

24(5)

AUTHORS: Il'in, R. N., Afrosimov, V. V.,
Fedorenko, N. V.

SOV/56-36-1-7/62

TITLE: Ionization of Air by H^+ and H_2^+ -Ions (Ionizatsiya vozdukha
ionami H^+ i H_2^+)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,
Vol 36, Nr 1, pp 41-48 (USSR)

ABSTRACT: Hitherto, the ionization of air by ions has been investigated
mainly in connection with investigations of the energy
dependence of the proton range (Ref 1), and ionization cross
section was only inaccurately determined (Ref 2). Direct
measurements of the ionization cross section in air by protons
are not known to the authors. In the present paper collisions
between positive hydrogen ions and air molecules are in-
vestigated, and the formation of secondary ions by the knocking
out of electrons and electron exchange is observed. The total
ionization cross section is measured by means of electron re-
cording during the passage of an ion beam through air. The
simultaneous electron capture of H-ions was already investi-
gated by reference 4. The investigation of the composition of
the secondary ions was carried out by means of a mass

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spectrometer. Also the production cross sections for these ions was determined. The measuring method was already described in references 3 and 5 and is discussed in short. The monochromatic ion beam penetrates into a collision chamber in which air pressure amounts to $1.5 \cdot 10^{-4}$ torr. It contains a measuring condenser, which, by means of an ion current, permits determination of σ_+ and σ_- cross sections. The total capture cross section is $\sigma_{10} = \sigma_+ - \sigma_-$, and for the production cross section of secondary ions it holds that $\sigma_{A^{n+}} = \frac{1}{n} \sigma_+ \alpha_{A^{n+}}$ ($\alpha_{A^{n+}}$ = relative intensity of A^{n+} -ions). The total measuring error amounted to about $\pm 12\%$, in which case $\pm 6\%$ related to pressure- and $\pm 6\%$ to current measurements. Spectrum lines were recorded of the following ions: N_2^+ , O_2^+ , N^+ , O^+ , N^{++} , O^{++} , Ar^+ , and in the residual gas (after evacuation of the chamber, pressure $5 \cdot 10^{-6}$ torr) H^+ , H_2^+ , and H_2O^+ . A spectrogram of these secondary ions is shown by figure 1.

Results: Total capture cross section of electrons by primary ions: Results are given by figure 2 (energy dependence of σ_{10} , comparison between measured data with the results of references 4, 7, 6).

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Total ionization cross section σ_- : Energy dependence $\sigma_-(E_{H^+, H_2^+})$ is shown by figure 4, the velocity dependence by figure 5. For H^+ at 60 keV, $\sigma_- \approx 6.3 \cdot 10^{-16} \text{ cm}^2$ and for H_2^+ at 140 keV: $\sigma_- \approx 1.2 \cdot 10^{-15} \text{ cm}^2$ is given. The maximum in an energy range of 50 - 120 keV is given as amounting to $(8.6 - 12.5) \cdot 10^{-16} \text{ cm}^2$. From measurement of velocity dependence it follows that air ionization by protons and H_2^+ -ions takes place in the velocity range of $v < e^2/\hbar$, where there is no ionization by an electron collision.

Production cross section of secondary ions: Figure 6 shows the energy dependence of $\sigma_{A^{n+}}$ in the case of ionization by protons, figure 7 shows the same in the case of ionization by H_2^+ -ions. The formation of simply charged molecule ions in nitrogen and oxygen was also investigated, the dependence of $\sigma_{A^{n+}}$ on the velocity of primary ions is shown for nitrogen by figure 8 and for oxygen by figure 9. Further, results of production cross section measurements of single - and double-charge atom ions in nitrogen and oxygen are given. The production cross sections $\sigma_{O^{++}}$ and $\sigma_{N^{++}}$ have a maximum at $v \approx (1 - 1.5) e^2/\hbar$: $\sigma_{O^{++}} \approx 1 \cdot 10^{-17} \text{ cm}^2$ and $\sigma_{N^{++}} \approx 8.3 \cdot 10^{-18} \text{ cm}^2$ and in the case of ionization by H_2^+ : $\sigma_{O^{++}} \approx 2.9 \cdot 10^{-17} \text{ cm}^2$

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and $\sigma_{N^{++}} \approx 2.4 \cdot 10^{-17} \text{ cm}^2$. The authors finally thank Professor V. M. Dukel'skiy and also O. B. Firsov for their advice and discussions. There are 9 figures, 1 table, and 12 references, 4 of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR
(Leningrad Physico-Technical Institute of the Academy of Sciences, USSR)

SUBMITTED: July 29, 1958

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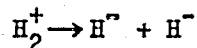
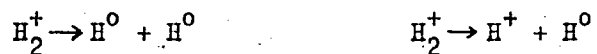
5(4),24(0)

AUTHORS: Fedorenko, N. V., Afrosimov, V. V., SOV/56-36-2-6/63
Il'in, R. N., Kaminker, D. M.

TITLE: The Dissociation of the Molecular H_2^+ -Ion in Collisions in a Gas
(Dissotsiatsiya molekulyarnogo iona H_2^+ pri stolknoveniyakh v gaze)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,
Vol 36, Nr 2, pp 385-392 (USSR)

ABSTRACT: In the introduction, the following possible dissociation
processes in inelastic collisions are discussed:



The publications dealing with this subject, Fogel' et al. (Ref 1),
Salpeter (Ref 2), Effat (Ref 3), Fedorenko (Ref 4), Damodaran (Ref 5)
and others are discussed.

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in Collisions in a Gas

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The present paper gives a report on the results obtained by measurements of proton formation cross sections in a energy interval that is between the intervals investigated by references 4 and 5. Investigations were carried out in the atomic gases helium and argon as well as in the molecular gases hydrogen and air. Measurements were carried out in a mass-spectrometrical device such as is described by references 8 and 9. The collision chamber and the analyzer used is shown in form of a schematical drawing (Fig 1) and is described. For the investigation of scattering a similar method was used as in references 11 and 12. Measurements were carried out for H_2^+ -ion energies (T) between 5 and 180 kev. The formation cross sections for protons and H^- -ions were investigated; results are shown by diagrams (Figs 2-5). For hydrogen and helium the course $\sigma_{H^+}(T)$ shows two maxima, a broad one in the range of 100 - 160 kev, and a smaller one at about 15 kev (Figs 2, 4). For argon and air the curve at first takes a curved, and from about 40 kv onwards, a nearly linearly rising course (Figs 3, 5). The cross section of the formation of negative ions was measured

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only in argon for 12 kev σ_{H^+} $1.6 \cdot 10^{-18} \text{ cm}^2$. With an energy increase of up to 180 kev, σ_{H^+} showed a monotonously steep increase. The authors further investigated the angular distribution of H_2^+ -ions with a primary energy of 24 kev scattered in argon without a change of e/m , as well as the distribution of the H^+ and H^- ions formed as a result of dissociations. Figure 6 shows the course followed by the angular distribution $f(\theta)$ in collision chambers with $5 \cdot 10^{-6}$ torr and $1.5 \cdot 10^{-4}$ torr (Ar). The authors arrive at the conclusion that with a decrease of the distance of closest approach of the nuclei of the colliding atomic particles, the relative probability of scattering with dissociation increases. The authors finally thank O. B. Firsov and V. M. Dukel'skiy for discussions. There are 6 figures and 20 references, 13 of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tehnicheskii institut Akademii nauk SSSR
(Leningrad Physico-Technical Institute of the Academy of Sciences,
USSR)

SUBMITTED: July 29, 1958
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S/057/60/030/06/17/023 81596
B012/B064

24.6600

AUTHORS: Afrosimov, V. V., Il'in, R. N., Solov'ev, Ye. S.

TITLE: Capture of Electrons¹¹ by Protons¹⁹ in Rare GasesPERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 6,
pp. 705-710

TEXT: This paper gives the results of the measurement of the full capture cross section in the capture of one electron by protons with an energy of 10 - 180 kev in He, Ne, Kr, and Xe and of the capture cross section in the capture of two electrons in Ar. Furthermore, the elastic and inelastic proton scattering was investigated, which is connected with the transitions $H^+ \rightarrow H^0$ and $H^+ \rightarrow H^-$. A short description of the measuring method is given. For measuring the full capture cross section the condenser method was applied that had been described in the previous paper (Ref. 6) by the authors. The diagrams of Tables 1 - 4 show the curves obtained for the relationship between the energy T and the full capture cross

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section in the capture of one electron by one proton in He, Ne, Kr, or Xe. Table 5 shows the relationship between the velocity and the full capture cross section in the capture of two electrons by one proton in argon. The analysis of these data shows that the full cross section in the capture of two electrons decreases at $T > 100$ kev with the increase in velocity of about v^{-9} , i.e., it decreases much more rapidly than the full cross section in the capture of one electron (about v^{-5} in this range). Table 6 shows the angular distributions of the protons of the primary beam at the residual and working pressure in the chamber, as well as the angular distributions of the neutral atoms H^0 and the negative ions H^- which were formed during the capture of one or two electrons by the proton. The slight extension of the angular distribution of the protons when the chamber is filled with gas (curve 2) proves that the charge is not affected by the scattering of the protons. On the basis of the data obtained it is shown that the capture of two electrons induces a relatively closer approach of the colliding particles than does the capture of one electron.

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In previous papers (Refs. 8, 9) issued by the authors' laboratory it was stated that the relative probability of the inelastic processes increases while the distance between the nuclei of the colliding particles decreases. The results of the present paper show that this conclusion can also be applied to the processes in the capture of the electrons and that this seems to be a general law in inelastic atom collisions. The paper (Ref. 5) by Ya. M. Fogel', R. V. Mitin, V. F. Kozlov, N. D. Romashko, and the paper (Ref. 11) by N. V. Fedorenko and V. A. Belyayev are mentioned. Professor N. V. Fedorenko and Professor V. M. Dukel'skiy showed an active interest in the present paper. There are 6 figures and 16 references: 11 Soviet and 5 English.

