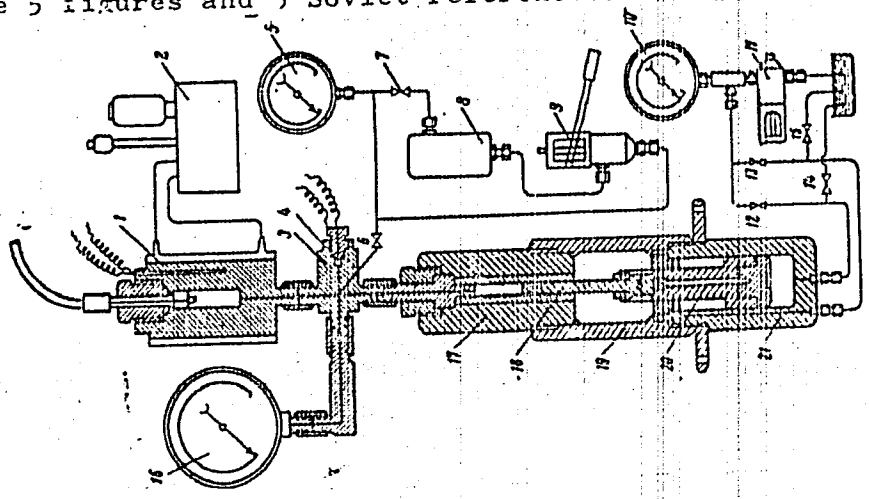
"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

86750

S/120/60/000/006/026/045
E073/E335

High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

Acknowledgments are expressed to M.Ya. Knutov for his participation in the assembly and operation of the equipment.
There are 5 figures and 3 Soviet references.



Card 5/8

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

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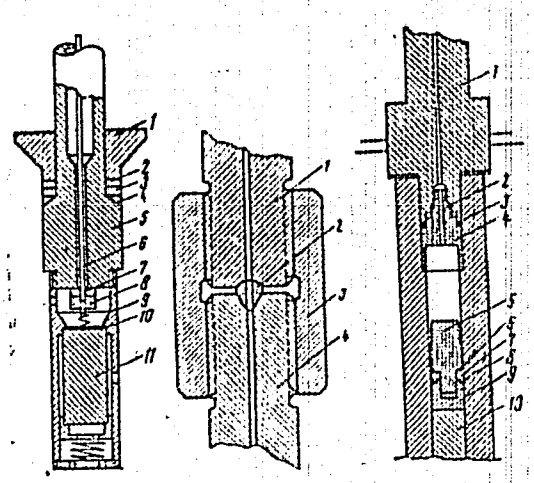
E073/E335

High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.



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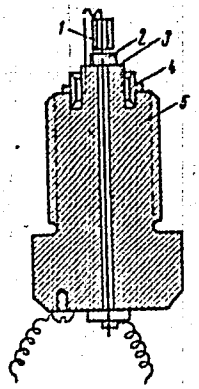
E073/E333

High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.



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E073/E335

High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-Pressure Physics of the AS USSR)

SUBMITTED: November 18, 1959

Card 8/8

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

18.6100

80220
S/126/60/009/04/025/033
E111/E435

AUTHORS: Voronov, F.F. and Balashov, D.B.

TITLE: Adiabatic Moduli of Elasticity of Cermet Tungsten Carbides

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 4, pp 616-620 (USSR)

ABSTRACT: The moduli of elasticity of the carbides VK6, VK8, VK10, VK11, and VK15 (Co contents between 6 and 15%) are given which were determined at 22°C by means of a dynamic method, namely from the speeds of the longitudinal and transverse ultrasonic waves and from the densities. The moduli of elasticity were determined with an accuracy of 2 to 4%. The speed of the ultrasonics was measured by means of apparatus described in an earlier paper (Ref 6), using piezoquartz pick-ups with a natural frequency of 10 Mc/s; the duration of the radio-frequency pulse received by the pick-up was about 1 μs. The pulses were emitted at a frequency of 1 kc/s. The speed of the ultrasonics was measured with an accuracy of 0.5% for a specimen length of 5 cm. On the basis of the obtained speeds and densities, the adiabatic moduli of elasticity and Poisson's coefficient were calculated with an accuracy of ± 2 to 4%, taking into consideration the scatter in the

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E111/E435

Adiabatic Moduli of Elasticity of Cermet Tungsten Carbides

values of specimens of various batches. The graph, Fig 1, shows the dependence of the density ρ, the speeds of the 10 Mc/s longitudinal v_p and the transverse v_s waves on the Co content of the tested tungsten carbides. The Dependence of the adiabatic modulus of compression K, the Young modulus E, the shear modulus G and the Poisson coefficient σ on the Co content is plotted in Fig 2, using the same data as are given in Table 1. In Table 2, the most reliable values of the Poisson coefficient, as determined by Lardner and McGregor (Ref 3), for specimens of 6 and 10% Co, by means of the method of static compression of cylindrical specimens, are given and also the values obtained by the authors of this paper for specimens with equal Co contents. In the plot, Fig 3, published data are compared with results obtained by the authors for the Young modulus as a function of the Co content. The following values were obtained for the carbide VK6: modulus of volume compression $K = 3.59 \times 10^{12}$ dynes/cm^2; Young modulus $E = 6.20 \times 10^{12}$ dynes/cm^2; shear modulus $G = 2.61 \times 10^{12}$ dynes/cm^2. The increase in the

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80220

S/126/60/009/04/025/033
E111/E435

Adiabatic Moduli of Elasticity of Cermet Tungsten Carbides

Co content from 6 to 15% leads to the following reduction in value: K by 12.6%; E by 14.5% and G by 14.7%; the Poisson coefficient increases thereby from $\sigma = 0.212$ to $\sigma = 0.222$. There are 3 figures, 2 tables and 12 references, 8 of which are Soviet, 2 German and 2 English.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-Pressure Physics AS USSR)

SUBMITTED: January 21, 1959

Card 3/3

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

S/020/60/135/005/018/043
B019/B067

AUTHORS: Voronov, F. F., Vereshchagin, L. F., Corresponding Member of the AS USSR, and Goncharova, V. A.

TITLE: Effect of Hydrostatic Pressure on the Elastic Properties of Cerium

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 5, pp. 1104-1107

TEXT: In the introduction, the authors describe the cerium anomalies at high pressures and low temperatures which have been known for a considerable period of time. They mention A. I. Likhter, Yu. N. Ryabinin, L. F. Vereshchagin (Ref. 1), and Bridgman (Ref. 2). The authors studied the elastic properties at high pressure, and their changes on a polymorphous transition of the structure by means of ultrasonic methods. The propagation of ultrasonic waves with a frequency of 3.5 - 5.5 megacycles was measured by means of a pulse device shown in Fig. 1. Specimens contained 98.5% Ce, 1.5% of rare earths, 0.002% Fe, and 0.003% Pb, Bi, Sn, and Sb, their diameter was 20 mm, their lengths differed. With increasing

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

Effect of Hydrostatic Pressure on the Elastic Properties of Cerium

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B019/B067

pressure, phase transition took place at 7650±50 kg/cm^2, with decreasing pressure, at 5950±50 kg/cm^2. Formulas are given for calculating the elasticity characteristics from the results of sound velocity measurements. Figs. 2 and 3 graphically show the dependence of the propagation velocity v_l of longitudinal waves, of the propagation velocity v_t of transverse waves, and the Debye temperature on hydrostatic pressure, as well as the dependence of elastic properties on hydrostatic pressure. There are 3 figures and 15 references: 7 Soviet, 1 German, and 6 US.

ASSOCIATION: Institut fiziki vysokikh davleniy Akademii nauk SSSR (Institute of the Physics of High Pressures of the Academy of Sciences USSR)

SUBMITTED: August 22, 1960

Legend to Fig. 1: 1) trigger block, 2) pulse generator, 3) amplifier, 4) oscilloscope, 5) obtuator, 6) screwed nut, 7) high-pressure container, 8) electric supply lines, 9) piezoelement, 10) cerium specimens, 11) piezoreceiver.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

Effect of Hydrostatic Pressure on the Elastic Properties of Cerium

S/020/60/133/005/019/047
B019/B067

Legend to Fig. 2: Θ_D Debye temperature, v_l propagation velocity of longitudinal waves, and v_t that of transverse waves.

Legend to Fig. 3: G shearing modulus, E Young's modulus, σ Poisson's ratio, and K_s modulus of adiabatic volume elasticity.

