ANKHIMYUK, Vyacheslav Leont'yevich; IL'IN, Oleg Pavlovich;
    TETERINA, L.N., red.

    [Automatic control of electric drives] Avtomaticheskoe
    upravlenie elektroprivodami. Minsk, Vysshaia shkola, 1965.
    469 p.   (MIRA 19:1)

ACC NR: AP7000765

SOURCE CODE: UR/0143/66/000/005/0040/0045

AUTHOR: Ankhimyuk, V. L. (Docent; Candidate of Technical Sciences); Il'in, O. P. (Docent; Candidate of Technical Sciences); Sheyna, G. P. (Engineer)

ORG: Belorussian Polytechnic Institute (Belorusskiy politekhnicheskiy institut)

TITLE: Selection of motors for electric drives with frequency control at constant power

SOURCE: IVUZ. Energetika, no. 5, 1966, 40-45

TOPIC TAGS: electric motor, frequency control

ABSTRACT: A method is analyzed for selecting a motor for a system of frequency controlled drive in the P_0=const operating regime. The method is based on the condition of production of a minimal size motor, in consideration of the problem of determining the frequencies at which the fixed range of control and power can be provided with series produced asynchronous motors. The authors call for development of technical conditions or state standards with respect to permissible values of voltage, current and rotation rate of series produced asynchronous motors used in frequency controlled electrical drive systems. An example of the calculation is presented. Orig. art. has: 19 formulas.
[JPRS: 37,061]

SUB CODE: 09 / SUBM DATE: 17May65 / ORIG REF: 006

Card 1/1

UDC: 62-83-531.6

IL'IN, O.V.

Influence of some positive emotions on the effectiveness of the
mystey of physical exercises by pupils. Nauk. zap. Nauk.-dosl.
inst. psykhol. 11:201-204 '59. (MIRA 13:11)

1. Gosudarstvennyy institut fizicheskoy kul'tury, Kiyev.
     (Emotions)   (Physical education for children)

IL'IN, P., inzh.

We indroduce advanced methods of construction. Sil'. bud. 11
no.12:15-16 D '61.   (MIRA 15:2)
   (Ukraine—Construction industry)(Precast concrete construction)

MAGID, B., inzh.; IL'IN, P., inzh.

Transportation of long elements. Na stroi. Ros. 4 no.5:18 My
'63.   (MIRA 16:6)
(Precast concrete--Transportation) (Truck trailers)

IL'IN, P.A.

Some characteristics and problems of the development of petroleum
refining. Neft. khoz. 40 no.12:13-18 D '62.   (MIRA 16:7)

(Petroleum—Refining)

IL'IN, F.A.

For the petroleum refining industry, high tempos of development.
Khim. i tekh. topl. i masel 9 no.7:1-5 Jl '64.

(MIRA 17:12)

IL IV / i...

ZAPOL'SKII, M.V.

"PK-2 and PK-2 m electric caterpillar crane." P.I.Il'in, S.Kh.Khei-
fets. Reviewed by M.V.Zapol'skii. Torf.prom. 31 no.7:30 '54.
(MLRA 7:11)
(Cranes, derricks, etc.) (Il'in, P.I.) (Kheifets, S.Kh.)

IL'IN, P.I.

Types of folds in the coal deposits of the Southern Ural Basin. Sov.
geol. 3 no.3:130-133 Mr '60.   (MIRA 13:11)
          (Southern Ural Basin--Folds (Geology))

KULESHOV, Aleksey Vasil'yevich; IL'IN, Pavel Ivanovich; PETROV, V.P., red.;
ZHITNIKOVA, O.S., tekhn. red.

[Safety measures in the peat industry] Tekhnika bezopasnosti v tor-
fianoi promyshlennosti. Moskva, Gos. energ. izd-vo, 1960. 166 p.
(MIRA 14:6)

(Peat industry--Safety measures)

KISELEV, N.N.; KUZHEL', M.O.; DIMASHKO, A.D.; IL'IN, P.L.