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Leningrad) CH

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Capture of Electrons by Protons in
Rare Gases

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81596

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SUBMITTED: January 30, 1960

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87454

S/057/60/030/012/001/011
B019/B056

26.2311

AUTHORS: ~~Afrosimov, V. V.~~ Glukhikh, V. A., Golant, V. Ye.,
Zaydel', A. N., Komar, Ye. G., Konstantinov, B. P.,
Malyshev, G. M., Malyshev, I. F., Monoszon, N. A.,
Stolov, A. M., Fedorenko, N. V.

TITLE: Plasma Studies With "Al'fa" Research Installation

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12,
pp. 1381 - 1393

TEXT: A research installation for producing high-power pulsed discharges in a toroidal chamber with an average diameter of 3.2 m and an inner cross-section diameter of 1 m is described. The chamber is filled with hydrogen, and discharge is obtained at a pressure of about $2 \cdot 10^{-4}$ mm Hg, and with an external magnetic field of 180-720 oe. Discharges are produced by 2-3 msec electric pulses coming from a capacitor battery capable of storing $1.5 \cdot 10^6$ joules of energy. The entire installation is shown in a photograph, and is schematically represented in Fig.2.

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B019/B056

The electric and magnetic characteristics of a plasma discharge are described in detail, after which microwave studies, spectrum analyses, and studies of the atomic flux emitted by the plasma are discussed. The experiments hitherto carried out on "Al'fa" show that the production and character of a discharge do not correspond to the general conceptions of a selfcontracting quasisteady discharge. The authors formed this opinion owing to the lack of a long plasma column, which follows from measurements of the electric and magnetic characteristics, from microwave studies, from the existence of a large azimuthal current, from the asymmetry of discharge, from the occurrence of oscillations therein, and from a considerable inhomogeneity of plasma. Besides, there is an inhomogeneous hydrogen-ion distribution, which is indicated by a large quantity of protons with energies exceeding 10 kev. An explanation of these effects is not possible as yet. There are 8 figures and 22 references: 13 Soviet, 3 Swedish, and 6 US.

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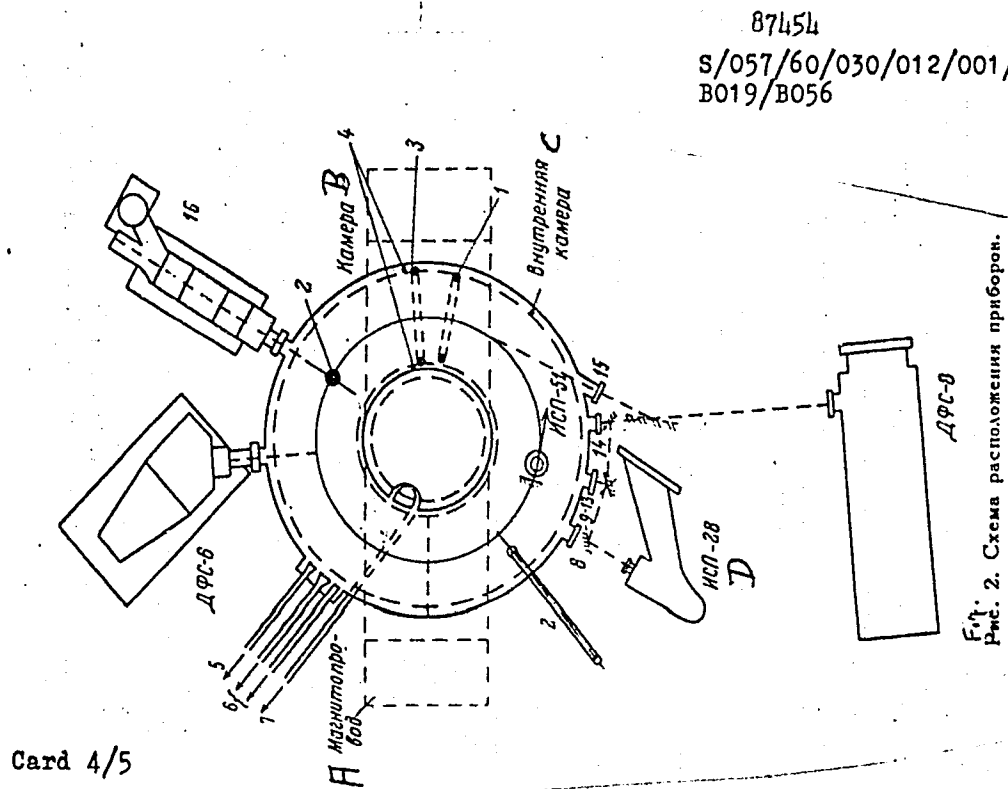
Plasma Studies With "Al'fa" Research
Installation

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ASSOCIATION: Fiziko-tehnicheskiy institut AN SSSR (Institute of
Physics and Technology of the AS USSR). Nauchno-
issledovatel'skiy institut elektrofizicheskoy apparatury
(Scientific Research Institute of Electrophysical
Apparatus)

SUBMITTED: July 15, 1960

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Legend to Fig.2: 2) Rogovskiy girdle; 3) Coil for measuring the magnetic flux passing through the cross section; 4) Coil for measuring the magnetic field between the two chambers; 5), 6), and 7) are emitters of millimeter and centimeter waves. 16) Instrument for studying the atomic flux. A) Magnetic conductor. B) Chamber. C) Inner chamber.

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87462

S/057/60/030/012/009/011
B019/B056

24.2120

AUTHORS: ~~Afrosimov, V. V.~~, Gladkovskiy, I. P., Gordeyev, Yu. S.,
Kalinkevich, I. F., and Fedorenko, N. V.

TITLE: Investigation of Atomic Flux Emitted by Plasma

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12,
pp. 1456 - 1468

TEXT: The authors developed a method of measuring the flux of uncharged atoms having an energy of 300 ev to some thousand kev. The method is based upon the recording of individual atoms after their ionization and acceleration to 10-20 kev. Fig.1 shows a scheme of this instrument, in which the ionized particles are directed onto an Al-Mg target, where they produced secondary ions which were measured by a scintillation counter. For the calibration of the installation, a special device for monochromatic ions and atoms was used. The calibration curves are shown and discussed in detail. Further, installations are described in detail, which permit the time dependence of the atom flux, the energy distribution, and the mass analysis of the atoms to be determined by an

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oscilloscope. The energy distribution of the atoms was studied with the relation $dJ/dE = J_+(E)/\bar{\alpha}_0(E)\mu E$, where $J_+(E)$ is the current of secondary ions, and $\bar{\alpha}_0(E)$ the mean recording efficiency. The density of the atomic flux was determined from the relation

$$dJ/d\Omega = (1/\bar{R}S_{\text{eff}}) \int_{E_1}^{E_2} J_+(E)dE/\bar{\alpha}_0(E)\mu E, \text{ where } \Omega \text{ is the mean solid angle,}$$

and S_{eff} the effective plasma surface. For calculating the concentration of atoms per unit volume the formula

$$n_0 = 2\sqrt{2M} \int_{E_1}^{E_2} (dJ/dE)dE/\sqrt{E} \text{ was used. By changing } \Omega, \text{ the light intensity } \mu,$$

and the thickness of the gas target, it is possible to improve the sensitivity considerably. The least measured density of the flux of hydrogen atoms having an energy of 300 ev in the case of an isotropic

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Plasma

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velocity distribution was $1 \cdot 10^{10}$ at/cm².sec. There are 10 figures and
5 references: 4 Soviet and 1 US.

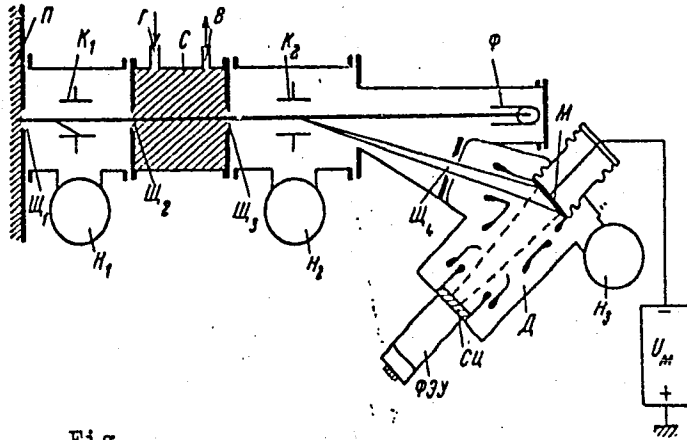
ASSOCIATION: Fiziko-tehnicheskiy institut AN SSSR Leningrad
(Institute of Physics and Technology AS USSR, Leningrad)

SUBMITTED: July 15, 1960

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Legend to Fig.1:
 Π plasma space. Ш₁ entrance slit of the instrument. K₁ capacitor for the deflection of charged particles. C ionization chamber. Ш₂ and Ш₃ entrance and exit slits of the ionization chamber. Γ and B tubes for the lead-in of a gas and pressure measurement. K₂ analyzer. Ш₄ detector-entrance slit. Д detector.

Fig.
 РЖК 1. Схема прибора для исследования потока атомов.

M target. U_M source of acceleration voltage. CU scintillator.
 ФЭУ photomultiplier. H₁, H₂, and H₃ diffusion pumps. Ф Faraday auxiliary receiver.
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S/057/60/030/012/010/011
B019/B056

26.2311

AUTHORS: Afrosimov, V. V., Gladkovskiy, I. P., Gordeyev, Yu. S.,
Kalinkevich, I. F., Petrov, M. P., and Fedorenko, N. V.

