distribution on the vibration states on occasion of cancellation of the thermal equilibrium distribution. Of essential interest on this occasion was the assumption that the vibration quanta until the limit of the dissociation approximately remain constant. This work now computes the constant of the velocity of the reaction $Ab + C \rightarrow A + B + C$ without the above mentioned restriction. In collision in a diatomic molecule only a transition between 2 adjacent vibration levels is assumed to take place and the dissociation of the molecule be possible only from the last discrete level. The Maxwell distribution of the colliding molecules may be maintained. For the probability of the vibration

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On the Computation of the Decomposition Velocity of Diatomic Molecules 20-119-3-37/65

an excitation of the molecules at a collision in a transition from the level $k - 1$ to the level k a formula is given. An equation system follows for the change with respect to time of the probability to find the molecule on the k -th level. Then the general solution of this equation system is written down and discussed. Also on the consideration of the not adjacent levels a short report is given. The computed and the experimental values of the constants of the decomposition velocity agree with each other according to their order of magnitude. Finally the author thanks Professor N. D. Sokolov for valuable advice and for the discussion of the work. There are 7 references, 3 of which are Soviet.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics, AS USSR)

PRESENTED: October 24, 1957 by V. N. Kondrat'yev, Member, Academy of Sciences, USSR

SUBMITTED: September 28, 1957

AVAILABLE: Library of Congress
Card 2/2

NIKITIN, E. E.

"Band Shapes of Induced Rotational and Vibrational Spectra of Homo-nuclear Molecules."

report presented by SOKOLOV, N. D. at the 4th International Meeting of Molecular Spectroscopy, Bologna, Italy, 7-12 September 1969.

Institut of Chemical Physics, Moscow.

OV/51-8-2-3/39

AUTHOR: Nikitin, Ya. Ye.

TITLE: On Calculation of the Probability of Vibrational Excitation of Molecules by Collisions (O vychislenii veroyatnosti kolebatel'nogo vozbuzhdeniya molekul pri stolknoveniyakh)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 2, pp 141-145 (USSR)

ABSTRACT: Using methods of the theory of non-stationary perturbations the author calculated the cross-section for inelastic collisions of diatomic molecules which are accompanied by excitation of vibrations. It was assumed that the energy of intermolecular interaction may be represented by a Lennard-Jones potential and that the angular dependence of the interaction does not affect the order of the cross-section. The author allowed for the change of the relative energy of the colliding molecules before and after collision, since this affects the value of the cross-section. If only the repulsion between molecules is taken into account, then the calculated collision cross-section agrees with the value obtained earlier by exact quantum-mechanical methods. Dependence of the cross-section on the potential-well depth, which describes the attraction between the two molecules, is stronger than in earlier calculations

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Calculation of the Probability of Vibrational Excitation of Molecules by Collisions

when the attraction was allowed for approximately. This is in qualitative agreement with the strong dependence of the probability of vibrational deactivation on the nature of colliding molecules. Acknowledgment is made to N.D. Sokolov for his advice. The paper is entirely theoretical. There are 7 references, 1 of which is Soviet, 5 English and 1 translation from English into Russian.

RECEIVED: February 6, 1958

1/1 2/8

MAITI, Ya.Yo.

Shape of the bands of the forced rotational and vibrational
spectra of dipoleless molecules. Opt. i spektr. 7 no. 6:744-
750 D '59. (MIRA 14:2)

(Spectrum, Molecular)

SOV/76-33-3-11/41

5(4)

AUTHOR:

Nikitin, Ye. Ye.

TITLE:

On the Perturbation of the Equilibrium Thermal Distribution in the Thermal Dissociation of Diatomic Molecules (O narushenii teplovoogo ravnovesnogo raspredeleniya pri termicheskoy dissotsiatsii dvukhatomnykh molekul)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 3, pp 572 - 580 (USSR)

ABSTRACT:

For the calculation of the rate of decomposition of diatomic molecules it is necessary to investigate carefully the process of collision of the molecules. The present paper describes calculations of this type taking into account the effect of perturbation of the Boltzmann-distribution upon the rate of decomposition. After an investigation of the initial conditions and the model of molecules AB the constant of reaction rate of the decomposition reaction is calculated and the distribution function is determined with the reaction not being in equilibrium. The following statements are made: in the case of a harmonic oscillator with a finite number of