Permissible pitch of cable winding on the drum of a hoisting machine.
Ugol' 29 no.11:27-31 '54.   (MIRA 7:11)

1. Otdel Glavnogo konstruktora Nova-Kramatorskogo mashinostroitel'no-
go zavoda im. Stalina.
        (Mine hoisting)

KISELEV, Nikolay Nikolayevich; KUZHEL', Maksim Georgiyevich; DIMASHKO,
    Aleksandr Dominikovich; IL'IN, Petr Lukich; KARPYSHEV,N.S., re-
    daktor; ZAPREYEVA,K.A., redaktor; MEDOVA,Ye.I., tekhnicheskiy
    redaktor

    [Mine hoisting machinery (mechanical part); construction atlas]
    Shakhtnye pod"emnye mashiny (mekhanicheskaia chast'); atlas kon-
    struktsii. Moskva, Ugletekhizdat, 1955. 114 p.   (MLRA 9:1)
                      (Mine hoisting)

KUZHEL', M.G.; IL'IN, P.L.

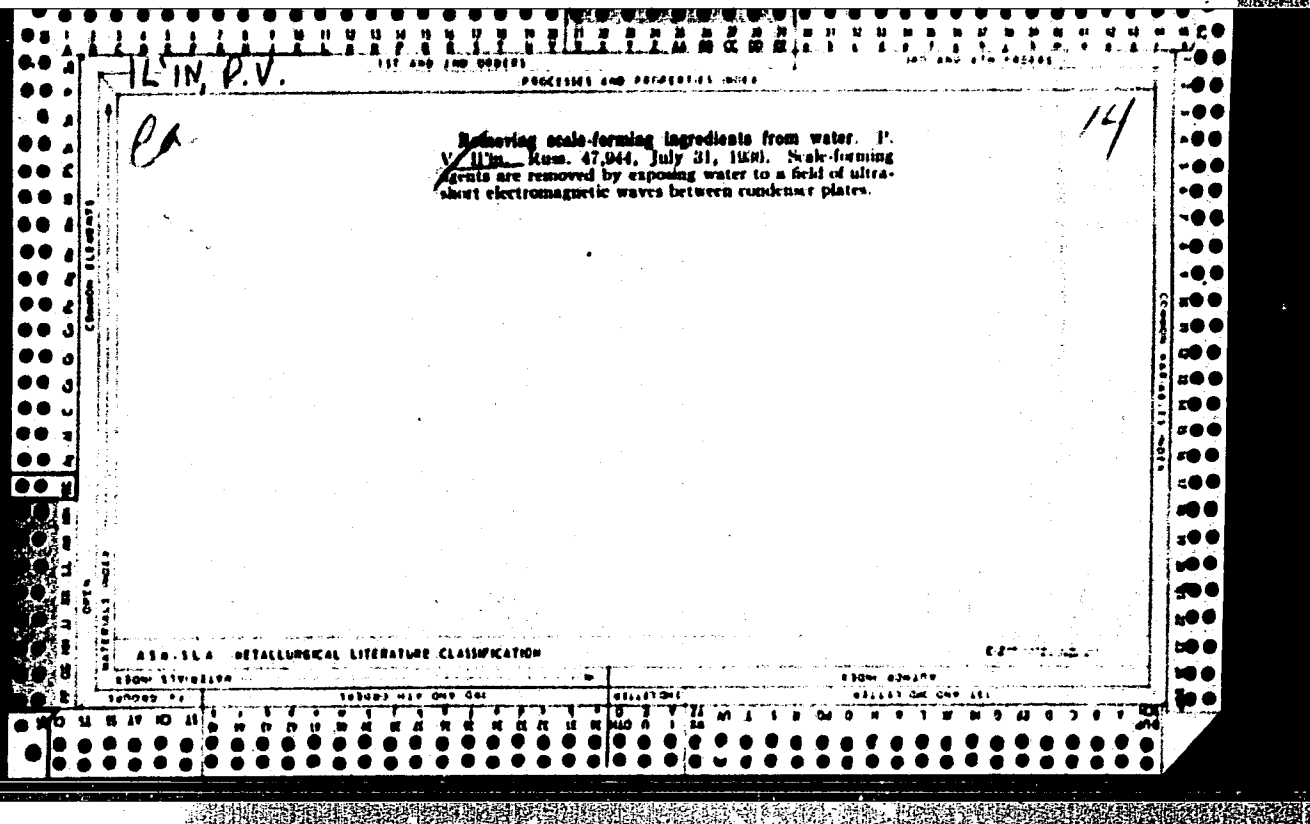Mine hoisting machinery. Sbor.Novo-Kram.machinostroi. zav. no.1:17-51 '59. (MIRA 16:12)

SNEGOVSKIY, F.P., kand.tekhn.nauk; POLIDOROV, A.V., inzh.; IL'IN, P.L.,
inzh.; VILENKIN, D.M., inzh.