TITLE: Investigation of a Flux of Neutral Atomic Particles
Emitted by the Plasma of "Al'fa" Research Installation

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol. 30, No. 12,
pp. 1469 - 1484

TEXT: The authors used the device described in the present issue on
p. 1456 ff. to investigate the atomic flux with energies of 300 ev to
10 kev, emitted by the plasma of "Al'fa". The measurements showed that
practically all atoms recorded are hydrogen atoms. The quantity of the
fast atoms grows with an increase of the capacitor voltage, with a de-
crease of the external magnetic field H_z , or with a decrease of the
hydrogen pressure in the chamber. In the course of discharge, the quan-
tity of fast atoms reaches a maximum, while the discharge current in-
creases to its first maximum. However, there is no considerable

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Emitted by the Plasma of "Al'fa" Research B019/B056
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difference in the energy distribution of atoms during discharge. A table gives data on the atomic flux. Analysis of the data showed that the fraction of atoms in the atomic flux generated by reflection of ions from the wall, is small compared to the fraction coming direct from the plasma. It was further shown that the energy distribution of atoms and ions in the plasma space are very similar, and that the energy distribution cannot be approximated by Maxwell distribution. The mean energy of hydrogen atoms reflected from a metal surface is estimated in an appendix. The authors thank B. P. Konstantinov for his valuable advice and discussion, D. M. Kaminker for his interest, O. V. Konstantinov and V. I. Perel' for taking part in discussions, as well as Ye. G. Komar, A. M. Stolov, and V. A. Glukhikh for their assistance in measurements. There are 11 figures, 1 table, and 8 references: 6 Soviet and 2 US.

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Investigation of a Flux of Neutral Atomic S/057/60/030/012/010/011
Particles Emitted by the Plasma of "Al'fa" B019/B056
Research Installation

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR (Institute of
Physics and Technology of the AS USSR). Nauchno-
issledovatel'skiy institut elektrofizicheskoy apparatury
(Scientific Research Institute of Electrophysical
Apparatus)

SUBMITTED: July 15, 1960

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1 Режим	2 Плотность потока			3 E _{ср.} эВ	4 ε, кДж/разр.
	а атомов на единичный телесный угол $\frac{dN}{d\Omega}$ см ² · стрд. · разр.	б при изотропном распределении скоростей атомов J_v см ² · разр.	с средняя кинетическая энергия атомов, $\frac{1}{2} m v^2$ Дж/см ² · разр.		
5 кв, 360 врс.	1.9 · 10 ⁻¹³	1.2 · 10 ¹⁴	1.0 · 10 ⁻²	480	3.0
10 кв, 360 врс.	8.6 · 10 ⁻¹³	5.4 · 10 ¹⁴	4.5 · 10 ⁻²	530	13.5
10 кв, 720 врс.	5.3 · 10 ⁻¹³	3.3 · 10 ¹⁴	2.5 · 10 ⁻²	480	7.5
15 кв, 180 врс.	5.0 · 10 ⁻¹³	3.1 · 10 ¹⁴	3.1 · 10 ⁻²	670	9.4
15 кв, 360 врс.	3.5 · 10 ⁻¹³	2.2 · 10 ¹⁴	2.3 · 10 ⁻²	630	7.0
15 кв, 720 врс.	4.4 · 10 ⁻¹³	2.8 · 10 ¹⁴	2.4 · 10 ⁻²	530	7.2

Legend to Table 1: 1) Experimental conditions, voltage at the discharge capacitors in kv, magnetic field in oe. 2a) Atoms per unit of solid angle. 2b) Density of atomic flux in isotropic velocity distribution. 2c) Energy of atoms in joules/cm².

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S/056/61/041/004/005/019

B108/B102

26.2340

AUTHORS: Afrosimov, V. V., Il'in, R. N., Oparin, V. A., Solov'yev, Ye.S., Fedorenko, N. V.

TITLE: Ionization of argon by atoms and by singly and doubly charged ions of neon and argon

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 4(10), 1961, 1048-1055

TEXT: In order to study the effect of the charge of primary particles upon the total ionization cross section, the authors examined ionization by collision with particles of 20 to 360 kev. Argon bombarded with Ar, Ar⁺, Ar⁺⁺, Ne, Ne⁺, and Ne⁺⁺ was chosen for the experiments. The experimental arrangement is shown in Fig. 1. It is basically the same as that described in earlier publications (N. V. Fedorenko, ZhTF, 26, 1929, 1959 and 1941, 1956). Fast neutral atoms were obtained by resonance charge exchange of a monochromatic ion beam in chamber B. Ions that were left in the beam emerging from B, were eliminated by capacitor K. The total

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Ionization of argon by atoms and by ...

ionization cross section σ_- , the slow-ion production cross section σ_+ , and the production cross section σ_{On} for slow ions of charge n were measured. The random error was $\pm 12\%$ for work with fast ions, and $\pm 15\%$ for fast atoms. σ_- was found to increase monotonically with increasing particle velocity. The contribution of stripping to σ_- also increases with increasing particle velocity. Moreover, this contribution is the greater, the lower the charge of fast particles. Therefore, σ_- will be smaller for monoenergetic particles with a high charge than for monoenergetic particles with a small charge. As a general rule, it has been found that σ_- is greater for those fast particles which have more electrons in their sheath. These results are in accordance with those of other authors (I. P. Flaks. ZhTF, 31, 367, 1961). σ_{On} was found to rise with increasing charge of the bombarding ions. It is lowest for atom-atom collisions. This is caused by charge exchange and by ionization with capture, which predominate in atom-ion collisions. Professor V. M. Dukel'skiy is thanked for his interest, and I. T. Sheftel' for having supplied the resistance thermometers used in the Card 2/A₃

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B108/B102

Ionization of argon by atoms and by ...

collector. There are 10 figures and 14 references: 12 Soviet and 2 non-Soviet. The reference to the English-language publication reads as follows: H. B. Gilbody, J. B. Hasted. Proc. Roy. Soc., A240, 382, 1957. Mention is made of D. M. Kaminker (ZhTF, 25, 1843, 1955) and O. B. Firsov (ZhETF, 36, 1517, 1959).

ASSOCIATION: Leningradskiy fiziko-tehnicheskii institut Akademii nauk SSSR (Leningrad Physicotechnical Institute of the Academy of Sciences USSR)

SUBMITTED: May 13, 1961

Legend to Fig. 1: C - collision chamber, W - measuring capacitor, A - mass analyzer for slow ions, F - collector for fast particles; H₁, H₂, and H₃ are pumps evacuating the collision chamber to about $1 - 2 \cdot 10^{-6}$ mm Hg.

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AFROMISOV, V.V.; GLADKOVSKIY, I.P.; KALINKEVICH, I.F.; PETROV, M.A.;
FEDORENKO, N.V.

"investigation of a current of atomic particles emitted by a plasma in a magnetic field."

Report submitted to the Conf. on Plasma Physics and Controlled Nuclear Fusion Research (IAEA)

Salzburg, Austria 4-9 Sep 1961.

AFROMISOV - Leningrad Physico-Technical Inst.

AFROSIMOV, V. V., GORDEYEV, Yu, S, PANOV, M. N., and FEDORENKO, N. V.,

"Characteristic Energy Losses in Single Collisions of Atomic Particles"

report presented at the 3rd Intl. Conf. on Physics of Electronics and Atomic Collision, London, 22-26 Jul 63

ACCESSION NR: AT4025308

S/0000/63/000/000/0182/0192

AUTHORS: Afrosimov, V. V.; Gladkovskiy, I. P.; Petrov, M. P.

TITLE: Plasma diagnostics by means of fast neutral particles in apparatus using a discharge in a strong magnetic field

SOURCE: Diagnostika plazmy* (Plasma diagnostics); sb. statey. Moscow, Gosatomizdat, 1963, 182-192

TOPIC TAGS: plasma turbulence, plasma research, magnetic mirror, ion mass analysis, nuclear stripping reaction, mass analysis, ionization, ionized plasma

ABSTRACT: In view of the large amount of information that can be obtained from a study of the flux of fast neutral atoms emitted by a plasma in toroidal-discharge installations in a strong magnetic field, an atomic analyzer was employed for the analysis of the flux of fast atoms emitted by the plasma in the "Tokamak-2 (T-2)" appara-

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tus. The analyzer was described in detail earlier (Zh. tekhn. fiz. v. 30, No. 12, 1456, 1960). A fraction of the fast atoms entering the instrument was converted into ions by stripping on nitrogen molecules. These ions were analyzed by energy in an electric field and then by mass in a magnetic field, after which they proceeded to the detector. The instrument was calibrated with auxiliary apparatus described in detail in the same reference as the main apparatus. The various precautions needed to ensure precision are discussed. It was established that the plasma from the T-2 apparatus emits an atom flux with energy of hundreds and thousands of electron volts. A mass analysis of the secondary ions produced by stripping the nitrogen atoms has shown that about 99% of the ions are protons. The only noticeable impurity was carbon-12. The main mechanism producing this flux of fast atoms is neutralization of the plasma ions via charge exchange with the atoms entering the plasma. The conditions for the occurrence of this flux are estimated. Preliminary measurements of the spatial distribution of the atom flux over the volume

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ACCESSION NR: AT4025308

of the chamber was also carried out and it was established that the fast-atom flux comes from all parts of the chamber. The energy distribution of the fast atoms indicates that the plasma ions have no Maxwellian energy distribution, a feature characteristic of turbulent plasma. Orig. art. has: 3 figures and 6 formulas.