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APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F. F., Cand. Phys-Math. Sci. (diss) "Investigation of Effect of Hydrostatic Pressure Up To 10,000 kG/cm^2 On Elastic Property of Some Metals by the Ultra-sonic Method." Moscow, 1961, 12 pp (Instit. of High-Pressure Physics, Acad. of Sci. USSR) 125 copies (KL Supp 12-61, 250).

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

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S/126/61/011/003/010/017
E032/E514

AUTHORS: Voronov, F.F. and Vereshchagin, L.F.

TITLE: Effect of Hydrostatic Pressure on the Elastic Properties of Metals. 1. Experimental Data

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.3, pp. 443-450.

TEXT: The effect of hydrostatic pressure on the elastic properties of polycrystalline specimens of pure metals has been investigated. The mechanical properties were investigated using a pulse ultrasonic method (10 Mc/s). The ultrasonic apparatus employed was described earlier by the authors and V. I. Murav'yev (Ref.6). The following materials were investigated: Al, 99.996% pure (Fe 0.0015%, Si 0.0015%, Cu 0.001%); Mg, 99.92% pure (Fe 0.04%, Si 0.01%, Cu 0.01%, Al 0.02%); armco-iron (Fe 99.8%, C 0.012%, Si 0.02%, Mn 0.02%, P.0.03%, S 0.03%); Be, 99.2% pure (Fe 0.36%, Mg 0.2%, Al 0.05%, Si 0.05%, Mn 0.02% Ni 0.015%; molybdenum, 99.88% pure (W 0.1%, Fe 0.005%, Al 0.002%, Cu, Zn, P, S, Mn, As 0.001%). The densities of these materials were found to be: Al - 2.695, magnesium - 1.731, armco-iron - 7.836, beryllium-1.843, molybdenum - 9.838 g/cm^3. Quartz plates were

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attached to the ends of the specimens and their working frequency was 10 Mc/s. The elastic moduli were computed from the following data: length of specimen under pressure (ℓ_0), density (ρ_0), time of transit of longitudinal and transverse ultrasonic waves at atmospheric pressure and the change in these times on application of pressure, Δt_ℓ and Δt_t. Changes in length and density on application of pressure were corrected for using the results of Bridgman and others. The adiabatic bulk modulus was calculated from the formula

$$K_{T,0} = 4l_0^2 \rho_0 \left(t_{l,0}^{-2} - \frac{4}{3} t_{t,0}^{-2} \right) \quad (1)$$

and the corresponding isothermal bulk modulus from

$$K_{T,0} = \frac{K_{T,0}}{1 + \frac{\alpha^2 T K_{T,0}}{l \cdot C_p}}, \quad (2)$$

where α is the volume expansion coefficient, assumed to have the

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following values for Al, Mg, Fe, Be and Mo, respectively: 7.09×10^{-5}, 7.66×10^{-5}, 3.52×10^{-5}, 3.65×10^{-5}, 1.54×10^{-5} deg^{-1}. The specific heat C_p at constant pressure for these materials was assumed to be 0.214, 0.235, 0.180, 0.475, 0.060 cal/g·deg, respectively. The temperature was T = 303°K, the mechanical equivalent of heat was assumed to be 4.182×10^7 erg/cal and at 2000 kg/cm^2 the adiabatic bulk modulus was calculated (on the first approximation) from the formula

$$K'_{s,2} = 4l_0^2 \rho_0 \left(1 + \frac{1}{3}\frac{\Delta P}{K_{T,0}}\right)\left[(l_{l,0} + \Delta l_l)^{-2} - \frac{4}{3}(l_{t,0} + \Delta l_t)^{-2}\right]. \quad (3)$$

The adiabatic bulk modulus $K'_{s,2}$ was then converted to the isothermal bulk modulus $K'_{T,2}$ in accordance with Eq. (2). Changes in C_p and α were neglected. Next, in order to introduce the correction, the average value of the bulk modulus in the range 0 to 2000 kg/cm^2 was used and the second approximation $K''_{s,2}$ was computed. The new average value of the isothermal modulus was

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Effect of Hydrostatic Pressure... S/126/61/011/003/010/017
E032/E514

then used in the correction term for the next approximation. This procedure can be continued indefinitely to obtain the values of $K_{s,i}$. Young's modulus, the shear modulus and the velocity of propagation of ultrasonic waves were computed from the formulae

$$E = \frac{3K_s}{A-1}, \text{ где } \left(A = \frac{v_l^2}{v_t^2} = \frac{(l_{t,0}+\Delta l_t)^2}{(l_{l,0}+\Delta l_l)^2}\right); \quad (5)$$

where

$$G = 4l_0^2\rho_0\left(1+\frac{1}{3}\frac{\Delta P}{\overline{K}_{T,2}}\right)\left(1+\frac{1}{3}\frac{\Delta P}{\overline{K}_{T,4}}\right)\ldots(l_{t,0}+\Delta l_t)^{-2}; \quad (6)$$

$$v = 2l_0\left(1-\frac{1}{3}\frac{\Delta P}{\overline{K}_{T,2}}\right)\left(1-\frac{1}{3}\frac{\Delta P}{\overline{K}_{T,4}}\right)\ldots(l_0+\Delta l)^{-1}. \quad (7)$$

$$\sigma = \frac{1}{2}\frac{A-2}{A-1}. \quad (8)$$

Eq (3)(5)(6)(7) and (8) from pages 445

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APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

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E032/E514

The Debye temperature was calculated from

$$\theta_D = \frac{h}{k}\left(\frac{9N_A}{4\pi}\right)^{\frac{1}{3}} l_0 \left(\frac{\rho_0}{M}\right)^{\frac{1}{3}} \left[(l_{l,0}+\Delta l_l)^3 + 2(l_{t,0}+\Delta l_t)^3\right]^{-\frac{1}{3}}, \quad (11)$$

and the average velocity of sound from

$$\bar{v} = \left(\frac{1}{v_l^3} + \frac{2}{v_t^3}\right)^{-\frac{1}{3}}. \quad (10)$$

In the above expressions N_a is the Avogadro number. All the results were obtained at 30°C. The numerical data are summarized in Figs. 1-5, in which the pressure is plotted along the horizonal axes in kg/cm^2. There are 5 figures, 2 tables and 16 references: 3 Soviet and 13 non-Soviet.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of Physics of High Pressures AS USSR)

SUBMITTED: July 22, 1960

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Eq. (11) and (10) on page 446 attached Mat 28

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21368

188200 1413, also 2108, 1160

S/126/61/011/004/018/023
E032/E314

AUTHOR: Voronov, F. F.

TITLE: Effect of Hydrostatic Pressure on the Elastic Properties of Metals. II. General Discussion and Further Calculations

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol. 11, No. 4, pp. 620 - 627

TEXT: The determination of the effect of pressure on the elastic properties of metals by static methods is difficult owing to the low accuracy of these methods and the smallness of the effect. Thus, for example, Bridgeman (Ref. 1) did not succeed in measuring the change in Young's modulus for steel and a number of other metals at a pressure of the order of 27 000 kg/cm^2. The present author suggests that dynamic methods and, in particular, pulsed ultrasonic methods are more likely to be successful. The present author and Vereshchagin (Ref. 2) have determined experimentally the effect of high pressure (up to 10 000 kg/cm^2) on the elastic

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properties of Mg, Al, Be, Fe and Mo. It was found in that paper that the velocity of propagation of longitudinal and transverse waves increases linearly with pressure (the measurements were carried out at 30 °C). The present paper is concerned with the interpretation of these data. Fig. 1 shows the variation in the ratio $(v_l/v_t)^2$ as a function of pressure. As can be seen from this graph, the departure from the Cauchy relation for Fe and Mo, which have a body-centred cubic lattice, is in the opposite direction to that for Al (face-centred cubic lattice, dense packing). The ratios E/G, E/K and K/G are found to be independent of pressure (E - Young's modulus, K - bulk modulus and G - shear modulus). This is shown by Table 2, which gives the ratio of the adiabatic moduli with and without pressure. The Grüneisen constant calculated from the ultrasonic measurements is found to increase with pressure. The effect of hydrostatic pressure on the Grüneisen constant is illustrated in Fig. 2. Kornfel'd (Ref. 9) has analysed Bridgeman's

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experimental data on the compressibility of solids and found that the "instantaneous" bulk modulus varies linearly with pressure and can therefore be represented by a formula of the form

$$K_T = q(P + \pi) \qquad (22)$$

where π and q are constants and

$$q = \partial K_T / \partial P .$$

Integration of this expression yields

$$V = \left(\frac{\pi}{\pi + P}\right)^{1/q} ; \quad V_o = 1 \qquad (23)$$

which complies with Bridgeman's P-V data in a wide pressure range. The ultrasonic method can be used to determine the bulk modulus as a function of pressure to a high degree of accuracy. Table 4 gives the coefficients q and π for

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Effect of Hydrostatic ....

various metals at 30 °C. Acknowledgments are expressed to Corresponding Member of the AS USSR L.F. Vereshchagin for valuable advice.
There are 2 figures, 4 tables and 10 references:
7 Soviet and 3 non-Soviet.