Industrial testing of an ore-crushing ball mill with hydrostatic
bearings. Vest.mashinostr. 45 no.10:41-42 O '65.
                                            (MIRA 18:11)

IL'IN, P.P.; SELIVANOV, S.A.

Improve the quality of reinforced concrete ties. Put' i put.khoz.
7 no.7:21-22 '63.   (MIRA 16:10)

1. Nachal'nik puteobsledovatel'skoy stantsii, Kiyev (for Il'in).
2. Starshiy inzh. puteobsledovatel'skoy stantsii, Kiyev (for
Selivanov).

IL'IN, P.V.

/14

Removing scale-forming ingredients from water. P.
V. Il'in. Russ. 47,944, July 31, 1938). Scale-forming
agents are removed by exposing water to a field of ultra-
short electromagnetic waves between condenser plates.

A10.1L4   METALLURGICAL LITERATURE CLASSIFICATION

BOGDANOVICH, M.M.; MOCHALIN, V.S.; IL'IN, P.A.; UKHOV,K.S., redaktor;
   PETERSON, M.M., tekhnicheskiy redaktor

[Elements of the theory of navigational gyroscopic instruments]
Elementy teorii navigatsionnykh giroskopicheskikh priborov.
Leningrad, Izd-vo "Morskoi transport," 1956. 270 p.   (MLRA 9:8)
      (Gyroscope)

IL'IN, P. A.   (Candidate of Technical Sciences)   *LITNO*
(Litmo)

"The creation of new small-size designs of gyroscopic registers of ship rolling."

paper presented at the Second Scientific and Technical Intervus Conference on Problems of Contemporary Gyroscopy, Ye. F. Otvagin, Secretary of the Organization Committee; Leningrad, Izvestiya Uchebnykh Zavedenity, Priborostroyeniye, No. 5, Sep/Oct 1958, pp 161-163

The Second Intervus Conference on Problems of Contemporary Gyroscopy Technique, convoked by decision of the Ministry of Education USSR, took place in the Leningrad Institute of Precision Mechanics and Optics from 24 to 27 November 1958.

13.2521
9.6100

83465

S/146/60/003/004/005/010
B004/B056

AUTHORS: Bogdanovich, M. M.,   Il'in, P. A.

TITLE: A Gyrocompass for Latitude Determination With Indirect
                Correction

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Priborostroyeniye,
                1960, Vol. 3, No. 4, pp. 43-47

TEXT: By controlling a gyroscope with moments applied to its suspension
pin it is possible to produce an apparatus which simultaneously indicates
the true meridian-direction and latitude. On an astatic gyroscope in
Cardanic suspension (Fig. 1) a gyromotor acts as sensitive element, upon
whose vertical axis correcting moments act by means of a moment trans-
ducer. These moments are proportional to the angular velocity $\dot{\alpha}$ of the
deviation of the main axis of the gyroscope from the meridian plane:
$M\xi$ - $k\dot{\alpha}$. This correcting moment is calculated by means of a computer ob-
taining all data necessary for determining the value $M\xi$. By means of the
geographically orientated coordinate system $O\xi\eta\xi$, which is connected with

Card 1/2

83465

A Gyrocompass for Latitude Determination With   S/146/60/003/004/005/010
Indirect Correction   B004/B056

the earth, and the coordinate system Oxyz (Fig. 2) the authors derive the
equations of motion of the main axis of the gyroscope. This paper was
recommended by the kafedra giroskopicheskikh i navigatsionnykh priborov
(Chair of Gyroscopic and Navigation Instruments). There are 2 figures.