ASSOCIATION: None

SUBMITTED: 19Oct63

DATE ACQ: 16Apr64

ENCL: 02

SUB CODE: ME

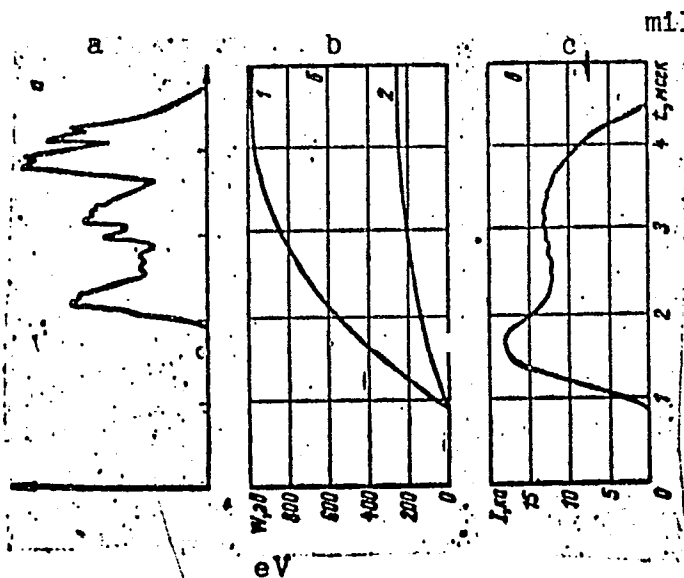
NR REF SOV: 003

OTHER: 002

Card 3/5

ACCESSION NR: AT4025308

ENCLOSURE: 01



Comparison of time dependence of the hydrogen atom flux, discharge current, and energy supplied.

a - hydrogen atom flux ($E = 300$ eV), b - energy delivered to plasma (1 - per particle within the plasma pinch, 2 - per particle within the chamber volume), c - discharge current

Card 4/5

ACCESSION NR: AP3004484

s/0048/63/027/008/0994/0995

AUTHOR: Sena, L. A.

TITLE: Second All-Union Conference on the Physics of Electron and Atom Collisions [Uzhgorod, 2-9 October 1962]

SOURCE: AN SSSR. Izvestiya, ser. fiz., v. 27, no. 8, 1963, 994-995

TOPIC TAGS: conference, electron collision, atom collision, collision physics

ABSTRACT: The II Vsesoyuznaya konferentsiya po fizike elektronnykh i atomnykh stolknoveniy (Second All-Union Conference on the Physics of Electron and Atoms Collisions), was held in Uzhgorod, 2-9 October 1962. The following reports were presented: "Theory of the charge-exchange process during atomic collisions," by Yu. N. Demkov; "Charge-exchange of multicharge ions," by I. P. Flaks; "Ionization due to atomic collisions," by N. V. Fedorenko; "Excitation of atoms and molecules due to electronic collisions," by I. P. Zapesochnyy; "Charge exchange and ionization during atomic collisions in the high-energy range," by V. S. Nikolayev; "Photoionization of gases and vapors by vacuum ultraviolet radiation," by Academician A. N. Terenin and F. I. Vilesov; "Effective cross sections of

atomic collisions important in the theory of gaseous quantum generators," by I. I. Sobel'man; "Dissociation of molecules and ions during collisions of fast particles," by N. N. Tunitskiy; and "Corpuscular diagnostic of plasma," by V. V. Afrosimov.

ASSOCIATION: none

S/057/63/033/002/011/023
B108/B186

AUTHORS: Afrosimov, V. V., Gladkovskiy, I. P., Kislyakov, A. I., and Petrov, M. P.

TITLE: A mass analysis of the current of neutral atomic particles ejected from the plasma in the "Alpha" machine

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 33, no. 2, 1963, 205 - 211

TEXT: Fast neutral particles with energies of 500 - 5000 ev were mass-analyzed by measuring the flight time of the particles as described in ZhTF, 30, 12, 1456, 1960. A magnetic mass analyzer was used to avoid difficulties in handling high-energy particles. The hydrogen plasma in the Alpha machine was found to be a source of a large number of impurity atoms. Since the impurity concentration varies with time and depends on the working conditions of the machine in the same way as the hydrogen concentration it can be assumed that the impurity and hydrogen atoms form in similar processes (recharging, desorption of gases from chamber wall, evaporation of wall material, etc.). The current of the impurity atoms increases at the end of the discharge. This may lead to an increase in impurity ion concentration of the plasma, and also to an increase of the Card 1/2

A mass analysis of the current...

S/057/63/033/002/011/023
B108/B186

current of particles on which the impurity ions are recharged. There are 4 figures.

ASSOCIATION: Fiziko-tehnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: February 2, 1962

Card 2/2

ACCESSION NR: AP4018380

S/0120/64/000/001/0143/0146

AUTHOR: Afrosimov, V. V.; Kalinkevich, I. F.; Serenkov, I. T.

TITLE: Automatic stabilization of a beam of fast atomic particles

SOURCE: Pribery* i tekhnika eksperimenta, no. 1, 1964, 143-146

TOPIC TAGS: elementary particle, fast elementary particle, atom, atomic particle, particle intensity stabilization, particle direction stabilization

ABSTRACT: A stabilization method involving direct control of the beam position in a measuring outfit is proposed. The principle is illustrated in Fig 1 (see Enclosure 1) where the typical effect of the accelerating voltage on the beam current can be seen. A modulating sawtooth voltage, whose amplitude is small in comparison with the half-width ΔU of the line, is added to the d-c accelerating voltage. Modulating-frequency pulses appear in the circuit which records the beam current; the amplitude and polarity of these pulses will depend on the value

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ACCESSION NR: AP4018380

of the accelerating voltage which makes the detection of variations in the accelerating voltage possible. The latter is controlled by the d-c component of the pulses. This type of stabilization is independent of the spectrometer resolution. A functional diagram (see Fig 2, Enclosure 1) and principal schematics of the sawtooth-voltage generator and balanced detector are presented. It is claimed that the beam can be easily stabilized up to 10^{-10} amp intensity and that the functioning time is 0.01 sec. "The authors are deeply grateful to N. V. Fedorenko for his valuable advice in discussing the results of this project." Orig. art. has: 5 figures.

ASSOCIATION: Fiziko-tekhniicheskiy institut AN SSSR (Physico-Technical Institute, AN SSSR)

SUBMITTED: 04Sep62

DATE ACQ: 18Mar64

ENCL: 01

SUB CODE: 'NS

NO REF SOV: 003

OTHER: 000

Card 2/32

AEROSIMOV, V.V.; GORDEYEV, Yu.S.; PANOV, M.N.; FEDORENKO, N.V.

Use of the method of coincidences in studying elementary events of
atomic collisions. Zhur. tekhn. fiz. 34 no.9:1613-1623 S '64.
(MIRA 17:10)

1. Fiziko-tekhnicheskiy institut imeni Ioff'e AN SSSR, Leningrad.

AFROSIMOV, V.V.; GORDEYEV, Yu.S.; PANOV, M.N.; FEDORENKO, N.V.

Characteristic energy losses in atomic collisions. Zhur. tekhn. fiz.
34 no.9:1624-1636 S '64. (MIRA 17:10)

1. Fiziko-tehnicheskiy institut imeni A.F. Ioffe AN SSSR, Leningrad.

L 18056-05 EEC(b)-2/EPA(w)-2/ERG(z)/EAT(1)/EPA(sp)-2/EMP(w)-2/EEC(t)/T/EWA(m)-2

ACCESSION NR: AP4045274

03/05/64/034/009/1637/1644

AUTHOR: Afrosimov, V.V.; Gordeyev, Yu.S.; Panov, M.N.; Fedorenko, N.V.

TITLE: Elementary processes of charge change in atomic collisions

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.9, 1964, 1637-1644

TOPIC TAGS: inelastic scattering, ionization, particle collision, charge exchange, argon

ABSTRACT: Close collisions of argon ions with argon atoms, of the type $A^+ + A \rightarrow A^{m+} + A^{n+} + (m + n - 1)e$, were investigated with the apparatus described by the authors elsewhere (ZhTF 34, 1613, 1964, see Abstract A44 4327) with which it is possible to determine all the relevant parameters of the collision, and the cross sections for the various processes are compared. The energy of the incident argon ions was always 50 keV. In addition to the distance r_0 of closest approach, which varied from 0.183 to 0.303 Å, and the charges m and n of the scattered and recoil ions, which ranged up to 6, a collision was characterized by one of the three possible discrete values, R_1^* (53 eV), R_2^* (363 eV), R_3^* (475 eV), of the excess of the inelastic energy loss over the ionization energy, discussed by the authors in the

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L 15056-65

ACCESSION NR: AP4045274

preceding paper (ZhTF 34,1624,1964; Abstract AP4045273). For the discussion the parameters m and n were replaced by $N = m + n - 1$ and $d = m - n$. The most probable value N_{\max} of N was found to depend both on r_0 and on the "level" R_k^0 excited; N_{\max} increased with decreasing r_0 and with increasing k . It had previously been found (loc.cit.supra) that k tended to increase with decreasing r_0 . The relative probability for obtaining a given value of N was found to be given for all collisions by the same expression, $\exp(-3(N-N_{\max})^2/2N_{\max})$, where N_{\max} is the value appropriate to that of r_0 and the R^0 level realized in the collision. The distribution of the parameter d was symmetric about $d = 0$ and was nearly independent of N . The near Gaussian distribution of N and the symmetric distribution of d are regarded as further evidence in favor of the authors' previous conclusion (loc.cit.supra) that the occurrence of discrete values of the inelastic energy loss in some manner associated with excitation of collective motion of the electrons within the colliding atoms. Original has 7 formulas and 5 figures

ASSOCIATION: Fiziko-tehnicheskij institut im.A.P.loffe AN SSSR, Leningrad (Physico-technical Institute, AN SSSR)

SUBMITTED: 25Feb64

ENCL: 00

SUB CODE: NP

NR REF SCN 000

OTHER: 003

2/2

L 9298-66 - EWT(1)

ACC NR: AP5026412

SOURCE CODE: UR/0386/65/002/006/0291/0296/4

AUTHOR: Afrosimov, V. V.; Gordeyev, Yu. S.; Panov, M. N.; Fedorenko, N. V.