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On the Perturbation of the Equilibrium Thermal Distribution SOV/76-33-3-11,41
in the Thermal Dissociation of Diatomic Molecules

discreet levels the rate of decomposition will depend on the probability of a transition of the oscillator in the discreet spectrum $P_{n,n+1}$ and a probability of transition to the continuous spectrum P_{∞} . In practice, when P_{∞} is sufficiently great (as compared to P_{10}) the rate of decomposition will be determined by the addition velocity of the molecules with a low energy level to the dissociation threshold. In this connection the maximum value of the pre-exponential factor has the order of magnitude of the number of collisions. The distribution function of the decomposing oscillators for periods of time that are longer than the time of relaxation of the oscillation energy $1/k_0$ decreases exponentially with time. It decreases more rapidly than the Boltzmann function $\exp(-E/kT)$ in the case of an increase in which connection it takes a zero-value at the last discreet level, whereas the constant of the rate of decomposition attains a maximum value as a function of P_{10} and P_{∞} . The yield in molecules which

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in the Thermal Dissociation of Diatomic Molecules

decompose at the time $t \approx 1/k_0$ and which initially were at low temperature is smaller than the ratio between relaxation time and the time characteristic of this reaction. The remaining molecules decompose according to the exponential law in the characteristic time $1/k$. In conclusion the author thanks Professor N. D. Sokolov. There are 8 references, 1 of which is Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut khimicheskoy fiziki, Moskva
(Academy of Sciences, USSR, Institute of Chemical Physics,
Moscow)

SUBMITTED: June 25, 1957

Card 3/3

SOV/76-33-8 34/39

5(4)
AUTHOR:

Nikitin, Ye. Ye.

TITLE:

On the Calculation of the Rate Constant of Bimolecular Thermal
Decomposition of Molecules

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 8, pp 1893-1894
(USSR)

ABSTRACT:

It is pointed out that in the calculation of the rate constant k_d of the bimolecular decomposition $AB + M \rightarrow A + B + M$ (1), the disturbance of the Boltzmann distribution with respect to the state of vibration is not considered. In a previous paper (Ref 2) the author calculated the constant k_d for biatomic molecules according to equation (2). This equation, which does consider the above disturbance, may also be used for the decomposition of polyatomic molecules. The validity of (2) is explained by means of the example of ozone decomposition, and calculations made by means of (2) are compared with the experimental values on the thermal decomposition of polyatomic molecules (Table). It is ascertained that the statement made in reference 17 on the work done in reference 8 is correct, i.e. that hydrazine decomposes bimole

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On the Calculation of the Rate Constant of Bimolecular Thermal Decomposition of Molecules

cularly and not, as had been assumed, monomolecularly. Finally, the author thanks Professor N. D. Sokolov. There are 1 table and 11 references, 4 of which are Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut khimicheskoy fiziki, Moskva
(Academy of Sciences USSR, Institute of Chemical Physics
Moscow)

SUBMITTED: December 26, 1958.

Card 2/2

5(4), 24(7)
AUTHORS:

Nikitin, Ye. Ye., Sokolov, N. D.

SOV/20-124-2-35/71

TITLE:

On the Relation Between the Dissociation Constants of the Thermal Decomposition of Biatomic Molecules in the Presence and in the Absence of Equilibrium (O sootnoshenii mezhdru konstantami skorosti termicheskogo raspada dvukhatomnykh molekul pri nalichii i pri otsutstvii ravnovesiya)

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 2, pp 366-369 (USSR)

ABSTRACT:

Short reference is first made to earlier papers on the dissociation of biatomic molecules $AB + M \rightarrow A + B + M$. The disturbance of Boltzmann distribution over the oscillation states of the decomposing molecule decreases the degree of population of the oscillation levels near the limit of dissociation. The disturbance of Boltzmann distribution increases as a result of the decrease of the oscillation quanta near the limit of dissociation. The kinetics of thermal decomposition and of recombination probably does not satisfy the usual kinetic equation. Dissociation is a process developing in several stages and therefore the kinetics of decomposition and recombination

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must be described by the following systems of equations:

$$(d/dt)x_n = - \sum_k P_{nk} x_n + \sum_k P_{kn} x_k.$$

Here x_n denotes the distribution function, i.e. the degree of population of the n-th level of the system AB, and P_{kn} - the probabilities of the rotation-

and oscillation transitions $k \rightarrow n$ of the molecule AB. The sums of the formula given above extend also to states of the continuous part of the spectrum. The authors investigate the simplest case in which at $[AB] \ll [M]$ the concentrations $[A]_0$ and $[B]_0$ are kept constant. The aforementioned system of equations becomes linear and can be written down in the form

$(d/dt)\hat{X} = \hat{B}\hat{X} + \hat{C} [A]_0 [B]_0$. The only column of the matrix \hat{X} is composed of the components of the distribution function x_n , and the matrices \hat{B} and \hat{C} describe the successive decomposition and recombination respectively. An expression is then written down for the general solution of the last-mentioned equation.