ASSOCIATION: Leningradskiy institut tochnoy mekhaniki i optiki
                (Leningrad Institute of Precision Mechanics and Optics)

SUBMITTED: February 27, 1960

Card 2/2

/3 2521   27012   8/123/61/000/016/009/022
                                    A004/A101

AUTHOR: Il'in, P.A. . .

TITLE: New gyrocompass for the maritime transportation fleet

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 16, 1961, 21-22, ab-
            stract 16D152 (V sb. "1-ya Mezhvuz, nauchno-tekhn. konferentsiya po
            probl. sovrem. giroskopii". Leningrad, 1960, 3 - 9)

TEXT: In accordance with the planned instructions of the XX Congress of
the KPSS on the extension of maritime transportation and the equipping of the
transportation and commercial fleet with up-to-date navigation instruments, the
Leningradskiy institut tochnoy mekhaniki i optiki (Leningrad Institute of Preci-
sion Mechanics and Optics) together with the Tsentral'nyy nauchno-issledovatel'-
skiy institut morskogo flota (Central Scientific Research Institute of the Mari-
time Fleet) has developed a new gyrocompass design. The peculiar feature of the
sensitive element of the gyrocompass consists in the fact that the internal sus-
pension axis is located vertically, while the external axis is placed horizontal-
ly, so that, consequently, during rolling the vertical ring does not immediately
affect the gyroscope as regards its vertical axis and so-called compensation

Card 1/2

New gyrocompass ...   27012   S/123/61/000/016/009/022
                                                      A004/A101

weights can be dispensed with which are balancing the moments of inertia of the vertical ring relative to both axes. Owing to the mentioned arrangement on the suspension axes it is possible to effect a damping of the free gyroscope oscillations by weights independent of the main pendulum, to do away with the "foot" bearings of the mercury vessels and to adjust the damping factor in operation without stopping the gyroscope. The mercury vessels need not be suspended on separate supports. They are fixed immediately to the vertical ring. The sensitive element has a torsional suspension of the vertical axis which is centered by high-sensitivity ball bearings, the horizontal axis resting on balls. The pilot assembly consists of the following units: 1) the gyrocompass proper; 2) feed unit of the АНГ-10Б (AMG-10B) type (serial output); 3) РОМ-10 (ROM-10) revolution controller (serial output); 4) corrector of speed and constructional errors of the gyroscope; 5) 15M distribution box (serial output); 6) 23M course recorder (serial output); 7) column-type bearing repeater (serial); 8) bracket-type repeater (serial). Two pilot models of the gyrocompass were tested on ships.

                                                      G. Flidlider

[Abstracter's note: Complete translation]

Card 2/2

IL'IN, P.A.

Small gyroscopic device for recording the rolling of a ship.
Izv.vys.ucheb.zav.; prib. 3 no.3:66-73 '60.   (MIRA 14:4)

1. Leningradskiy institut tochnoy mekhaniki i optiki. Rekomendovana
Orgkomitetom vtoroy nauchno-tekhnicheskoy mezhvuzovskoy konferentsii
po problemam sovremennoy giroskopii.
        (Stability of ships)   (Gyroscope)

PHASE I BOOK EXPLOITATION   SOV/5615

Bogdanovich, Mikhail Mitrofanovich, and Petr Alekseyevich Il'in

Giroskopicheskiye pribory i ustroystva; osnovy teorii (Gyroscopic Instruments
   and Devices; Fundamentals of the Theory) Leningrad, Sudpromgiz, 1961.
   359 p. Errata slip inserted. 6,900 copies printed.

Reviewers: A. N. Dokuchayev, Candidate of Technical Sciences, A. Yu. Ishlinskiy,
   Academician, D. R. Merkin, Doctor of Technical Sciences, Ya. G. Ostroumkhov,
   Engineer; Scientific Ed.: N. V. Butenin; Ed.: Ye. N. Shaurak; Tech. Ed.:
   R. K. Tsal.

PURPOSE: This book is intended for students of instrument building in schools
   of higher education and in maritime schools. It may also be useful to
   technical personnel engaged in designing and manufacturing gyroscopic
   instruments and devices.