ASSOCIATION: Institut fiziki vysokikh davleniy g. Moskva (Institute of High-pressure Physics, Moscow)

SUBMITTED: July 23, 1960

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 09498-67 EWT(d)/EWP(e)/EWT(m)/EWP(v)/EWP(t)/ETI/EWP(k)/EWP(h)/EWP(j) IJP(c) JD/WH
ACC NR: AP6034240 (A) SOURCE CODE: UR/0126/66/000/005/0207/0208

AUTHOR: Voronov, F. F.; Stal'gorova, O. V.

ORG: Institute of High Pressure Physics AN SSSR, Moscow (Institut fiziki vysokikh davleniy AN SSSR)

52
B

TITLE: Investigation of elastic properties of solids under high pressures by the ultrasonic method

SOURCE: Pribory i tekhnika eksperimenta, no. 5, 1966, 207-208

TOPIC TAGS: elasticity, solid mechanical property, strain, ultrasonics

ABSTRACT: A compression testing machine is described in which the piezoelectric sensors (quartz plates) are not in contact with the tested object but are attached to the high-pressure pistons, which, at the same time, act as ultrasonic conductors (see Fig. 1). The high-pressure pistons are made either from ShKh15 (or R18) steel or the VK-6 metal-ceramic alloy, permitting the test pressure to attain a value of approximately 40kbar. The strain and the propagation time of the ultrasonic wave may be measured as functions of the applied pressure. The applied pressure is measured by a wire strain gage and a manometer with an accuracy of 0.6% at a nominal pressure of 20kbar. The quartz plates measure the longitudinal and transverse velocities of propagation of the ultrasonic wave which are related to the elastic properties of the tested sample. The same method is applicable in conic and belt-type compression chambers in

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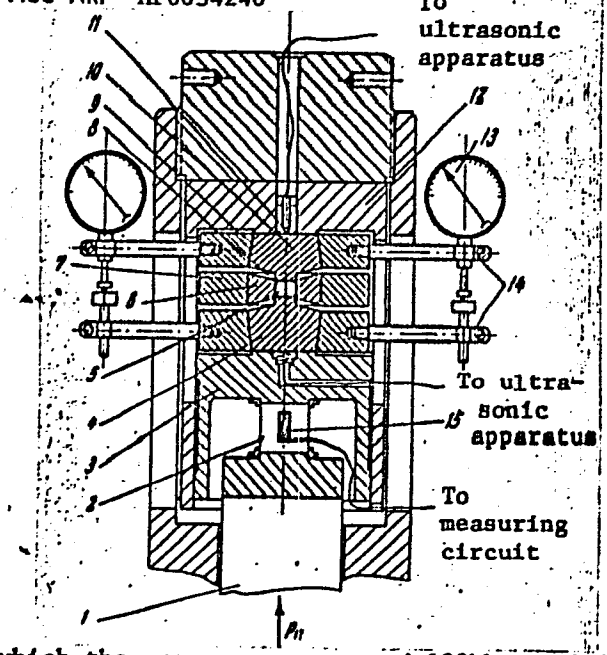

Fig. 1. High-pressure installation.

1) Hydraulic press piston; 2) dynamometer; 3) guiding support; 4) high-pressure piston; 5) tested sample; 6) high-pressure chamber; 7) chamber support; 8) compression rings; 9) piston support; 10) high-pressure piston; 11) quartz plate; 12) guide socket; 13) indicator; 14) rods; 15) wire strain gage.

which the pressure may exceed 100kbar. Orig. art. has: 1 figure.

SUB CODE: ~~14~~ 20/ SUBM DATE: 14Oct65/ ORIG REF: 004/ OTH REF: 001/ ATD PRESS: 5103

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L 37095-66 EWP(k)/EWT(1)/EWT(m)/EWP(t)/ETI IJP(c)

ACC NR: AP6018795 SOURCE CODE: UR/0056/66/050/005/1173/1182

53

AUTHOR: Voronov, F.F.; Goncharova, V.A.

50

ORG: Institute of Physics of High Pressures, AN SSSR (Institut fiziki vysokikh davleniy AN SSSR)

B

TITLE: Effect of pressures up to 20 kbar on the elastic properties of rubidium chloride and iodide

SOURCE: Zh eksper i teor fiz, v. 60, no. 5, 1966, 1173-1182

TOPIC TAGS: propagation velocity, transverse wave, elastic modulus, ~~rubidium~~ iodide, Debye temperature, ~~rubidium~~ chloride, elasticity, LONGITUDINAL WAVE, RUBIDIUM COMPOUND

ABSTRACT: The propagation velocity of longitudinal and transverse waves in rubidium chloride and iodide have been measured by the ultrasonic pulse method at pressures of 0 to 20 kbar. A polymorphic transformation from a structure of the NaCl type to a structure of the CsCl type has been confirmed for RbCl at 5.5 kbar and for RbI at

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3.9 kbar. The elastic moduli K_s, K_t, E, G, δ, and the Debye temperature θ have been calculated for both phases of each compound up to pressures of 20 kbar. It has been shown that the values of the polymorphic transformation pressures and dependences of the isothermic bulk ridgity modulus K_t on pressure for RbCl and RbI, calculated from the Born model, are in agreement with the experimental data. The authors thank L. F. Vereshchagin, corresponding member AN SSSR, for his constant attention to this work and R. G. Arkhipov and Ye. Ye. Tareyev for participating in discussions of the results. Orig. art. has: 2 figures, 12 formulas, and 4 tables. [Based on author's abstract] [NT]

SUB CODE: 20,11/ SUBM DATE: 16Nov65/ ORIG REF: 005/OTH REF: 012

Card 2/2

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

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L 27822-66 EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6015506 (N) SOURCE CODE: UR/0181/66/008/005/1643/1645

AUTHOR: Voronov, F. F.; Goncharova, V. A.; Stal'gorova, O. V.; Agapova, T. A.

ORG: Institute of High-Pressure Physics, AN SSSR, Moscow (Institut fiziki vysokikh davleniy AN SSSR)

TITLE: The compressibility of lithium hydride

SOURCE: Fizika tverdogo tela, v. 8, no. 5, 1966, 1643-1645

TOPIC TAGS: lithium hydride, high-pressure research

ABSTRACT: Three lithium-hydride specimens were subjected to pressures up to 20 kbar at 298K. The dependance between the relative volume change $\Delta V/V_0$ and pressure p was found to be linear: $\Delta V/V_0 = 4.38 \cdot 10^{-12} p$. The volume change was also determined by the Born model under assumption of the ionic bond in lithium hydride. The calculated values at 20 kbar were 15% lower than the experimental. From the energy of the lithium-hydride lattice (W_0 = 218 kcal/mol at 298K and atmospheric pressure) and Born's equation for energy, the value for compressibility was calculated as $3.38 \cdot 10^{-12}$ cm^2/dyn, which differed from the experimental ($4.38 \cdot 10^{-12}$ cm^2/dyn) by 30%. This disagreement can be explained by the fact that in lithium hydride, the bond is not fully ionic and the Born's model (of central forces) is only a rough approximation. The linear dependence of the volume change on pressure proves that no polymorphic transformation occurs at pressures up to 20 kbar. Orig. art. has: 4 formulas. [WW]

SUB CODE: 11,20/SUBM DATE: 20Dec65/ ORIG REF: 002/ OTH REF: 001/ ATD PRESS: 5003

Card 1/1

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 41143-66 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6026681 SOURCE CODE: UR/0181/66/008/008/2344/2348

AUTHOR: Voronov, F. F.; Chernysheva, Ye. V.; Goncharova, V. A.; Stal'gorova, O. V.