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The first eigenvalue of the matrix \hat{B} corresponds to the dissociation-constant of decomposition and is, in the case of lacking recombination, determined by the expression $\mu_0 = -(d/dt) [AB] / [AB]$. The second eigenvalue μ_1 of the matrix

\hat{B} is approximately equal to the rate of relaxation of the oscillation energy of the molecule AB, where, by the way,

$\mu_0 \ll \mu_1$ holds. The solution of the equation $\hat{B}X_0 + \hat{C}[A]_0[B]_0 = 0$ is the distribution function $x_n^{(0)} = N \exp(-E_n/kT)$ corresponding

to equilibrium. Next, the amount of the constant N is determined, after which an equation is written down for the kinetics of thermal decomposition and of recombination. In the case of equilibrium the dissociation constant of decomposition is greater than the dissociation constant k_d in the case of lacking equilibrium. The calculated values of k_d for the thermal decomposition of J_2 , Br_2 and O_2 agree satisfactorily with the

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On the Relation Between the Dissociation Constants of the Thermal Decomposition of Biatomic Molecules in the Presence and in the Absence of Equilibrium

values which were determined experimentally by the kinetic method in the decomposition of molecules in the shock wave in an argon atmosphere at temperatures of 1500 - 4000° K. The dissociation constant corresponding to equilibrium is greater by one order of magnitude than the value corresponding to the lacking equilibrium. There are 15 references, 5 of which are Soviet.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute for Chemical Physics of the Academy of Sciences, USSR)

PRESENTED: August 7, 1958, by V. N. Kondrat'yev, Academician

SUBMITTED: July 11, 1958

Card 4/4

24(7)

AUTHOR:

Nikitin, Ye Ye

SOV/20-124-5-55/62

TITLE:

The Oscillation-relaxation of Diatomic Molecules - Kolebatel'-naya relaksatsiya dvukhatomnykh molekul!

PERIODICAL:

Doklady Akademii nauk SSSR. 1959. Vol 124. Nr 5. pp 1068-1068 (USSR)

ABSTRACT:

For the transition probability of a single-quantum transition, the author puts $P_{n, n+1} = c(n+1) \exp[-3\gamma(n)]$. Here $\gamma(n)$ is proportional to $(E_{n+1} - E_n)^{2/3}$ and has the value 5-10 for various molecules at the usual temperatures; c does not depend on n . For a Morse oscillator describing a diatomic molecule at $n \ll \epsilon/2$ with sufficient accuracy it is possible to put $(E_{n+1} - E_n)^{2/3} = [\hbar\omega_0(1 - 2 \cdot n)]^{2/3} = \hbar\omega_0^{2/3}(1 - (4/3)\epsilon n)$. In the case of multi-quantum transitions $n \rightarrow n+p$ the probability $P_{n, n+p}$ is proportional to the factor $c^{p+1} \exp[-3p^{2/3}\gamma]$ and is smaller by many orders of magnitude than the probability $P_{n, n+1}$. It is therefore also possible with sufficient

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accuracy to put $P_{n, n+p} = 0$ at $p > 1$. The relaxation of a system of inharmonic oscillators probably differs essentially from the relaxation of a system of harmonic oscillators. The relaxation of the distribution function $x_n(t)$ for the oscillations of the inharmonic oscillator is described by the system of equations $\frac{d}{dt} x_n(t) = \sum_m B_{nm} x_m(t)$, in which the elements of the matrix B are expressed by the transition probabilities $P_{n, n+1}$ and $P_{n, n+p}$. Also for relaxation times expressions are written down

$$\tau_n = \int_0^{\infty} t \frac{d}{dt} [x_n(t) - x_n(\infty)] dt = \int_0^{\infty} [x_n(t) - x_n(\infty)] dt$$

The author investigates the δ -like initial distribution $x_n(0) = \delta_{nm}$ and, accordingly, introduces the notations τ_{nm} . Further explicit expressions for τ_{nm} are written down. In approximation to equilibrium the distribution function for the lower oscillation levels remains smaller than

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the function corresponding to equilibrium. As an example for the application of the here derived formulas the oscillation-deactivation of an oxygen molecule $O_2^*(n) + N_2 \rightarrow O_2^*(n-1) + N_2$ is investigated. By using the relaxation times τ_{nm} it is possible to calculate the relaxation time of any physical quantity characterizing a molecule in the simpler manner. The relaxation time of the oscillation energy of a harmonic oscillator does not depend on initial distribution, but in the case of an inharmonic oscillator it decreases with an increase of energy in the initial instant of time. The author thanks N. D. Sokolov for discussing the present paper. There are 10 references, 3 of which are Soviet.