ORG: Physicotechnical Institute im. A. F. Ioffe, Academy of Sciences SSSR (Fiziko-
tehnicheskiy institut Akademii nauk SSSR)

TITLE: Ionization and scattering with characteristic energy losses in atomic collisions

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 6, 1965, 291-296

TOPIC TAGS: atomic physics, ionization, collision cross section, argon, krypton, neon

ABSTRACT: This is a continuation of an earlier investigation (ZhTF v. 34, 1613, 1624, and 1637, 1964) of the elementary acts of collisions between ions and argon atoms having kev energies at impact parameters smaller than the atomic dimensions, where it was found that the spectrum of the excess inelastic loss is not continuous, but consists of relatively narrow discrete lines, the energies of which do not depend on the shortest distance between the nuclei, on the relative velocity of the particles, or on the scheme of the elementary process by which the charge states are changed. To determine the extent to which the observed phenomenon is general, the authors investigated collisions between ions and atoms of different noble gases. The measured excess inelastic energy loss R^* for the $Ne^+ + Ar$ pair was found not to de-

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L 9298-66

ACC NR: AP5026412

pend on the scheme of the elementary process. Excitation of several R* lines was observed in the investigated interval of shortest distances between the nuclei of the colliding particles. The regions in which one R* line is excited, and the region where the transition occurs from excitation of one line to excitation of another, do not shift when the relative particle velocity changes. However, excitation of lines with different energies were observed when the velocities were different. Analogous results were obtained for Kr⁺ + Kr pair at 25 and 50 kev. In this case, three characteristic R* lines were observed in the interval 100--600 ev. For the Ne⁺ + Ne pair at 50 kev, one R* line with energy ~160 ev was observed. The authors investigated the connection between the excitation of the characteristic lines and the charges of the colliding particles. When like particles collide ("symmetrical" pairs Ar⁺ + Ar, Kr⁺ + Kr) this connection is manifest in a clear-cut correlation between the average charge of the scattered particles and the inelastic energy loss. No such correlation is observed when an "asymmetrical" pair is investigated (Ne⁺ + Ar, energy 25 kev). The scattering of the colliding particles was also investigated in detail. It was found that the total differential scattering cross section is not, as heretofore assumed, a continuous function of the scattering angle, and singularities are observed when the measured cross sections are compared with the cross sections calculated for a continuously varying interaction potential. In the transition region, the experimental scattering cross sections differ most strongly from the calculated ones, with deviations in the form of maxima. The effect is observed for all the investigated pairs and suggests that the real interaction potential is not a continuous function

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ACC NR: AP5026412

of the shortest distance, but changes abruptly on going from the excitation of one characteristic line to the excitation of another. It is difficult at present to present an unambiguous interpretation of the observed effects. The explanation offered earlier, based on the assumption that vacancies are produced in the inner shells of the colliding particles and are followed by Auger transitions, in in poor agreement with the experimental data, as are other hypotheses. Authors thank M. Ya. Amus'ya for a discussion of the results and A. P. Shergin and Z. Z. Iatypov for help with some of the measurements. Orig. art. has: 3 figures. 44,55

SUB CODE: 20/ SUBM DATE: 29Jul65/ ORIG/REF: 002/ OTH REF: 004 44,55

44,55

BC

Card 3/3

2

ACC NR: AP6004883

SOURCE CODE: UR/0057/66/036/001/0089/0101

66
61
B

AUTHOR: Afrosimov, V.V.; Ivanov, B.A.; Kislyakov, A.I.; Petrov, M.P.

ORG: none

TITLE: Active ^{2, 44, 55} diagnosis of a hot plasma by means of neutral particles

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 1, 1966; 89-101

TOPIC TAGS: heated plasma, hydrogen plasma plasma diagnostics, plasma density, particle beam, neutral particle, atomic beam, charge exchange.

ABSTRACT: A technique for measuring the charged particle density of a hydrogen plasma with the aid of a beam of high energy (5-20 KeV) hydrogen atoms has been developed and tested by measuring plasma densities in the "Al'fa" installation. The method has the advantages of good sensitivity, negligible interference with the plasma and independence of the physical state of the plasma and the presence of magnetic fields. The injector consisted of an ion source, accelerating electrodes, electrostatic deflecting electrodes for directing the beam, a charge exchange chamber containing hydrogen at $(1-4 \times 10^{-4})$ mm Hg in which some of the ions were neutralized, and a transverse electric field which removed the unneutralized ions. After traversing the plasma the hydrogen atom beam passed through a transverse electric field which cleared it of any charged particles that it might have picked up, and a charge exchange chamber in which some of the atoms became ionized. The ions issuing from

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UDC: 533.9.07

ACC NR: AP6004883

the charge exchange chamber were analyzed by means of electric and magnetic fields and those with the proper energy and mass, corresponding to the energy and mass of the initial probe beam particles, were recorded with a scintillation counter. The sensitivity was such that a beam current corresponding to 10^{-10} A of singly-charged ions could be employed. The injector and detector assemblies were enclosed in iron housings of approximately 1 cm wall thickness for magnetic shielding. The plasma density was calculated from the attenuation of the beam on traversing the plasma. The theoretical discussion is facilitated by the fact that once a beam particle is ionized it is removed from the beam by the ambient magnetic field, so that the possibility of the ion becoming neutralized again does not have to be considered. The most significant beam attenuating process is shown to be resonant charge exchange with plasma protons; ionization by electron impact is also significant, but other processes are negligible. The effect of scattering of beam atoms was partly eliminated by comparing the attenuation of the beam by the plasma with its attenuation by an equivalent mass of unionized gas, and the residual effect of scattering was shown experimentally to be imperceptible. The attenuation of the beam was independent of beam energy over the investigated range from 4 to 20 keV. The attenuation of such high energy beams is nearly independent of the plasma temperature. The decay curve of the plasma in the "Alfa" machine from 1.5×10^{13} to $0.2 \times 10^{13} \text{ cm}^{-3}$ as measured with the hydrogen atom probe agreed within the experimental error with the decay curve measured with a microwave interferometer. It is concluded that with the investigated technique one can make

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10043-00

ACC NR: AP6004883

absolute measurements of the ion concentration in a hot hydrogen plasma over the range of plasma thickness from 5×10^{13} to 10^{16} cm⁻². The authors thank N.V. Fedorenko for his interest and for valuable discussions. Ye. G. Komar and A.M. Timonin for their interest, and M.M. Larionov and V.V. Rozhdestvenskiy for performing the microwave interferometer measurements. Orig. art. has: 6 formulas and 7 figures. [15]

SUB CODE: 20/ SUBM DATE: 03May65/ ORIG REF: 015/ OTH REF: 007/ ATD PRESS: 4203

FW
Card 3/3

ACC NR: AP6004884

SOURCE CODE: UR/0057/66/036/001/0102/0110

AUTHOR: Afrosimov, V.V.; Ivanov, B.A.; Kislyakov, A.I.; Petrov, M.P.

ORG: none

TITLE: Investigation of the plasma concentration in the "Al'fa" installation with a probe beam of fast atoms

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 1, 1966, 102-110

TOPIC TAGS: hydrogen plasma, plasma diagnostics, particle beam, neutral particle, atomic beam, plasma density, plasma magnetic field, plasma decay, plasma dynamics, plasma concentration

ABSTRACT: The authors have employed their technique of plasma diagnosis with a fast atomic beam to investigate the hydrogen ion concentration in plasmas in the "Al'fa" installation over a wide range of operating conditions. The theory of the technique and the apparatus employed have been described in a previous paper by the authors (ZhTF, 36, 89, 1966/ see Abstract AP6004883/). For the present measurements the apparatus was so adjusted as to have a resolving time of 30 μ sec. Under all operating conditions the proton density rose rapidly to a maximum value of n_{max} at time t_{max} after initiation of the discharge, decreased less rapidly with irregular fluctuations until the discharge current fell to zero, and subsequently decreased exponentially with the time constant T. The variations with the discharge conditions (the gas pressure P_0 prior to the discharge, the strength H_z of the longitudinal magnetic field,

Cord 1/2

UDC:533.

L 21707-00

ACC NR: AP6004884

2

and the potential U on the capacitor bank feeding the eddy winding) of the parameters n_{\max} , t_{\max} , T , and the time $t_{0.5}$ during which the proton concentration was greater than half its maximum value are presented graphically and are discussed at some length. n_{\max} was proportional to P_0 and, for fixed P_0 , increased linearly with H_z . Values of n_{\max} up to nearly 10^{14} cm^{-3} were observed. The ionization was relatively independent of U and increased from about 42% for $H_z = 200 \text{ Oe}$ to approximately 85% for $H_z = 1 \text{ kOe}$. For $U = 10 \text{ kV}$, t_{\max} and $t_{0.5}$ reached minimum values of 0.5 and 1.4 millisecc, respectively, at about the same value (360 Oe) of H_z . T increased linearly with H_z from approximately 0.25 millisecc for $H_z = 200 \text{ Oe}$ to 0.8 millisecc for $H_z = 900 \text{ Oe}$. Mechanisms possibly contributing to the plasma decay are discussed and it is concluded that diffusion plays no appreciable part, that drift in the toroidal magnetic field makes the most significant contribution, and that recombination may be important if the plasma temperature at this stage is of the order of 0.2 eV. The authors thank V.Ye.Goliant for valuable discussions and N.V.Fedorenko for his interest. Orig. art. has: 8 formulas and 9 figures.

SUB CODE: 20/

SUBM DATE: 22Jul65/

ORIG REF: 010/

OTH REF: 004

Card 2/2

ACC NR: AP6004887

SOURCE CODE: UR/0057/66/036/001/0123/0131

63
60
B

AUTHOR: Afrosimov, V.V.; Gordeyev, Yu.S.; Panov, M.N.; Fedorenko, N.V.