ORG: Institute of Physics of High Pressures, AN SSSR, Moscow (Institut fiziki vysokikh davleniy AN SSSR)

TITLE: The effect of pressures up to 20 kbar on the elastic properties of silver chloride

SOURCE: Fizika tverdogo tela, v. 8, no. 8, 1966, 2344-2348

TOPIC TAGS: silver chloride, high pressure, Debye temperature, elastic property, Poisson ratio, Young modulus, shear modulus, elasticity, ultrasonic technology

ABSTRACT: The pulsed ultrasonic method has been used to investigate the velocity of longitudinal and transverse waves in silver chloride at pressures of up to 20 kbar. The absolute values were determined for adiabatic and isothermal compliance coefficients (K_S, K_T), Young's modulus (E), shear modulus (G), Poisson's ratio (σ), and Debye temperature (θ_D). Density calculations performed in the Born's approximation were found to be in agreement with the experimental results; however, variations in the experimentally determined values of K_T with pressure did not agree with theoretical data obtained by the same method. It

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L 41143-66

ACC NR: AP6026681

was found that the relative changes of G and E at the maximum pressure were smaller by one order of magnitude than those of K_T and K_S. The small increase in G and E was attributed to the instability of silver chloride, which has the same structure as NaCl under pressure. Orig. art. has: 8 formulas, 4 figures, and 1 table. [CS]

SUB CODE: 20/ SUBM DATE: 03Jan66/ ORIG REF: 003/ OTH REF: 008

ATD PRESS: 5057

Card 2/2

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ACC NR: AP6037004 (A,N) SOURCE CODE: UR/0181/66/008/011/3405/3407

AUTHOR: Voronov, F. F.; Goncharova, V. A.; Agapova, T. A.

ORG: Institute of High Pressure Physics, AN SSSR, Moscow (Institut fiziki vysokikh davleniy AN SSSR)

TITLE: Elastic constants of single-crystal RbCl under pressure

SOURCE: Fizika tverdogo tela, v. 8, no. 11, 1966, 3405-3407

TOPIC TAGS: rubidium compound, chloride, high pressure research, ultrasonic wave propagation, elastic stress, ionic crystal, phase transition

ABSTRACT: This is a continuation of earlier work dealing with polymorphic transformations of RbCl under pressure, similar to that investigated earlier for the NaCl ⇌ CsCl transformation (ZhETF v. 50, 1173, 1966). The tests were made on three samples in the form of right parallelepipeds with each of the principal axes in the [100] direction. The velocities of transverse and longitudinal sound waves in the samples were measured at atmospheric pressure and room temperature, and the elastic constants calculated from them agreed well with the published data. The high pressure apparatus and the pulsed ultrasonic method employed were described elsewhere (PTE, no. 3, 104, 1960 and no. 3, 81, 1958, respectively). The high-pressure measurements consisted of determining the time of passage (Δt) of longitudinal and transverse waves as functions of the pressure (p). In some experiments the measurements were extended up to the start of the phase transition (6.5 - 7 kbar). Prior to the

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ACC NR: AP6037004

start of the phase transition, there were no deviations from a smooth $\Delta t(p)$ dependence. At the start of the phase transition, a snapping sound was produced in the high-pressure apparatus, and the signal attenuated rapidly or disappeared completely because of the smashing of the sample or the separation of the quartz from the sample. Plots of the relative changes of the elastic constants with pressure prior to the phase transition turned out to be straight lines, similar to the results obtained for KCl. The experimental results were compared with Born's theory of ionic crystals and large discrepancies were observed between the tow. Some of the discrepancies may be due to the fact that earlier measurements were made with polycrystalline samples. It is proposed to repeat the experiments with greater accuracy. Orig. art. has: 1 figure, 2 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 25May66/ ORIG REF: 004/ OTH REF: 005

Card 2/2

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 16502-[illegible] EWP(t)/EWP(b) [illegible]
[illegible]
ACCESSION NR AP[illegible]

S/0056/64/047/005/1999/2001

AUTHOR: Voronov, F. F.

TITLE: Influence of pressure on the temperature of the antiferromagnetic transition of chromium

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 5, 1964, 1999-2001

[illegible] chromium, antiferromagnetism, pressure dependence, ultrasonic wave [illegible], magnetic transition, interatomic distance

ABSTRACT: [illegible] of the time of passage of longitudinal [illegible] was measured as a function of the pressure [illegible] cylindrical sample of polycrystalline [illegible] The measurements were made by a pulse [illegible]

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APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 16502-65
ACCESSION NR: AP5000362

[illegible] A. Goncharova, DAN SSSR v. 135, 1104, [illegible] the ultrasonic wave plotted against the [illegible] pressures [illegible] were assumed to be the points of the magnetic transition [illegible] plotted on a P-T diagram. The Neel temperatures of the tested sample are estimated on the basis [illegible] at atmospheric pressure and 23.3C at [illegible] values fit well the plotted curve obtained [illegible] measurements show that the Neel temperature [illegible] in the distance between the atoms and the [illegible] the absolute value of the exchange interaction. The [illegible] to Ye. N. Yakovlev for a discussion of the results and to [illegible] for help with the experiments." Orig. art. has: 2 figures.

Card 2/3

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 16502-65

ACCESSION NR: AP5000362

ASSOCIATION: Institut fiziki vy"sokikh davlenii Akademii nauk SSSR (Institute of High Pressure Physics, Academy of Sciences SSSR)

SUBMITTED: 29Jul64 ENCL: 00

SUB CODE: GP, SS NR REF SOV: 001 OTHER: 002

Card 3/3

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F.I., kandidat geologo-mineralogicheskikh nauk.

On the configuration and steepness of railroad embankments and slopes in loess soils. Trudy TASHIIT no.5:123-128 '56.
(Railroads--Earthwork) (MLRA 9:12)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F. I.

23549. O. RATSIONALIZATSII PRIYEMOV INZHENERNO-GEOLOGICHESKIKH RABOT PRI ISSLEDOVANIYAKH BOL'NYKH MEST ZEMLYANOGO POLOTNA. SBORNIK NAUCH. TRUDOV (TASHK. IN-T INZHENEROV ZH.-D. TRANSPORTA), VYP. 2, 1949, C. 133-44.-BIBLIOGR: 17 NAZV.

SO: LETOPIS NO. 31, 1949.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

124-58-9-10418

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 9, p 144 (USSR)

AUTHOR: Voronov, F. I.

TITLE: On a Method for the Determination of the Plasticity of Soils (O metodike opredeleniya plastichnosti gruntov)

PERIODICAL: Zap. Uzbekist. otd. Vses. mineralog. o-va, 1957, Nr 11, pp 81-96

ABSTRACT: Well-known information of the plasticity of soils is repeated, and various classifications are provided; the author proposes his own classification in which the plasticity characteristic of a soil is tied to its grain-size designation. Existing methods for the determination of the yield point (plastic limit) are described, and a method is proposed which is similar to that proposed by P. O. Boychenko (V sb.: Nekotoryye metody opredeleniya fiziko-mekhanicheskikh svoystv gruntov. Leningrad, LGU, 1950, pp 5-32). It is noted that a determination of the strength of a soil based on a relationship between the yield point and the natural moisture content is inconsistent, so long as the fundamental structure of the soil is disregarded. A critical survey is made of existing methods for the determination of the consistency of soils. Bibliography: 22 references. G. I. Ter-Stepanyan

Card 1/1

1. Soils--Plasticity 2. Soils--Theory

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F.I.

Method for determining the plasticity of soils. Nap. Uz. Otd. Vses. min. ob-va no.11:81-96 '57. (MIRA 11:6)
(Soil physics)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, V. I.

Dissertation: -- "Oscillations of a Mechanical System Described by Linear Differential Equations With Periodic Coefficients." Cand Phys-Math Sci, Leningrad Polytechnic Inst, Leningrad, 1954. (Referativnyy Zhurnal--Matematika, Moscow, Jun 54)

SO: Sum 318, 23 Dec. 1954

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F.I.

VORONOV, F.I., kandidat geol.-miner.nauk

Loess soils in building engineering structures. Trudy TASHIIT no.3:3-13 '51. (MLRA 8:10)

(Soil mechanics) (Loess)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

Ca

PROCESSES AND PROPERTIES INDEX

Continuous hydrogenation under pressure. N. A. Klyuzvin, F. N. Voronov and M. O. Preis. *Destructive Hydrogenation of Fuels*, O. N. T. I. Goskhimtekhizdat (Leningrad) 1, 202-23(1934); cf. *C. A.* 28, 6276[8].—There is a max. of hydrogenation temp. (to produce the highest yield of light products with the lowest yields of gases and coke) and the process must be carried out in the presence of catalysts and with recycling of the heavier products of hydrogenation. The presence of gasoline in the recycling stock affects the gasoline yield in recycling. It is essential that the cold H pressure be high, as well as the operating pressure, while a lowering of the content of H in the gases requires a higher operating pressure if a high yield of light products is sought, although the presence of up to 30% of inert gases does not have any appreciable influence on the character of the process.