ASSOCIATION. Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences, USSR)

PRESENTED: October 25, 1958, by V. N. Kondrat'yev, Academician

SUBMITTED: October 22, 1958
Card 3/3

66495

SOV/20-129-1-43/64

~~5(4)~~ 5.4130

AUTHOR: Nikitin, Ye. Ye.

TITLE: On the Theory of the Thermal Decomposition of Dinitrogen Oxide at Low Pressures

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 1, pp 157-160 (USSR)

ABSTRACT: Reference is made to a paper by E. K. Gill and K. J. Laidler (Ref 2) in which the decomposition rate constant for N_2O is calculated for low pressures. The calculation is based on the condition that the deformation vibrations do not affect the value of the rate constant, and on the assumption of two effective degrees of freedom. It is proved that four and not two degrees of freedom must be taken into consideration, and that the effectiveness of vibration excitation must be several orders smaller than the number of collisions. Taking these facts into account, the decomposition rate constant is calculated, obtaining $k \approx 10 \text{ cm}^3/\text{M}\cdot\text{sec}$. Conclusions drawn from this study are stated to be applicable for adiabatic decomposition of other molecules also. In the case of monomolecular decomposition the rate of

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On the Theory of the Thermal Decomposition of Dinitrogen Oxide at Low Pressures

thermal adiabatic decomposition is determined by the rate of transition from one potential energy curve to the other, involving a change in multiplicity, whereas in the case of dimolecular decomposition it is limited by the rate of activation of vibrations. The author thanks Professor N. D. Sokolov for criticizing the paper. There are 8 references, 3 of which are Soviet.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences, USSR)

PRESENTED: June 15, 1959, by V. N. Kondrat'yev, Academician

SUBMITTED: June 12, 1959

Card 2/2

N. K. TIN, Ye. Ye.

Following is a list of the Soviet papers submitted to the combustion symposium:

I. A. Levechev - The Dependence of Laminar Flame Properties on the Mechanism of Chain Reactions

I. A. Levechev - The Theory of Flame Propagation in Systems Involving Branched Chain Reactions

On the Mechanism of Non-adiabatic Retardation in Molecular Collisions

Some Questions of Analogy between Combustion in a Thrust Chamber and in a Detonation Wave

On the Criterion of High-Frequency (Laminar) Turbulence Generation in a Turbulent Combustion Chamber

A Simple Method for Determining Effective Activation Energies for Thermal Decomposition and Spontaneous Ignition of Certain Complex Molecules

On the Theory of Detonation Initiation by Impact

The Energy of Activation of Gaseous Reactions with Solid Carbon

Formation of Dispersed Carbon by Oxidation and Thermal Decomposition of /acetylene

Formation of Dispersed Carbon in Hydrocarbon Diffusion Flames

Effect of Dissociation on the Parameters of Reflected Shock Waves in Carbon Blanks

Study of Combustion of /acetylene Swabbed Gas Mixtures

New Methods for Studying Two-Phase Fuel-Air Mixtures in a Flow

Propagation of Flames in Turbulent Flow of Two-Phase Fuel-Air Mixture

Thermodynamic Properties of Air at High Temperatures

Conditions of Regular Movement of Strong Shocks and Detonation

Some Remarks on the Regular Movement of Shocks with Spherical and Cylindrical Symmetry

Regular Motion of Shocks and of Detonation from the Viewpoint of Maxwell's Transfer Equations

I. G. Bolshovitskiy - On the Theory of Detonation Initiation by Impact

P. A. Pomeroy - The Energy of Activation of Gaseous Reactions with Solid Carbon

P. A. Pomeroy - Formation of Dispersed Carbon by Oxidation and Thermal Decomposition of /acetylene

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Regular Motion of Shocks and of Detonation from the Viewpoint of Maxwell's Transfer Equations

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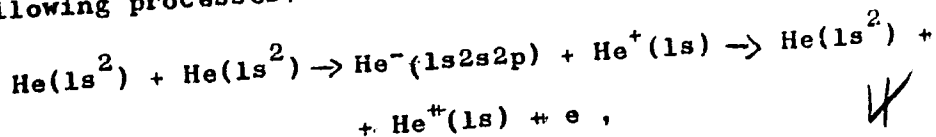
S/051/60/008/02/003/036
E201/E391

AUTHOR: Nikitin, Ye. Ye.