ORG: Physicotechnical Institute in. A.F.Ioffe, AN SSSR, Leningrad (Fiziko-tehnicheskoy institut AN SSSR)

TITLE: Ionization and scattering with characteristic energy losses in atomic collisions

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 1, 1966, 123-131

TOPIC TAGS: ionization, inelastic scattering, argon, neon, krypton, excitation energy, particle collision, ion energy

ABSTRACT: The characteristic inelastic energy losses (energies carried off by electrons and radiation), previously investigated in Ar⁺-Ar collisions by the present authors (Compt. Rend. de la VI-e Conf. Int. Phen. d'Ionisation dans les Gas, eds. SERMA, 1, 111, Paris, 1963; ZhTF 34, 1613, 1964; ZhTF, 34, 1624, 1964; ZhTF, 34, 1637, 1964) and confirmed by E.Everhart et al (Phys. Rev. Lett., 14, 247, 1965; Phys. Rev. Lett., 14, 484, 1965), have been further investigated in Ne⁺-Ne, Ar⁺-Ar, Kr⁺-Kr, and Ne⁺-Ar collisions at incident ion energies of 12, 25, and 50 keV, using the apparatus and techniques described in the earlier papers. Characteristic inelastic energy loss "lines" were observed in all the investigated systems. The probabilities for "excitation" of the different "lines" (occurrence of the different characteristic energy

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UDC: 533.9

ACC NR: AP6004887

3

losses) were nearly independent of the incident ion energy but depended strongly on the distance of closest approach; the positions of the lines, however, did depend somewhat on the incident ion energy. The curves representing the composition with respect to charge of the scattered particles as a function of scattering angle revealed regions of slow and rapid change associated with excitation of the different characteristic lines, and the differential cross section deviated from a smooth curve at scattering angles associated with excitation of the characteristic lines. There was no simple relation between the characteristic lines excited in Ne^+ -Ar collisions and those excited in Ne^+ -Ne and Ar^+ -Ar collisions; from this it is concluded that the lines are not to be ascribed to excitation of any energy levels characteristic of the isolated atoms. Difficulties are pointed out that are encountered in attempts, including the attempt of U.Fano and W.Lichten (Phys. Rev. Lett., 14, 627, 1965), to account for the experimental results by invoking Auger transitions. The authors argue in favor of their earlier hypothesis involving excitation of collective vibrations of the electron shells. The authors thank E.Ya.Amus'ya for valuable discussions, and A.P.Shergin and Z.Z.Latypov for participating in the work. Orig. art. has: 7 figures.

SUB CODE: 20/

SUBM DATE: 05Aug65/

ORIG REF: 002/

OTH REF: 008

Card 2/2 dda

AFROSIMOVA, V.N., inzh.; POLYATSKIN, M.A., kand. tekhn. nauk

Study of carburetion in a cylindrical model of a peripheral
gas burner. Teploenergetika 10 no.9:26-29 S '63. (MIRA 16:10)

1. Tsentral'nyy kotloturbinnyy institut.
(Gas burners)

ACCESSION NR: AP4025418

S/0096/64/000/004/0022/0026

AUTHORS: Afrosimova, V. N. (Engineer); Polyatskin, N. A. (Candidate of technical sciences)

TITLE: Investigation of mixing in a cylindrical burner with a peripheral gas distribution

SOURCE: Teploenergetika, no. 4, 1964, 22-26

TOPIC TAGS: gas combustion chamber, cylindrical combustion chamber, peripheral gas injection, gas mixing

ABSTRACT: The mixing of gas introduced into a uniformly flowing air stream from a row of peripheral openings in a cylindrical combustion chamber was studied by using the equipment and method described by V. N. Afrosimova and N. A. Polyatskin

("Teploenergetika" No. 9, 1963). The mixing effectiveness $X = \frac{\int_0^1 \frac{C_i - C_{cr}}{C_{cr}} d\bar{F}_i}{C_{cr}}$

(C_i = local concentration, C_{cr} = average concentration, $\bar{F}_i = F_i/F_{tr}$, F_i = area of the i th ring at which C_i is measured, F_{tr} = total area of combustion cyclinder) was

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ACCESSION NR: APL025418

measured for different values of $\bar{d} = d/D$, $\bar{\rho} \bar{v}^2 = \rho_g v_g^2 / \rho_a v_a^2$, $\bar{x} = x/D$, $\bar{Q} = \frac{Q_a}{Q_g}$, $\bar{s} = s/d$ (d = diameter of gas orifices, D = diameter of chamber, ρ_g , ρ_a , v_g , v_a = densities and velocities of gas and air respectively, X = distance between gas injection and measuring section, Q_a , Q_g = air and gas flow, s = distance between gas orifices). It was found that the concentration x could be correlated by a single curve (for a given $\bar{v} = v_g/v_a$) if it were plotted against the parameter

$$\bar{h}_x = 2b_s \bar{d} \sqrt{\frac{\bar{x}}{\bar{d}} (\bar{\rho} \bar{v}^2)^{1/2}}$$

(where b_s is empirical constant which varies linearly between 0.7 - 0.95 as \bar{s} varies between 2 and 20). The graph so plotted as shown in Fig. 1 on the Enclosure (for $\bar{v} = 3$, \bar{h}_x) gives the depths to which the gas jet penetrates the air stream. It can be seen from Fig. 1 that x is at a minimum (best mixing) at $\approx \bar{h}_x = 1$ or when the gas jets penetrate to the center of the air stream. Orig. art. has: 5 formulas, 5 figures, and 1 table.

Cord 2/4

ACCESSION NR: AP4025418

ASSOCIATION: Tsentral'nyy kotloturbinnyy institut (Central Turbine Institute)

SUBMITTED: 00

DATE ACQ: 20Apr64

ENCL: 01

SUB CODE: PR

NO REF SOV: 007

OTHER: 000

Card 3/4

ACCESSION NR: AP4025418

ENCLOSURE: 01

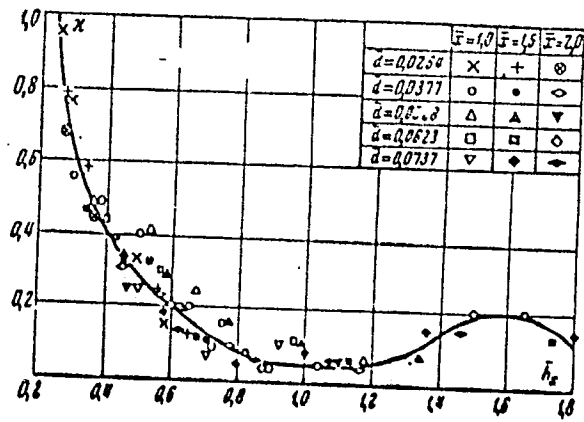


Fig. 1. Mixing effectiveness x as a function of dimensionless penetration depth h_x .

Card 4/4

POLYATSKIN, M.A.; SHATIL', A.A.; AFROSIMOVA, V.N.

Evaluating the completeness of the processes of mixing and combustion
in a boiler furnace burning natural gas. Gaz.prom. 10 no.2:24-27
'65. (MIRA 18:12)

AFROSIMOVA, V.N.

Studying mixture formation in cold models. Gaz.prom. 10 no.3:22-26
'65. (MIRA 18:5)

AFROSIN, Aleksandr Nikolayevich; ANDREYEV, P., red.; LUKASHEVICH, V.,
tekh. red.

[Sunflower, a profitable crop] Podsolnechnik - kul'tura dokhodnaya.
Saratov, Saratovskoe knizhnoe izd-vo, 1960. 19 p. (MIRA 14:12)

1. Predsedatel' kolkhoza "Rossiya" Bazarno-Karabulakskogo rayona
(for Afrosin).

(Sunflowers)

AFRUTKIN, G. I.

AUTHORS: Yakovchuk, N.S. and Afrutkin, G.I.

120-4-13/35

TITLE: Apparatus for Oscillographic Investigation of Crystal Triode Characteristics (Pribor dlya ostsillograficheskogo issledovaniya kharakteristik kristallicheskikh triodov)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, No.4,
pp. 49 - 52 (USSR).

ABSTRACT: Apparatus is described which permits the characteristics of crystal triodes to be displayed and photographed on a CRT screen. The data obtained can be used graphically in the design of circuits using crystal triodes, and also for the investigation of the triodes themselves. The characteristic $U_K = f(I_K)_{I_3 = 0}$ can be obtained by use of the circuit

given in Fig.1 where \mathcal{E} is the emitter and K is the collector. The voltage from the transformer is applied to a crystal triode through a resistance R connected in series with the collector. The voltage developed across the resistor R , which is proportional to the collector current I_K , is applied to the vertical plates of the CRT; the collector voltage U_K is applied to the horizontal plates. A step voltage/current generator is connected to the emitter and the following characteristics are

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120-4-13/35

• Apparatus for Oscillographic Investigation of Crystal Triode
Characteristics.

• ASSOCIATION: Physico-technical Institute Ac.Sc. USSR.
(Fiziko-tehnicheskiy institut AN SSSR)

SUBMITTED: November 18, 1955.

AVAILABLE: Library of Congress

Card 3/3

BLAWAT, F.; CHYLINSKI, G.; AFTANAS, A. (Gdansk)

Pathogenic Clostridia in the soil and feces of domestic animals near
Danzig. Rocznik nauki rolnej 70 no.1/4:299 '60.

(EEAI 10:9)

(Soils) (Domestic animals) (Feces) (Clostridium)

AFTANAS, J.

AFTANAS, J.

Waves against a sloping breakwater.

P. 334 (TECHNIKA I GOSPODARKA MORSKA) (Gdansk, Poland) Vol. 7, no. 11, Nov. 1957

SOI Monthly Index of East European Accessions (EEAI) LC Vol. 7, No. 5. 1958

AFTANAS, Jerzy, mgr inz.

Water flush tanks. Tech gosp morska 10 no.9:284-286 S '60. (EEAI 10:3)
(Poland--Harbors)

ANDRIAN, A.; COJOCARU, Gh.; BORSARU, I.; APTENIE, B.; STEFANESCU, C.

Thoracoplasty in pulmonary tuberculosis. The results obtained in 428 cases (620 surgical interventions) at the end of 5-15 years following the operation. Rumanian M Rev. no.2:24-27 Ap-Je '60.

(TUBERCULOSIS, PULMONARY surgery). (THORACOPLASTY)

AFUSO AE D

RUMBLE/Cultivated Plants - General Problems.

Abstr Jour : Raf Zhur Biol., No 18, 1958, 82281

Author : Bucur, M., Debreanu, C., Lepadru, G., P. S. C., ADUSCOA, D., Dumbrava, I.