A. A. Boehtlingk

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Ethylene cracking. P. N. Vorontsov and A. V. Vorontsova. *Sintet. Kauchuk* 1933, No. 3, 5-12.—Formation of butadiene from C_2H_4 was studied. A mixt. contg. C_2H_4 80-85, CO_2 0.2, C_3H_6 1-3, air 1% and the rest satd. hydrocarbons, CH_4, C_2H_6, etc., was passed through $CaCl_2$ and cracked in a quartz tube filled with Cu gauze and heated to 700-750° in an elec. furnace. The products of the cracking were passed through a tar collector (cotton filter), a condenser cooled by solid CO_2 and an absorber contg. activated C for collection of the butadiene fraction. The max. possible butadiene recovery under the conditions prevailing in the reaction zone was 2-4%; when butadiene and aromatic hydrocarbons were sepd. and the gas was recirculated through the cracking unit, the newly formed butadiene in the resulting gas had the same proportion to C_2H_4 as previously; 5 consecutive sepns. and recirculations gave 9-10% yields of butadiene; increase of the rate of flow of the gas through the app. decreased yields of liquid hydrocarbons and increased butadiene yields; use of diminished pressures did not affect the butadiene yields; the temp. of 750° gave max. butadiene yields, decreased the quantity of tar and eliminated coke formation in the cracking zone. The operations and app. of a cont. plant were outlined on the basis of these results.

James Scott

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

CA

10

Fractional recovery of intermediate hydrocarbons. F. N. [illegible], *Sintetic-heskii Kauchuk* 1, 7-12(1932).—Adsorption of the fraction b. −[illegible]° to [illegible]° (contg. butylene, butadiene and propylene) by activated C was studied. A method for the quant. analysis of butadiene in gas with the interferometer and activated C is described.

Tamer Borrin.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

MATERIALS INDEX

AUTHOR INDEX

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

Divinyl. P. N. Vinogrov and A. V. Voronova. Russ. 43,473, June 30, 1935. Divinyl and aromatic hydrocarbons are prepd. from gases contg. unsatd. hydrocarbons (e. g., from cracking gases or coke-oven gases) by heating in 2 stages. In the first stage from the products of pyrolysis are sepd. the ethylene hydrocarbons, and the remaining unsatd. hydrocarbons are subjected to a second pyrolysis process in a continuous recycling process with a continuous withdrawal of the divinyl and the amylene-benzene fractions.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

A-3

Fractional separation of unsaturated hydrocarbons. F. N. Vo[illegible] (Sintet. Kautschuk, 1962, 1, 7—13; Chem. Zentr., 1963, ii, 2462).—Components of a complex hydrocarbon mixture are adsorbed on active C in the reverse order to their volatility. The process is followed with an interferometer. Description follows in the reverse order, and may be applied in separating the mixture. H. J. E.

COMMON ELEMENTS

MATERIALS INDEX

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

BC

PROCESSES AND PROPERTIES INDEX

C. C.

Ethylene cracking. F. N. Yonopov and A. V. Yonopova (Sintet. Kaucheh. 1953, No. 3, 5—12).—When gas containing C_2H_4 50—65, CO_2 0.2, C_2H_4 1—3, air 1%, and the [illegible] hydrocarbons was passed over $CaCl_2$ and cracked in a [illegible] tube filled with Cu gauze and heated at 700—[illegible] the max. recovery of butadiene (I) was 2—4%; 5 consecutive separations and [illegible] gave 9—10% yields. Optimum conditions were: increased rate of gas flow, and a temp. of 750°; [illegible] of pressure did not affect the yield of (I). Ch. Abs.

43 I 2

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

BC

B-I-2

Continuous hydrogenation under pressure. N. A. Klikovin, F. N. Yeremov, and M. O. Preis (Destr. Hydrog. of Fuels, 1934, 1, 202—[illegible]).—There is a max. hydrogenation temp. to give a max. yield of light products with a min. of coke and gases. Catalysts are used, and the heavier hydrogenation products are recycled. Lowering of the H_2 content of the gases necessitates a higher operating pressure. Up to 30% of inert gas has no influence on the process.

Ch. Abs. (s)

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

KORCHAGIN, V.N., agronom po zashchite rasteniy; VORONOV, F.P., ispolnyayushchiy obyazannosti starshego nauchnogo sotrudnika; DIUNOV, V.I.; MYAKEMYAYNEN, S.

For an amateur fruitgrower. Zashch. rast. ot vred. i bol. 9 no.10:37-39 '64 (MIRA 18:1)

1. Institut sadovodstva nechernozemnoy polosy (for Voronov). 2. Upravlyayushchiy Yaroslavskoy oblastnoy kontoroy "Sortsemovoshch" (for Diunov). 3. Leningradskaya stantsiya zashchity zelenykh nasazhdeniy (for Myakemyaynen).

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F.P., nauchnyy sotrudnik

In Gorki Leninskiye. Zashch. rast. ot vred. i bol. 7 no.11:11-13 N '62. (MIRA 16:7)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, F.P.

The sour cherry moth Argyresthia ephippiella. Zashch.rast. ot vred. i bol. 9 no.11:38-39 '64. (MIRA 18:2)

1. Institut sadovodstva nechernozemnoy polosy.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

NARINSKIY, M.I., inzh.; TSVETKOV, P.I., inzh.; VORONOV, G., inzh.

Consultation. Tekst.prom. 21 no.3:84-85 Mr '61. (MIRA 14:3)

1. Tekhnicheskiy otdel Kamyshinskogo khlopchatobumazhnogo kombinata (for Voronov).
(Textile industry)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.; REYMERS, N.F.

Distribution and biology of insectivores and rodents in the taiga of the upper Lena Valley. Dokl. Inst. geog. Sib. i Dal'. Vost. no.2:15-26 '62. (MIRA 18:10)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

GIBET, L.A.; VORONOV, G.A.

Distribution and abundance of wildfowl in Kalinin Province. Ornitologiia no.7:44-54 '65. (MIRA 18:10)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Ecology of gray voles in the upper Lena Valley. Biul. MOIP. Otd. biol. 70 no.3:22-34 My-Je '65. (MIRA 18:10)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, Gennadiy Alekseyevich; KORNEYEV, Ye.P., retsenzent; VERBITSKAYA, Ye.M., red.

[Modernization of the ShB-140 sizing machines] Modernizatsiia shlikhtoval'nykh mashin ShB-140. Moskva, Legkaia industriia, 1965. 20 p. (MIRA 18:3)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Biology of the northern pika in the upper Lena Valley taiga.
Zool. zhur. 43 no.4:619-621 '64 (MIRA 17:8)

1. Institute of Geography of Siberia and Far East, Siberian Division of the Academy of Sciences of U.S.S.R., Irkutsk.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Distribution of Microtus arvalis Pall and Microtus maximowiczii Schrenck in central Siberia. Zool. zhur. 43 no.5:783-785 '64. (MIRA 17:7)

1. Institut geografii Sibiri i Dal'nego Vostoka Sibirskogo otdeleniya AN SSSR, Irkutsk.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Biology of Siberian mole of the upper Lena taiga. Biul. MOIP. Otd. biol. 69 no.1:117-119 Ja-F '64. (MIRA 17:4)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G. A.(USSR)

"Methods of investigating the influence of mammals upon the plant cover in Russia."

report presented at the Intl. Symposium on Methods of Theriological Investigation. Brno, Czech.,
26 Aug - 4Sept. 1960

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ALEKSANDROV, Yu.A.; VORONOV, G.S.; DELONE, N.B.

Measuring the rate of growth of bubbles in a propane chamber. Prib. i tekh. eksp. 8 no.3:62-63 My-Je '63. (MIRA 16:9)

1. Fizicheskiy institut AN SSSR.

(Bubble chamber)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

New developments in the organization of the work of shift foremen. Tekst. prom. 22 no.7:10-11 Jl '62.

(MIRA 17:1)

1. Zamestitel' zaveduyushchego tkatskoy fabriki No.1 Kamyshinskogo khlopchatobumazhnogo kombinata.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Is there a need for loom overhauling? Tekst. prom. 23 no.12: 38-39 D '63. (MIRA 17:1)

1. Zaveduyushchiy tkatskoy fabrikoy No.1 Kamyshinskogo khlopchatobumazhnogo kombinata.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Reducing the total draft of warp yarn on sizing machines. Tekst. prom. 23 no.11:66-68 N '63. (MIRA 17:1)

1. Zaveduyushchiy tkatskoy fabriki No.1 Kamyshinskogo khlopchatobumazhnogo kombinata.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.A.