TITLE: On a Possible Mechanism of Electron Excitation in Slow Atomic Collisions

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 2, pp 157 - 159 (USSR)

ABSTRACT: The adiabatic approximation is inapplicable in certain cases of inelastic atomic collisions. In such cases the simplest non-adiabatic process which can occur is multiple (in particular double) charge exchange. Before and after collision the atoms have different potential energies and transition from the initial to final potential energy occurs along the potential curve of the ionic state. The author uses charge-exchange mechanism to discuss the following processes:



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AUTHOR: Nikitin, Ye. Ye.

TITLE: On the Interpretation of Induced Infrared Spectra of Compressed Gases

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 2,
pp 264 - 266 (USSR)

ABSTRACT: Interpretation of the infrared spectra of non-polar molecules was dealt with in a number of papers (Refs 1-4). No explanation has yet been offered for the linear dependence of the splitting of the Q-band on the density of an inert gas, reported by Chisolm and Welsh (Ref 5). Since the residual splitting at low densities is due to rotation of the induced moment directed along the axis of two colliding molecules (Refs 3,5) the linear dependence of the displacement of the Q_p and Q_R branches of the Q-band on the density should be due to triple collisions. The present paper gives a qualitative explanation of this splitting within the framework of the author's earlier theory (Ref 3). To make the case definite the author considers the Q_R branch and the frequency ω is read off

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On the Interpretation of Induced Infrared Spectra of Compressed Gases

from the position of its maximum at low pressures; the Q_P branch is obtained by a mirror reflection of the Q_R branch with respect to the vibration-transition frequency. The author comes to the following conclusion: displacement of the frequency of the Q_R -branch maximum rises linearly with the number of collisions on increase of the density and the coefficient of proportionality between the number of collisions and the frequency shift amounts to several units. The separation, $\Delta\omega$, between the maxima of Q_P and Q_R branches is twice as large as the displacement of the Q_R maximum, when the residual (constant) splitting is neglected. The results obtained agree qualitatively with the experimental data of Chisholm and Welsh (Ref 5) for hydrogen. Acknowledgment is made to Professor N.D. Sokolov for his advice. There are 5 references, 1 of which is Soviet, 3 Dutch and 1 English.

SUBMITTED. July 2, 1959
Card2/2

NIKITIN, Ye.Ye.

Nonadiabatic vibrational excitation of molecules attending
molecular collisions. Opt.1 spektr. 9 no.1:16-21
Je '60. (MIRA 13:7)
(Spectrum, Molecular)

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S/048/60/024/008/018/018/IX
B013/B067

26.2440
AUTHORS:

Nikitin, Ye. Ye. and Sokolov, N. D.

TITLE:

Theory of the Thermal Decay of Diatomic Molecules

PERIODICAL:

Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960.
Vol. 24, No 8, pp. 996 - 1000

TEXT: In one of their earlier papers (Ref. 10), the authors showed that for calculating the decay rate, the anharmonicity of the vibrations and the accompanying reduction of the vibration quanta are to be taken into account with increasing reserves of vibrational energy of the molecule. In this paper, it is shown that by taking account of this fact as well as of rotation it is possible to calculate the decay rate K_d .

$$(8) K_d = g_{el} \int \mu_0 (D_{eff}) \exp(-\epsilon_t / kT) d\epsilon_t / kT = [g_{el} g_t Z \frac{k_{av}}{kT} \exp(-D/kT)] / Q,$$

where D_{eff} is the effective dissociation energy of the rotating AB molecule. Owing to the action of the centrifugal force, D_{eff} becomes smaller

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Theory of the Thermal Decay of Diatomic
Molecules

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B013/B067

than D . By integrating (8), an additional pre-exponential factor appears. The non-equilibrium distribution function corresponding to the exponential decay is determined by the first eigenvector $l_n(\mu_c)$ of the matrix $B^{-1}l_n(\mu_c)$ can be easily found from the general formulas of the eigenvectors of the Jacobian matrix if the formula for μ_c is known. The percentual improvement in population of the upper vibration levels is of the order of $\exp\left[\frac{(D - E_p)}{kT}\right]$, where p is the number of vibration levels calculated from the dissociation limit. This result especially corresponds to Refs. 9 and 13 dealing with the model of a decaying harmonic oscillator. Since in the case of a real anharmonic oscillator the oscillation quanta at the dissociation limit are small compared with kT , numerous levels reach the region of great improvement $D - E_p \approx kT$. Hence, it may be said that the equilibrium of the Boltzmann distribution in decay reactions is always perturbed. Since dissociation is a complex multistage process, the quantity K_d becomes small compared with the quantity obtained from the equilibrium condition $(K_d)_{\text{equil}} = K_{\text{rec}}$ owing to the perturbation of the