Inst : Inst Affiliats AS NR

Title : Salt Tolerance of Plants Grown on Non-irrigated Saline Soil of Jula-Bahlu Depression in the Year 1955.

Orig Pub : Studii si cercetari stiint. Acad. NR Fil. Inst. Biol. si stiintei agric., 1956, 7, No 1, 129-132

Abstract : Salt tolerance was studied in 12 species of agric. and plants which are cultivated on the saline lowland soil of Jula-Bahlu (Rumanian People's Republic) under the conditions of 1955, noted for its moist and cold summer to fall period. The salt tolerance was determined by

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Bucur's method, based on establishing changes in the vegetative mass in relation to soil salinity changes. Winter wheat, winter rye and alfalfa proved to be most tolerant to salinization, while alfalfa, barley, oat and particularly flax and clover were less tolerant. The author divides the salinized soil of Jula-Bahlu depression into the following four groups: 1) soils where salinization begins at the soil surface; 2) soils where salinization starts at a depth of 15-25 cm and deeper (grains and tilled crops can be grown in rainy years); 3) soils with salinization beginning at a depth of 30-40 cm and further down (the cereal fodder crops can be grown); 4) soils with salinization starting at 50-70 cm deep and further down (unsuitable only for fruit trees). -- P. I. Lopyshanskiy

Card 2/2

ABABEI, V.; AFUSOAIIE, D.

Geochemical distribution of Mn, Cu, and Co in some soils of Rumania.
Studii chim Iasi 11 no.2:263-279 '60.

1. Academia Republicii Populare Romine, Filiala Iasi, Institutul de
chimie "Petru Poni."

(Soils) (Metals)

ABABI, V.; AFUSQAIE, D.

Geochemical distribution of Mn, Cu, and Co in some intrazonal and azonal soils of Moldavia. Studii chim Iasi 13 no.1:97-107 '62.

1. Academia R.P.R., Sectorul de geochimie.

ABABI, V.; AFUSOAI, D.

Geochemical distribution of Mn, Cu, and Co in some chernozem
and forest brown soils in Moldavia. *Studia Univ B-B S Chem*
8 no.1&2, 197-200 '63

1. Iasi Branch of the Rumanian Academy.

AG, Arpad

Effective filament length in electron tubes. Muszaki kozl
MTA 32 no.1/4:221-230 '63.

1. Híradastechnikai Ipari Kutató Intézet.

AG, Arpad

Description of spark machining on the basis of the equation of heat conduction. Muszaki kozl MTA 33 no.1/4:235-241 '64

1. Híradastechnikai Ipari Kutató Intézet, Budapest.

L 01049-66

ACCESSION NR: AT5022328

HU/2502/64/041/003/0281/0290

19
BT1

AUTHOR: Kerekes-Cseti, Sarolta (Kerekesh-Cheti, Sh.) (Budapest); Ag, Arpad (Budapest)

TITLE: Basic equation of quantitative spectrum analysis

SOURCE: Academiae scientiarum hungaricae. Acta chimica, v. 41, no. 3, 1964, 281-290

TOPIC TAGS: spectrum analysis, spectroscopy

Abstract: [German article; authors' English summary, modified] The relations between line intensity and sample quantity were discussed. It was proved that the Scheibe-Lomakin equation and the Malpica equation describe this relation accurately only at low concentrations as they fail to take self-absorption into account. A new equation was derived which incorporates two factors characterizing the self-absorption. Means for calculating these factors were presented. Orig. art. has 14 formulas, 4 graphs, and 3 tables.

ASSOCIATION: Forschungsinstitut für die Nachrichtentechnische Industrie, Budapest (Research Institute for Communications Technology Industry)

SUBMITTED: 05Mar64

ENCL: 00

SUB CODE: NP

NO REF SOV: 006

OTHER: 000

JPRS

Card 1/1 *AP*

AGA, A.V., dots.

Morphological changes in transplanted bone and surrounding tissues in heterotransplantation. Ortop. travm. protez., Moskva 19 no.6:52-57
N-D '58. (MIRA 12:1)

1. Iz kafedry gosspital'noy khirurgii (Zav. - prof. V. L. Khenkin)
Chernovitskogo meditsinskogo instituta (dir. - dots. M.N. Kovalev)
i Ukrainского instituta ortopedii i travmatologii imeni M. I. Sitenko
(dir. - chlen-korrespondent AMN SSSR prof. N. P. Novachenko).

(BONE AND BONES, transpl.

heterotranspl., morphol. changes in transplanted bone &
surrounding tissues in rabbits (Rus))

AGA, A. V., Doc MED Sci, "HETEROGENIC OSTEOPLASTY. (EX-
PERIMENTAL ^{study} INVESTIGATION)." CHERNOVTSY, 1960. (KHAR'KOV
STATE MED INST). (KL, 3-61, 228).

VELLI, Yu.Ya., kand. tekhn. nauk; DOKUCHAYEV, V.V., kand. tekhn. nauk; FEDOROV, N.F., doktor tekhn. nauk; Prinsipialni uchastiye: DYUKOV, A.B., inzh.; STEPANOV, K.V., inzh.; NOVITSKIY, M.I., inzh.; AGA, M.M., kand. tekhn. nauk; SAKHAROV, I.V.; VOLKOV, V.N., inzh.; ZABORSHCHIKOV, O.V., inzh.; RYBAKOVA, V.G.; ZOLOTAR', I.A., kand. tekhn.nauk, nauchn. red.; KOSTANDOV, A.I., red.izd-va; CHERKASSKAYA, F.T., tekhn. red.

[Buildings and structures in the Far North] Zdanija i sooruzhenia na Krainem Severe; spravocnoe posobie. Leningrad, Gosstroizdat, 1963. 490 p. (MIRA 17:2)

124-57-2-2165

Translation from: Referativnyy zhurnal. Mekhanika. 1957, No. 2, p 99 (USSR)

AUTHOR: Aga, M. S.

TITLE: Investigation of the Thermal Fields of Some Cylindrically Symmetrical Bodies (Issledovaniye teplovykh poley dlya nekotorykh tel tsilindricheskoy simmetrii)

PERIODICAL: 13-ya nauch. konferentsiya Leningr. inzh. -stroit. in-ta, Leningrad, 1955, pp 228-229

ABSTRACT: Bibliographic entry

1. Cylindrical bodies--Thermodynamic properties

Card 1/1

SOV/124-57-8-9290

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 8, p 104 (USSR)

AUTHOR: Aga, M. S.

TITLE: On the Subject of the Temperature Fields and Thermoelastic Displacements for a Section of an Arch (K voprosu o temperaturnykh polyakh i termouprugikh peremeshcheniyakh dlya arochnoy seksii)

PERIODICAL: V sb.: 15-ya nauchn. konferentsiya Leningr. inzh.-stroit. in-ta. Leningrad, 1957, pp 439-440

ABSTRACT: Bibliographic entry

Card 1/1

SOV/124-58-11-13002

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 11, p 163 (USSR)

AUTHOR: Aga, M. S.

TITLE: On the Problem of Thermoelasticity in Certain Cylindrically Symmetrical Bodies (K zadache termouprugosti v nekotorykh telakh tsilindricheskoy simmetrii)

PERIODICAL: Sb. nauchn. tr. Leningr. inzh. -stroit. in-t, 1957, Nr 26, pp 136-144

ABSTRACT: The author examines the nonstationary distribution of temperature in a flat sector-shaped area bounded by two circular arcs and two segments of radii. The solution, obtained by the Fourier method, is in the form of a series. The convergence of this series is not investigated; individual instances corresponding to various conditions of heat exchange through the boundary of the area are studied. Thermoelastic stresses and displacements corresponding to temperature conditions investigated are not examined.

N. A. Kil'chevskiy

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AGA, M.S., assistant

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Thermal fields and thermoelectric displacemtns of segments
radiating heat through all their boundaries. Sbor. nauch. trud.
LISI no.3:202-207 '59. (MIRA 13:7)
(Heat--Transmission)

AGABABOV, A.

Organization of passenger transportation in the Armenian S.S.R. Avt.
transp. 4 no.8:9-11 Ag '62. (MIRA 16:4)

1. Ministr avtomobil'nogo transporta Armyanskoy SSR.
(Armenia—Transportation, Automotive)

AGABABOV, A.

We are responsible for everything. Za rul. 21 no.8:11
Ag '63. (MIRA 16:11)

1. Predsedatel' Federatsii avtomotornogo sporta Armenii,
ministr avtomobil'nogo transporta Armyanskoy SSR.

AGABABOV, A.A.

AGABABOV, A.A., inzh.

The production of precast reinforced concrete railroad ties, Mekh.
trud. rab. ll no.10:32-34 0 '57. (MIRA 10:11)
(Railroads--Ties, Concrete)

AGABABOV, A. A. G.

Armenian S.S.R. Avt.transp. 35 no.10:31 0 '57.

(MIRA 10:10)

1. Ministr avtomobil'nogo transporta Armyanskey SSR.
(Armenia--Transportation, Automotive)

AGABABOV, A. A.

Improve the planning of centralized freight haulage. Avt.transp.
33 no.9:6-7 S'55. (MIRA 8:12)

1. Ministr avtomobil'nogo transporta i shosseynykh dorog Armyan-
skoy SSR.

(Armenia--Transportation, Automotive)

AGABABOV, A. G

Forty years of automotive transportation in Armenia. Avt.transp.
38 no.11:3-5 N '60. (MIRA 13:11)

1. Ministr avtomobil'nogo transporta Armyanskoy SSR.
(Armenia--Transportation, Automotive)

AGABABOV, E.A.