Lowering the coefficient of friction of the warp thread. (MIRA 16:5)
Tekst.prom. 23 no.5:64-65 My '63.

1. Zamestitel' zaveduyushchego tkatskoy fabriki No.1 Kamyshinskogo khlopchatobumashnogo kombinata.
(Weaving) (Friction)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

REYMERS, Nikolay Fedorovich; VORONOV, Georgiy Anatol'yevich; ROZHKOV, A.S., kand. biol. nauk, otv. red.; SEPPING, N.G., red.

[Insectivora and Rodentia in the upper Lena Valley] Nasekomoiadnye i gryzuny verkhnei Leny. Irkutsk, Irkutskoe knizhnoe izd-vo, 1963. 191 p. (MIRA 18:3)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

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S

Rapid Determination of Nickel in Steels and Cast Iron. I. M. Korenman and G. D. Voronov. (Zavodskaya Laboratoriya, 1939, No. 7, pp. 664–665). (In Russian). The dimethylglyoxime reaction is used for the colorimetric determination of nickel. It has been found that the iron need not be removed provided that it is oxidised to the trivalent state (with bromine water) and the solution contains sodium-potassium tartrate. Carbon is removed, if necessary, by filtration. It is preferable to use standard steel specimens in making up the standard solutions. A determination takes 26–31 min. The maximum difference between the gravimetric and colorimetric determinations was 0·18% in a 4% nickel alloy.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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CA

7

Rapid determination of nickel in steels and cast irons. I. M. Korenman and G. D. Voronov. *Zavodskaya Lab.* 8, 604-5(1939).—Dissolve a 0.2-1 g. sample in HNO_3, boil, cool, dil. to 200 ml. and filter. Add 5-25 ml. of 25% Rochelle salt, 5 ml. satd. Br water, 2 ml. of 25% NH_3 and 3 ml. of 1% alc. soln. of dimethylglyoxime to 5-25-ml. portions of the test and standard solns., and compare in a colorimeter after 5 min. B. Z. Kamich

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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1ST AND 2ND ORDERS

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3RD AND 4TH ORDERS

BC

C 1

H8. Accelerated determination of nickel in steel and cast iron. N. H. Korenman and G. D. [illegible] (Zavod. Lab., 1939, 5, [illegible]).—A sample (0.5—1 g.) of steel or (0.5 g.) of Fe is dissolved in 15 ml. of HNO_3, and the solution boiled, cooled, and diluted to 500 ml. 5—15 ml. of 25% Na H tartrate are added to 5—15 ml. of the solution, followed by 5 ml. of saturated aq. Br, 2 ml. of 25% aq. NH_3, 2 ml. of 1% $(CH_3CN{\cdot}OH)_2$ in EtOH, and H_2O to [illegible] ml. After 5 min. the coloration developed is compared with that obtained similarly from alloys of known Ni content. The entire determination can be completed in ~30 min.; the results do not differ significantly from those given by the standard method.

R. T.

COMMON ELEMENTS

COMMON VARIABLES INDEX

MATERIALS INDEX

OPEN

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Fe GROUPS

3RD AND 4TH ORDERS

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1ST AND 2ND LETTER

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

G. D. Voronov

Rapid Determination of Nickel in Steels and Cast Iron. I. M. Korenman and G. D. Voronov. (Zavodskaya Laboratoriya, 1939, [illegible]) [illegible] The [illegible] action is used for the colorimetric determination of nickel. It has been found that the iron need not be removed provided that it is oxidised to the trivalent state (with bromine water) and the solution contains sodium-potassium tartrate. Carbon is removed, if necessary, by filtration. It is preferable to use standard steel specimens in making up the standard solutions. A determination takes 20–31 min. The maximum difference between the gravimetric and colorimetric determinations was 0.10% in a 1% nickel alloy.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.I.

BOWEN, Godfrey [Bowen, Godfrey]; KURGANSKIY, V.M. [translator]; VORONOV, G.I., red.; PREDIKHIN, A.M., red.; GUREVICH, M.M., tekhn.red.

[Skill in shearing sheep] Masterstvo strizhki ovets. Vstup. stat'ia i red. G.I.Voronova. Moskva, Gos. izd-vo sel'khoz. lit-ry, 1957. 176 p. (MIRA 11:5)
(Sheep shearing)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.I.

U-3

USSR / Farm Animals. Small Horned Stock.

Abs Jour : Ref Zhur - Biologiya, No 16, 1957, 72062

Author : Voronov, G.I.

Title : Some Results of Sheep Breeding in 1956 and some 1957 Problems.

Orig Pub : Ovtsevodstvo, 1957, No 1, 4-8

Abstract : No abstract.

Card : 1/1

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, Gennadiy Ivanovich

[On increasing the production and procurement of wool and the further development of sheep breeding] Ob uvelichenii proizvodstva i zagotovok shersti i dal'neishem razvitii ovtsevodstva. Moskva, Gos. izd-vo selkhoz lit-ry, 1955. 47 p. (MLRA 10:4)

(Wool) (Sheep)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, Gennadiy Ivanovich

[Speech at the 22d Congress of the CPSU, October 19, 1961] Rech na XXII s"ezde KPSS 19 oktiabria 1961 goda. Moskva, Gos. izd-vo polit. lit-ry, 1961. 19 p. (MIRA 14:11)
(Agricultural policy)
(Communist Party of the Soviet Union)

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

39148
S/120/62/000/003/007/048
E032/E114

21.6000

AUTHORS: Aleksandrov, Yu.A., Voronov, G.S., and Delone, N.B.

TITLE: The rise of bubbles and distortion of tracks in bubble chambers

PERIODICAL: Pribory i tekhnika eksperimenta, no.3, 1962, 50-51

TEXT: In a previous paper (Yu.A. Aleksandrov, N.B. Delone, V.M. Likhachev, V.M. Gorbunkov, PTE, no.6, 1960, 120) it was shown that as the bubbles forming the track expand, they float up through a distance which is considerably greater than their radius, and this gives rise to a displacement of the tracks. In the present note the authors make use of their theory of the growth of bubbles (FIAN, A-131, 1961) to calculate this displacement and estimate the distortion of tracks. Explicit formulae are given which may be used to compute these effects. In a typical hydrogen chamber (N.C. Barford, Progr. in Cryog., 2, 1960, 88) a spurious radius of curvature due to unequal displacement of tracks along their lengths was found to be of the order of 20 m. The distortion may be reduced either by ensuring that the bubbles

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have sufficiently small radii, or by increasing the rate of growth of the bubbles. In practice it is always possible to reduce the distortion by a suitable choice of the working parameters.

ASSOCIATION: Fizicheskiy institut AN SSSR (Physics Institute, AS USSR)

SUBMITTED: June 5, 1961

Card 2/2

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ALEKSANDROV, Yu.A.; VORONOV, G.S.; DELONE, N.B.

The sensitivity of fluids to radiation. Zhur. eksp. i teor. fiz. 43 no.4:1552-1554 O '62. (MIRA 15:11)

1. Fizicheskiy institut im. P.N. Lebedeva AN SSSR.
(Bubble chamber) (Cobalt--Isotopes)

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 24507-65 EWT(m) [illegible]

Aleksandrov, Yu. A.; Voronov, G. S.; Gorbunkov, V. M.; Dolgan, N. B.; Nechajev, [illegible]

Bubble chambers (Pusyer'kovyye kamery) Moscow, Gosatomizdat, 1963. 339 p. illus., biblio. Errata slip inserted. 3600 copies printed. Under the editorship of [illegible] A. [illegible] Technical editor [illegible]

TOPIC TAGS: Bubble chamber, charged particle, track formation, track observation, photofilm scattering, hydrogen refraction, superheated liquid, vapor nuclei, [illegible]

PURPOSE AND COVERAGE: The book represents the first attempt at a systematic exposition of the [illegible] operation and the design of bubble chambers [illegible] of particles. Special attention [illegible] observation of tracks [illegible] concerning the properties of the [illegible] medium, and to [illegible] and future trends. [illegible] directed [illegible]

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L 24507-65
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authors' attention to the need for this compilation. The authors utilized the work of specialists at the Joyedinennyy Institut Yadernykh Issledovaniy, the [illegible]

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 11396-63 EWT(m)/BDS AFFTC/ASD

S/120/63/000/002/008/041

AUTHOR: Aleksandrov, Yu. A., Voronov, G. S., and Delone, N. B.