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Theory of the Thermal Decay of Diatomic
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Boltzmann distribution. K - constant of the reaction equilibrium. K_{rec} - recombination constant. Since the recombination rate is essentially determined by the velocity with which two colliding atoms pass from the state with a continuous spectrum to one of the upper vibration levels of the bound state, the recombination constant must be approximately equal for both the equilibrium and the non-equilibrium process. The authors arrived at the conclusion that the dissociation rate depends on the concentration of the reaction products, although it is usually determined like an actual constant. This indicates that the ordinary kinetic equation for the reactions of decay and recombination, $\frac{d}{dt} [AB] = K_d [AB] [M]$

$K_{rec} [A] [B] [M]$, is invalid in the entire range of the concentration change of $[A]$, $[B]$ and $[M]$, since it does not take account of the difference between K_d and $(K_d)_{equil}$. There are 22 references: 8 Soviet.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of
Chemical Physics of the Academy of Sciences USSR)

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S/020/60/132/02/42/067
B004/BC07AUTHOR: Nikitin, Ye. Ye.TITLE: The Mechanism of Intermolecular Energy Exchange in the
Dissociation of a Diatomic Gas γ^1

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 2, pp. 395-398

TEXT: The author points out that by means of shock waves an accurate measurement of the rate constants of the dissociation of pure diatomic gases is possible. Experiments showed that dissociation in diatomic gas is considerably quicker than the same reaction within a diatomic gas rarefied by means of a monatomic gas. This fact is theoretically substantiated on the basis of the reactions $O_2 + A \rightarrow O + O + A$ (1) and $O_2 + O_2 \rightarrow O + O + O_2$ (2), for which the rates in Ref. 3 were measured at 3000-5000°K. The author investigates the inter-relation between the oscillation quantum ϵ of O_2 and the dissociation energy E and the probability of quantum transition. For the case (1), $\epsilon_1 = 0$ (no energy transfer on the part of the inert monatomic gas), equation (6) is derived for the dependence $E = E(\epsilon)$, proceeding from the Morse oscillator. For case (2),

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The Mechanism of Intermolecular Energy Exchange in
the Dissociation of a Diatomic Gas

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B004/B007

$\epsilon_1 \neq 0$, the possibility of energy exchange is discussed. The author arrives at the conclusion that the probability of partial transfer of the rotational energy ϵ_1 to the oscillation of the dissociating molecule is of the same order of magnitude as the probability of the exchange of rotational and linear motion. As a result, equation (8) is written down. The author suggests checking this equation by investigating the forced infrared absorption of molecules, such as occurs in the deformation of the molecule electron sheath as a result of collisions. He thanks Professor N. D. Sokolov for judging the paper, and Professor O. K. Rice for letting him have a copy of Ref. 7 before its publication. There are 12 references, 4 of which are Soviet.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of
Chemical Physics of the Academy of Sciences, USSR)

PRESENTED: January 6, 1960, by V. N. Kondrat'yev, Academician

SUBMITTED: January 3, 1960

Card 2/2



3004/3056

AUTHOR: Nikitin, Ye Ye

TITLE: The Vibrational Distribution Function for Polyatomic Molecules in Monomolecular Decomposition

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 6, pp. 1442 - 1445

TEXT: It was the purpose of the present work to investigate the monomolecular decomposition of polyatomic molecules at energies which are higher than the dissociation energy E_0 . In this way, secondary reactions

are initiated. An example of such a decomposition is given:
 $C_2H_5Br \rightarrow HBr + C_2H_4$, $E_0 \approx 53$ kcal/mole (1a); $C_2H_5Br \rightarrow Br + C_2H_5$, ✓

$E_0 \approx 65$ kcal/mole (2a). In the case 2a, a chain reaction

$Br + C_2H_5Br \rightarrow C_2H_4Br + HBr$, $C_2H_4Br \rightarrow C_2H_4 + Br$ occurs. The non-equilibrium distribution function is derived from the kinetic equation which describes the vibrational relaxation and the decomposition. The rate of decomposi-

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The Vibrational Distribution Function for
Polyatomic Molecules in Monomolecular
Decomposition