Construction of the curved edge of asymmetrically contoured end plates of the intake in case of oblique approach of the stream.
Trudy GruzNIIGiM no.20:260-266 '58. (MIRA 15:5)
(Hydraulic structures)

30(1)

SOV/99-59-9-3/14

AUTHOR:

Agababov, E.A., Engineer

TITLE:

Construction of Closed Irrigation Pipelines in Georgia

PERIODICAL:

Gidrotehnika i melioratsiya, 1959, Nr 9, pp 15-17
(USSR)

ABSTRACT:

It was established that in the mountainous regions of Georgia it is more expedient to use -- instead of open irrigation canals -- the closed asbestos-cement waterpipes. In order to obtain the maximum operating efficiency of such pipelines, natural gradients are to be made use of; the pressure in the pipes should not be larger than that required for temporary sprinklers. The pipe diameter is selected, depending on the water outlets. (Table on page 16). The layout of pipelines with diameters of 200 to 400 mm is expressed by formula $i = i_f + \frac{\Delta h}{L}$ where i is pipeline gradient; i_f - gradient corresponding to friction losses along the pipeline length; L = distance

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SOV/99-59-9-3/14

Construction of Closed Irrigation Pipelines in Georgia

between the wells; Δh = pressure at the temporary sprinkler. The waterflow speed in the pipes should not exceed 6 m/sec. The wells used for this irrigation system are of a semi-automatic water outlet type. Of late, a well construction designed by I.D. Suladze, M.I. Machavariani and E.A. Agababov came into use (Fig on page 17). The well operates on the principle of extinguishing the kinetic energy of intake water and of passing it on without extinguishing the transit consumption. The cost of building of such wells is nearly 40% lower than of those made until lately. There are 1 table and 1 schematic diagram.

ASSOCIATION: Gruzgiprovodkhoz

Card 2/2

AGABABOV, E.A., inzh.

Indicator tube for velocity measurements at points of sharp bends
in a stream. Gidr. 1 mel. 12 no.10;45-48 0 '60. (MIRA 13:11)

1. Gruzgiprovodkhoz.
(Stream measurements)

AGABABOV, E.A., inzh.

Structures for flumes. Gidr.i mel. 13 no.7:20-28 JI '61.
(MIRA 14:7)

1. Gruzgiprovodkhoz.
(Irrigation canals and flumes)

AGABABOV, E.A., inzh.; TSAMALASHVILI, M.V., inzh.

Structures for flumes on supercritical inclines. Gidr. 1 mel.
14 no.4:30-38 Ap '62. (MIRA 15:5)

1. Gruzgiprovodkhoz.
(Irrigation canals and flumes)

AGABABOV, E.A., kand. tekhn. nauk (Tbilisi); SULADZE, I.D., inzh. (Tbilisi)

Selection of flume sections for canals of varying gradients.
Gidr. i mel. 16 no.7:58-59 J1 '64.

(MIRA 17:11)

GAZARYAN, V.S., prof.; SOGOYAN, I.S., nauchnyy sotrudnik; AGABALOV, G.A.,
nauchnyy sotrudnik; MESROPYAN, V.V., veterinarnyy vrach

Copper poisoning of sheep. Veterinariia 42 no.9:58-59
S '65. (MIRA 18:11)

1. Kolkhoz "Aygezard" Armyanskoy SSR (for Mesropyan).

LASTOVKIN, G.A.; SHEVKUNOV, N.D.; Primalni uchastiy: TRIPUKOV, N.M.;
TRIPUKOVA, V.D.; AGABABOV, G.Ye.; ISAKOV, G.A.; SEREBRYANNIKOV,
N.D.

Increasing the capacity of retort chambers by intensifying the
heating of the upper zone of retorts. Trudy VNIIPS no.7:165-173
'59. (MIRA 12:9)

1. Sotrudniki Teplotekhnicheskoy Glavgaza SSSR (for Tripukov,
Tripukova). 2. Sotrudniki Slantsepererabatyvayushchego kombinata
(for Agababov, Isakov, Serebryannikov).
(Oil shales) (Gas retorts)

AGABABOV, Kh.A.

Analysis of certain typical errors in what students learn in a
general physics course. Uch.zap.MGZPI no.3:197-208 '59.
(MIRA 13:5)

(Physics--Study and teaching)

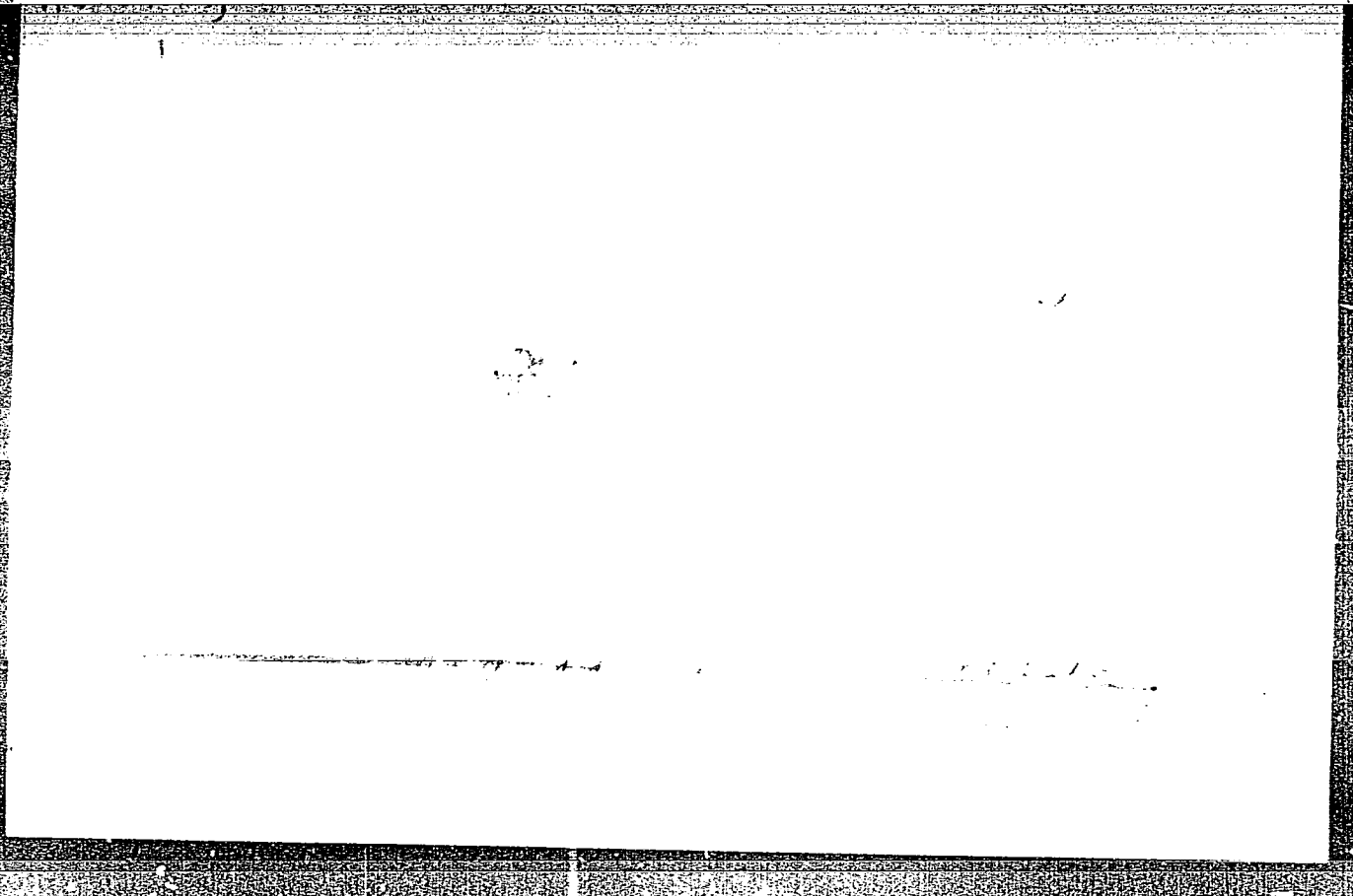
AGABABOV, Kh.A.

A.S. Popov, inventor of the radio and eminent Russian teacher.
Uch. zap. MGZPI no.9:214-236 '62. (MIRA 16:6)

(Popov, Aleksandr Stepanovich, 1859-1906)

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CIA-RDP86-00513R000100420014-9"

AUTHOR: Agababov, S.G. (Engineer) SOV/96-58-8-12/22
TITLE: The Radiating Properties of Furnace Slags (Izluchatel'naya sposobnost' topochnykh shlakov)
PERIODICAL: Teploenergetika, 1958, Nr 8, pp 56-60 (USSR)
ABSTRACT: A knowledge of the radiating properties of furnace slags is required for calculations of the heating of boiler surfaces covered with slag. There are some doubts about the values of the blackness factor of slags, which are thought to be about 0.8. This article describes determinations of the blackness factor of furnace slags in the solid and liquid conditions and also of the radiating properties of various vitreous substances of analogous composition. An equation is given for the radiation from solid slag and glass. This depends on the ratio of the radiation temperature, determined by a radiation pyrometer, to the true surface temperature, determined by measurements of the gradient within the specimen using platinum/platino-rhodium thermo-couples. Slag is very brittle and of high melting point. Thus it is very difficult to make from it samples containing a sufficient number of thermo-couples to permit of study of the temperature

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The Radiating Properties of Furnace Slags SOV/96-58-8-12/22

field. Suitable specimens were, therefore, made of glass. In the sample of slag, the temperature was measured at a depth of 1 mm. The surface temperature was determined from the results of tests on glass; this is permissible because the thermal conductivities of the material are similar. The arrangements of the thermo-couples in the glass samples are illustrated diagrammatically in Fig 1 and photographs of samples numbers 5 and 6 (see Table 1) are seen in Fig 2. The formula used to calculate the mean surface-temperature is given; the temperature so derived was used to calculate the radiating ability, using formula (1). The slag sample with thermo-couple is sketched in Fig 4; in some cases the surface of the sample was ground, but in others the natural surface obtained on cooling was used. When the slag or glass is molten, the thermo-couples cannot be positioned accurately and so the true surface temperature cannot be determined. In this case optical methods based on measurements of either the brightness temperature or the brightness and radiation temperatures are used to determine the blackness factor for

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