TITLE: Growth and condensation of bubbles in bubble chambers

PERIODICAL: Pribory i tekhnika eksperimenta, March-April 1963, v. 8, no. 2, 41-44

TEXT: The article discusses growth and condensation of vapor bubbles in a superheated liquid in order to account for flotation effects. It is shown that flotation effects substantially influence the rates of growth and condensation. Formulas are derived for the growth rate, the time dependence of the radius, the time necessary for condensation, and the heat dissipation. These formulas are used to analyze the processes necessary for resetting the chamber to initial conditions and the efficiency of chamber operation in registering rare random events. There are two figures.

ASSOCIATION: Fizicheskiy institut AN SSSR (Physics Institute, Academy of Sciences USSR)

SUBMITTED: June 18, 1962

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

[illegible]

[illegible]

AUTHOR: Voronov, G.S.; Popryadukhin, A.P.

TITLE: The influence of toroidal geometry and corrugation on the magnetic surfaces of a double helical field

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.10, 1964, 1780-1785

TOPIC TAGS: applied mathematics, helical magnetic field, torus, plasma research

ABSTRACT: The magnetic field due to a multiple helical winding about a torus was calculated to the first order in the ratio of the small to the large radius of the torus and the result is presented. The differential equations for the lines of [illegible] a helical field corresponding to [illegible] tions. The [illegible] points of intersection of a single line of force with a single plane [illegible]

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ACCESSION NR: AP4046336

lay on a smooth curve, and it is accordingly concluded that the field possesses magnetic surfaces. The effect of the toroidal geometry was to displace the magnetic [illegible] to distort their shape, and to decrease [illegible] magnetic surfaces. A resonance effect of [illegible] was found. The behavior of the type discussed [illegible] the lines of force in the presence of 1.5% and 5% longitudinal corrugation [illegible] calculated, and the regions within which the magnetic surfaces do not intersect the wall are shown graphically. The authors thank L.M. Kovrishnykh for valuable discussions of the work, and Ye.A. Zuteva for performing the calculations on a computer. Orig. art. has [illegible] formulas and [illegible] figures.

ASSOCIATION: none

ENCL: 00

[illegible]

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ACCESSION NR: AP4048337

AUTHOR: Voronov, G.S., Popryadukhin, A.P.

TITLE: Experimental study of the effect of perturbations on a helical magnetic field

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.10, 1964, 1786-1789

TOPIC TAGS: helical magnetic field, model test, perturbation, plasma research

ABSTRACT: The behavior under the influence of local perturbing fields, of the [illegible] magnetic field of the type employed in stellarators was [illegible] assess the effect of similar (but much smal- [illegible] stellarator. A double-thread helical field [illegible] 18 cm diameter right circular cylin- [illegible] component of the field [illegible] capacitor [illegible] perturbing field was 45 microsec, and it was [illegible] field was at the flat peak. The types of perturbing [illegible] timed to occur when [illegible]

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ACCESSION NR: AP4046337

field were investigated: a dipole field representing the field due to induced currents in the metal flange of the stellarator, and a field representing that of the leads supplying the [illegible] winding. The behavior of the lines of force was observed with the aid of a number of 4 mev electron beams from a specially constructed multi- [illegible] before the perturbing field. After traversing [illegible] The perturbing fields were [illegible] perturbing field. From the model experiments it was concluded that the field of the [illegible] winding and the dipole field due to induced cur- [illegible]

SUB CODE: EM, EP NR REF SOV: 002 OTHER: 000

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L 30390-66 EEC(k)-2/EWP(k)/EWT(1)/EWT(m)/FBD/T/EWP(t)/ETI IJP(c) AT/WH/WG/JD

ACC NR: AP6020794 SOURCE CODE: UR/0386/66/003/012/0480/0483

109
104
B

AUTHOR: Voronov, G. S.; Delone, G. A.; Delone, N. B.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Multiphoton ionization of krypton and argon by ruby laser radiation

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 12, 1966, 480-483

TOPIC TAGS: krypton, argon, xenon, laser application, gas ionization, ionization cross section, RUBY LASER, LASER RADIATION, ELECTRIC FIELD

ABSTRACT: The authors observed multiphoton ionization of krypton and argon atoms by ruby-laser radiation at an electric field intensity ~10^7 v/cm, and compared the ratios of the ion signals of krypton and argon with those of xenon, for which measurements of the ionization probability were made by them earlier (ZhETF v. 50, 78, 1966). The experimental setup was similar to that previously used for observation of the multiphoton ionization of xenon (also reported in Pis'ma ZhETF v. 1, no. 2, 42, 1965) and the hydrogen molecule (ibid. v. 2, 377, 1965). The measurements were made at pressures 10^{-5} - 10^{-4} mm Hg. The produced ions were

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ACC NR: AP6020794

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analyzed with a time-of-flight spectrometer and registered with an electron multiplier. The multiphoton ionization probability ratios obtained from the experimental ratios were found to be $10^{-0.87 \pm 0.1}$ and $10^{-2.08 \pm 0.5}$ for Kr/Xe and Ar/Xe respectively, as against $10^{-0.83 \pm 0.1}$ and $10^{-2.37 \pm 0.3}$ obtained for the ratio of the ion signals. The results are compared with the predictions of the theory of L. V. Keldysh (ZhETF v. 47, 1945, 1964) and with the perturbation-theory calculations of A. Gold and B. Bebb (Phys. Rev. Lett. v. 14, 60, 1965 and Phys. Rev., in press) and the differences in the results are discussed. The authors thank A. A. Grachev, S. A. Ob"yedkov, and V. P. Solov'yev for help, and L. V. Keldysh and M. S. Rabinovich for valuable discussions. Orig. art. has: 3 formulas and 1 table. [02]

SUB CODE: 20/ SUBM DATE: 15Apr66/ ORIG REF: 005/ OTH REF: 003/
ATD PRESS: 5017

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ACC NR: AP6037079 SOURCE CODE: UR/0056/66/051/005/1496/1498

AUTHOR: Voronov, G. S.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Dependence of the probability of multiphoton ionization of atoms on the intensity of the photon flux

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 5, 1966, 1496-1498

TOPIC TAGS: photon scattering, ionization phenomenon, Stark effect, transition probability, line shift, resonance line, line broadening

ABSTRACT: To explain the experimentally observed unusual variation of the ionization probability of the Xe atom with the photon beam intensity, observed by the author earlier (with N. B. Delone, ZhETF v. 50, 78, 1966), a possible mechanism is discussed, whereby the rate of change of the ionization probability with change in the photon beam intensity can be reduced by the action of the field on the intermediate states of the atom. The action of the field consists in shifting the energy levels by the Stark effect and broadening by the large probability of transition from this level to the continuous spectrum. The effect of a strong radiation field on the quasi-resonant energy levels of an atom is considered, and results of a calculation of this effect are given for atoms of noble gases in an approximation in which the broadening

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ACC NR: AP6037079

and the energy shift of the level under the influence of the field are comparable with the deviations in resonance for a single level only. These calculations lead to better agreement with the experimental results for Xe, but it is pointed out that a solitary experiment does not make it possible to choose between the possible mechanisms. The author thanks L. V. Keldysh, I. I. Sobel'man, G. A. Delone, N. B. Delone, and M. S. Rabinovich for valuable discussions, and L. Zubova for help with the computer calculations. Orig. art. has: 1 figure, 4 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 24May66/ ORIG REF: 001/ OTH REF: 005

Card 2/2

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ACC NR: AP7003207 SOURCE CODE: UR/0056/66/051/006/1660/1664

AUTHOR: Voronov, G. S.; Delone, G. A.; Delone, N. B.