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B004/B056

tion is determined by the lowest eigenvalue μ_0 of the stochastic matrix

The kinetic equation reads: $\partial x(\epsilon)/\partial t = \int K(\epsilon, \epsilon') d\epsilon' - Z^* x(\epsilon) - k(\epsilon)x(\epsilon)$
(3). $x(\epsilon)$ is the distribution function dependent on the dimensionless energy $\epsilon = E/kT$; Z^* is the number of collisions which become effective in the vibrational relaxation; $k(\epsilon)$ is the differential rate of decomposition; $K(\epsilon, \epsilon')$ describes the vibrational relaxation, where $\int K(\epsilon, \epsilon') d\epsilon' = Z^*$ holds. The diffusion equation is derived from (3);

$$\partial x/\partial t = D(\partial/\partial \epsilon) [\partial x/\partial \epsilon + f'(\epsilon)x] - k(\epsilon)x \quad (4) \quad D = Z \bar{\epsilon}^2 \quad (Z = \text{number of gas-}$$

kinetic collisions, $\bar{\epsilon}^2 = \text{mean square of energy transferred per unit time to the decomposing molecules}$ In the following, D is considered to be constant. The lowest eigenvalue μ_0 of the operator of equation (4) is found

by the variation method. For a system of $s + 1$ harmonic oscillators, for which $f(\epsilon) = \epsilon - s \ln \epsilon$; $\epsilon_0 = E_0/kT$ holds, one obtains:

$$\mu_0 = \min \begin{cases} D(\epsilon_0^s/s!) \exp(-\epsilon_0) & (6a) \\ \exp(-\epsilon_0) & (6b) \end{cases} \quad (6a) \text{ expresses the rate of bimolecular}$$

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The Vibrational Distribution Function for
Polyatomic Molecules in Monomolecular
Decomposition

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decomposition, (6b) that of monomolecular decomposition. The transition
from (6a) to (6b) is given by the condition $Df_0^0/s \approx 1$. For the non-

equilibrium distribution function, the following equation is written:

$\mu_0 x = D(x' + f'x)' - kx$ (7) By substituting $x = y \exp(-f/2)$ one obtains
for the condition $\epsilon_0 \gg s$: $y'' - U(\epsilon)y = 0$; $U(\epsilon) = [(f')^2/4 + (k - \mu_0)/D]$

(8); $y = (\text{const}/U^{1/4}) \exp(\int \sqrt{U} d\epsilon)$ (9); and finally:

$$x(\epsilon) = \frac{\exp[-f]}{\left[\sqrt{\frac{4(f_0')^2}{(f')^2 + 4k/D}} \right] \exp\left[\int \sqrt{\frac{(f')^2}{4} + (k/D)} d\epsilon \right]} \quad \begin{matrix} \epsilon \ll \epsilon_0 & (10) \\ \epsilon \gg \epsilon_0 & \end{matrix}$$

In the case of a sufficiently large D (10) acquires the form

$$x(\epsilon) = \exp(-f) \exp\left[-(\cdot/D) \int_0^\epsilon (k/f') d\epsilon\right] \quad \epsilon \gg \epsilon_0 \quad (11) \quad f(\epsilon_0) = f_0, \quad f'(\epsilon_0) = \dots$$

The non-equilibrium distribution function investigated might be of
importance for calculating the spectrum of stabilized fluorescence. It

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The Vibrational Distribution Function for
Polyatomic Molecules in Monomolecular
Decomposition

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should be possible to describe the vibrational distribution function in the excited electron state by means of an inhomogeneous equation which is similar to equation (8). The function $k(\nu)$ represents the probability of a radiationless transition. The author thanks Professor N. D. Sokolov and A. Ye. Shilov for discussions. There are 9 references: 5 Soviet and 4 US.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR)

PRESENTED: June 27, 1960 by V. N. Kondrat'yev, Academician

SUBMITTED: June 22, 1960

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S/051/61/010/004/002/007
E032/E314

AUTHOR: Nikitin, Ye. Ye.

TITLE: Wave Functions for Diatomic Molecules with Strong Spin-orbit Interaction

PERIODICAL: Optika i spektroskopiya, 1961, Vol. 10, No. 4, pp. 443 - 447

TEXT: The interaction between two identical atoms in the $(p^5)^2P_j$ ($j = 1/2, 3/2$) state in a halogen molecule is discussed. The formation of the chemical bond appears as a result of the tendency of the electron spins of atoms to pair off. In accordance with the vector model of Dirac, this correlation can be described by an antisymmetric (in space and spin coordinates) wave function, which is an eigenfunction of the total spins of the separate electron pairs (Corson - Ref. 2). On the other hand, the spin-orbit interaction upsets this correlation and leads to the "mixing" of structures belonging to different values of the total spin. Moreover, the spin-orbit interaction leads to the "mixing" of

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Wave Functions for

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wave functions with different spatial symmetry so that it can be responsible for the non-adiabatic interaction between electronic and nuclear motions in molecules and for the strong dependence of the dipole transition moment on the internuclear distance. In this connection, it is of interest to determine the correct wave functions which will diagonalise, in the first approximation, the total Hamiltonian for two interacting atoms and including strong spin-orbit interaction ($\epsilon \ll E$) so that the second-order corrections should be of the order of

E^2/ϵ . It is shown that in the case of a weak spin-orbit interaction the $1\Sigma^+$ state corresponds to the formation of a chemical bond, while the remaining states correspond to the repulsion between the atoms. As this spin-orbit interaction increases, it is necessary to take into account the interaction between the $0^{(1)}$ and $0^{(2)}$ states. Direct calculations show that as a result of interaction between the $1\Sigma^+$ and $3\Sigma^-$ states the binding energy of the ground

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Wave Functions for

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state is reduced but the second bound state appears with a binding energy of $D \sim \epsilon$. The formation of an excited bound state as a result of the spin-orbit interaction can be seen in the molecules F_2 , Cl_2 , Br_2 , J_2 (ϵ , respectively, 407, 881, 3685 and 7598 cm^{-1}). The absorption spectrum of these molecules ranges from continuous for F_2 to a clear band structure for I_2 . Detailed tables are reproduced, giving the matrices for the transformation of wave functions from type a to type c bonds. There are 2 tables and 8 references: 3 Soviet and 5 non-Soviet.

SUBMITTED: May 28, 1960

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NIKITIN, Ye.Ye.

Nonadiabatic transitions near the turning point in atomic
collisions. Opt. i spektr. 11 no.4:452-456 0 '61. (MIRA 14.10)
(Quantum theory) (Collisions (Nuclear physics))

NIKITIN, Ye. Ye.

Intermolecular energy transfer associated with the collisions of
chemically active molecules. Dokl. AN SSSR 136 no.6:1376-1379
F '61. (MIRA 14:3)

1. Institut khimicheskoy khimii AN SSSR. Predstavleno akademikom
V. N. Kondrat'yevym.

(Force and energy)
(Molecular theory)

NIKITIN, Ye.Ye.

Relationship between dissociation and recombination rate constants
under nonequilibrium conditions. Kin.i kat. 3 no.6:830-835
N-D '62. (MIRA 15:12)

1. Institut khimicheskoy fiziki AN SSSR.
(Dissociation) (Recombination)

NIKITIN, Ye.Ye.

Electron interaction in long molecules with conjugate bonds.
Opt. i spektr. 12 no.6:691-685 Je '62. (MIRA 15:5)
(Conjugation (Chemistry)) (Molecules) (Electrons)

13491
S/051/62/013/006/001/027
E039/E120

AUTHOR:
TITLE:

Nikitin, Ye.Ye.

Probability of non-adiabatic transitions in the case of non-separating terms

PERIODICAL: Optika i spektroskopiya, v.13, no.6, 1962, 761-765

TEXT: The Landau-Zener formula is usually used for calculating the probability of non-adiabatic transitions. The matrix interaction element ϵ_2 is then constant and the terms are assumed separable in so far as the ratio of ϵ_2 to the separation between them is vanishingly small. In the present paper the non-adiabatic transition in the case of inductive molecular collisions of the Fermi resonance type are examined for triatomic molecules. In the non-stationary condition when vibrational terms (frequency ω) can be adiabatically displaced as a result of an external force induced will lead to a significant intramolecular redistribution of energy. It is shown that the probability for the double transition is given by:

$\dots -r_{nv})]$

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Probability of non-adiabatic ...

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2) The exact point of resonance in zero approximation $\epsilon_1 = 0$ when the following expression is obtained:

$$P_{12} = \frac{1}{2} \text{ch}^{-2} (\pi \epsilon_2 \omega / \hbar \nu) . \quad (24)$$

3. For large relative velocity $2\pi\epsilon_2^2 / \Delta E \hbar \nu$, $2\pi\epsilon_1^2 / \Delta E \hbar \nu \ll 1$ the probability is given by:

$$P_{12} = \frac{1}{2} \frac{(2\epsilon_2)^2}{(2\epsilon_2)^2 + \epsilon_1^2} \quad (25)$$

It is estimated that the value of $\omega \tau_0$ is about 10 for molecules such as CO_2 at room temperature. There is 1 figure.

SUBMITTED: October 5, 1961

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