ORG: Physics Institute im. P. N. Lebedev of the Academy of Sciences SSSR

TITLE: Multiphoton ionization of atoms. II. Ionization of krypton by means of ruby laser emission

SOURCE: Zh eksper i teor fiz, v. 51, no. 6, 1966, 1660-1664

TOPIC TAGS: gas ionization, ruby laser, laser application

ABSTRACT: An experimental investigation was made of the multiphoton ionization of the krypton atom (J = 13.996 ev) with the aid of ruby laser emission ($\hbar\omega$ = 1.785 ev). The ionization probability and the dependence of the probability on the photon flux was measured for $F \gtrsim 10^{31}$ $cm^{-2} \cdot sec^{-1}$, which corresponds to an electric field strength of $E \sim 3 \times 10^7$ v/cm. The emission of a powerful laser was focused on a vacuum chamber filled with krypton at a pressure of 10^{-4} mm Hg when the mean free path ($\sim$40 cm) and the time between the collisions ($\sim 10^{-3}$ sec) were several orders larger than the size of the focusing region ($\sim 10^{-2}$ cm) and the duration of the pulse emission ($\sim 10^{-8}$ sec). Thus, the ionization was the result of the direct effect of emission on the separate atoms. The mean free path of electrons with an energy of $\sim$1 ev in the plasma with a density of $\sim 10^{12}$ cm^{-3},

Card 1/2 UDC: none

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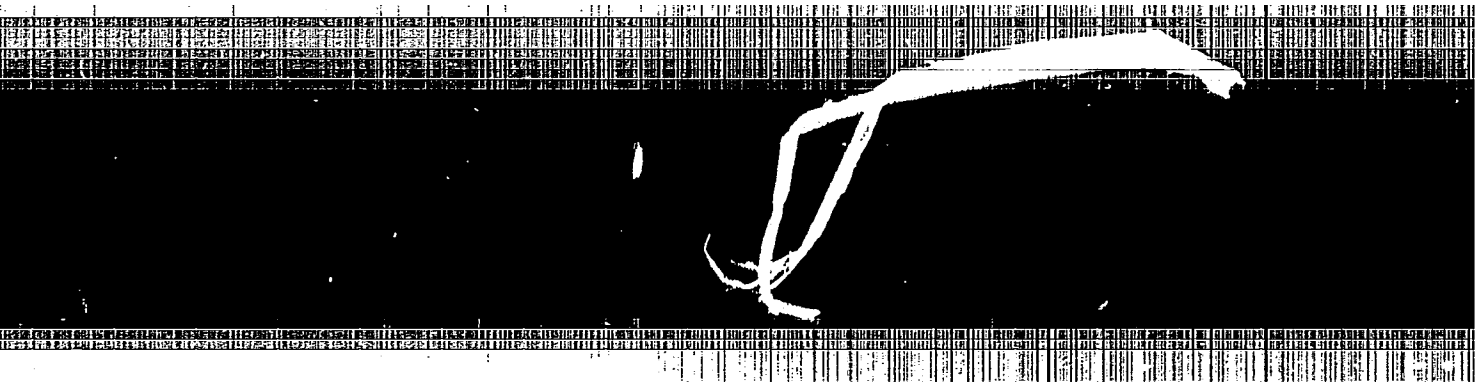

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

ACC NR: AP7003207

generated in the focusing region (assuming 100 percent ionization) was 1 cm. This was much greater than the size of the focusing region ($\sim 10^{-2}$ cm), demonstrating that in the ionization region no electron-ion collisions were present. The dependence of the ionization probability on the photon flux was found to be $K \approx \langle J/\hbar\omega + 1\rangle - 2$. The ionization probability observed experimentally was higher than the calculated probability of the transitions in the virtual levels of the continuous spectrum. This apparently is linked with the contribution of the transitions in the bound states. The comparison of the experimental and theoretical results indicates that transitions in the bound states contribute appreciably to the ionization probability and that the effect of the radiation field on these states is considerable. The authors thank V. Berdzkin, A. A. Grachev, and S. A. Ob'yedkov for their help in the experiment and Professors L. V. Keldysh and M. S. Rabinovich for discussing the results. Orig. art. has: 1 figure and 2 tables.

SUB CODE: 20/ SUBM DATE: 14Jul66/ ORIG REF: 006/ OTH REF: 003/
ATD PRESS: 5113

Card 2/2

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

L 21513-66 EWT(1)/EWP(e)/EWT(m) JD/AT/WH

ACC NR: AP6004923 SOURCE CODE: UR/0056/65/050/001/0078/0084

AUTHOR: Voronov, G. S.; Delone, N. B.

ORG: none

TITLE: Multiphoton ionization of xenon atoms by radiation from a ruby laser

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 50, no. 1, 1966, 78-84

TOPIC TAGS: laser, ruby laser, xenon, ionization, nonlinear optics, photoionization, photoabsorption

ABSTRACT: Multiphoton ionization of xenon by a focused beam of light from a Q-switched ruby laser was experimentally investigated. Comparison of the ionization potential of xenon (12.13 ev) with the energy of the photons from the ruby laser (h = 1.79 ev) indicates that the absorption of seven photons should be required for ionization. However, for the pulse duration of $\sim 10^{-8}$ sec and the electric field in the laser beam of $\sim 10^{7}$ v/cm achieved in the experiments, the number of photons absorbed per ionized atom of xenon was determined to be 6.23. The discrepancy was attributed to the effect of the strong electric field on the upper energy levels of the xenon atom. The higher the energy level, the closer the levels and the greater the Stark shifts. When the shifts are of the order of magnitude of the distance between the levels, transitions take place between the levels and the levels broaden, forming an almost continuous spectrum adjacent to that of the free electrons. After

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ACC NR: AP6004923

a sufficiently long time, an electron will make a transition into the continuum. The probability of such a transition is of the order of unity. The experimentally obtained dependence of the field strength on the probability of ionization by a six-photon process is of the same order of magnitude as that predicted by the multiphoton ionization theory of L. V. Keldysh (ZhETF, v. 47, 1964, p. 1945). A numerical calculation based on the perturbation theory, in which resonance levels in the xenon spectrum are taken into account, yields a similar value for the ionization probability. Orig. art. has: 3 figures and 3 formulas. [CS]

SUB CODE: 20/ SUBM DATE: 27Aug65/ ORIG REF: 006/ OTH REF: 002/ ATD PRESS: 4222

Card 2/2

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R001860920013-1

VORONOV, G.S.; DELONE, N.B.

Ionization of xenon atoms by the electric field of radiation from a ruby laser. Pis'. v red. Zhur. eksper. i teoret. fiz. 1 no.2:42-45 Ap '65. (MIRA 18:10)

1. Fizicheskiy institut imeni Lebedeva AN SSSR.

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L 6756-66 EPF(c)/EPA(w)-2/EWT(1)/EWT(m)/EWP(k)/T/EWA(m)-2/EWP(e) IJP(c) WH

ACC NR: AP5028018 SOURCE CODE: UR/0386/65/002/008/0377/0380

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TITLE: Multiphoton ionization of a hydrogen molecule in a strong electric field of ruby laser radiation

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu (Prilozheniye), v. 2, no. 8, 1965, 377-380

TOPIC TAGS: ionization, ion, ionization potential, negative ion, positive ion

ABSTRACT: An investigation was made of the multiphoton ionization of a hydrogen molecule under the effect of ruby laser radiation at an intensity of the electric field of $E \sim 10^7$ v/cm. The ratio between the ionization potential ($I = 15.43$ ev) and the quantum energy ($\hbar\omega = 1.79$ ev) shows that ionization can result from absorption of nine quanta. The following results characterize the multiphoton ionization of a hydrogen molecule. The number of quanta whose absorption probability determines the probability of ionization is $K = 7.67 \pm 0.36$. This number was obtained from the dependence of the number of generated molecular ions N_i on the number of photons N_j which passed through the focusing region. The probability of the multiphoton ionization of a hydrogen molecule resulting in the formation of a molecular ion is

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$W = 10^{6.3 \pm 1.5}$ sec^{-1} at a field intensity $E = (1.1 \pm 0.3) \times 10^7$ v/cm (photon flux $F = 10^{30.0 \pm 0.2}$ $cm^{-2} \cdot sec^{-1}$). A probability of absorption of less than nine quanta determines the probability of ionization of a hydrogen molecule. Calculations based on the theory of multiphoton ionization of atoms when applied to a hydrogen molecule show that the experimentally observed probability $W = 10^{6.3}$ sec^{-1} of an eight-photon process can take place in an electric field with an intensity of $E = 8.5 \times 10^7$ v/cm, which exceeds the experimental value of $E = 1.1 \times 10^7$ v/cm. In a strong field both the molecular ions H_2^+ and the atomic ions H^+ are generated. At a field intensity of $E \geq 1.2 \times 10^7$ v/cm the ratio of the generated ions is $10 \leq N(H_2^+)/N(H^+) \leq 100$. Atomic ions can be generated by dissociating a molecule with the subsequent ionization of neutral atoms or by ionizing a molecule followed by dissociation of a molecular ion. Orig. art. has: 2 figures.

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SUB CODE: NP/ SUBM DATE: 27Aug65/ ORIG REF: 003/ ATD PRESS: 4043

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