COVERAGE: The book presents problems of the theory and principles of operation
   of various gyroscopic instruments and devices. Stress is laid on instruments
   which are widely used in practice. However, some new circuits which as yet

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Gyroscopic Instruments (Cont.)   SOV/5615

have no widespread application, such as gyroscopic latitude indicators and
vibratory gyros, are discussed. The authors thank N. V. Butner, Professor,
Doctor of Physics and Mathematics, A. Yu. Ishlinskiy, Professor, Academician,
D. R. Merkin, Doctor of Physics and Mathematics, A. N. Dokuchayev, Docent,
Candidate of Technical Sciences, Ya. G. Ostromukhov, Engineer, and V. A.
Pavlov, P. I. Saydov and S. S. Rivkin, Professors, Doctors of Technical Sciences,
for their advice. There are 49 references: 45 Soviet, 2 English, and 2 German.

TABLE OF CONTENTS:

Card 2/10

IL'IN, P. A.

13.2520

S/146/61/004/004/008/015
D201/D306

AUTHORS: Il'yin, P.A.; and Sergeyev, M.A.

TITLE: The effect of base vibration on the indications of a
             gyroscope with two degrees of freedom

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Priboro-
             stroyeniye, v. 4, no. 4, 1961, 53 - 60

TEXT: In the theoretical part is is assumed that the base and body
vibrations are actually identical which means that as a result of
body vibrations, the sensing element is affected by the base vibra-
tions component perpendicular to the precession axis. It is shown
that the oscillations of the sensing element with respect to the
z-axis do not affect its azimuthal movement. M is the moment app-
lied to the sensing element in the plane perpendicular to the axis
of precession and varies according to $M = m \sin pt$; $m_1 = m \cos \theta$;
$m_2 = m \sin \theta$, h — the damping factor of the sensing element in the
absence of vibrations; μ^2 — the square of the frequency of free

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The effect of base vibration ...   29644 S/146/61/004/004/008/015
                                     D201/D306

self-oscillations in the absence of vibrations. The approximate so-
lution of the differential equation. Then becomes

$$a = e^{-ht}\left\{(\alpha_0 + \nu C_1)\cos nt + \left(\alpha_0 \frac{h}{n} + \nu C_2\right)\sin nt + \frac{\alpha_0 m_2 \nu}{2p}\times\right.$$

$$\times\left[\frac{M}{2n-p}\cos\left[(n-p)t + \psi\right] + \frac{N}{2n-p}\cos\left[(n+p)t - \delta\right]\right]\right\} +$$

$$+ \frac{m_1 p \nu \cos(pt - \sigma)}{\sqrt{(\mu^2 - p^2)^2 + 4p^2 h^2}}.$$

It may be seen from this that if damping of the sensing element is
provided in the gyro, the oscillations given by the terms in brack-
ets will be damped. After the decay of self oscillations the z-axis
oscillates only with forced oscillations. The amplitude of moment
m occuring during the vibrations of the base and on angle θ, and on
the ratio of frequencies μ and p. To evaluate the magnitude of for-
ced oscillations which introduce the error into the indication of
the gyro a numerical example is solved for such a gyro with air
cushions. The numerical results show that the base vibration provi-
Card 2/3

296<u>44</u>

The effect of base vibrations ...

S/146/61/004/004/008/015
D201/D306

ded its frequency and amplitude are constant, above a few C/s, does not affect the indications of a gyro with two degrees of freedom, since its period T is seldom less than 30 sec. It is stated that if the vibrations of the base have varying frequency and amplitude, experiments show that the gyroscope cannot be used any more to determine the meridian plane. This article was recommended by the Kafedra giroskopicheskikh i navigatsionnykh priborov (Department of Gyroscopic and Navigational Instruments). There are 3 figures and 1 Soviet-bloc reference.

ASSOCIATION: Leningradskiy institut tochnoy mekhaniki i optiki (Leningrad Institute of Precision Mechanics and Optics)

SUBMITTED: December 7, 1961

Card 3/3

IL'IN, P.A.

AID Nr. 938-11   12 June

DESIGNING A LATITUDE GYROCOMPASS (USSR)

Bogdanovich, M. M., and P. A. Il'in. Izvestiya vysshikh uchebnykh zavedeniy.
Priborostroyeniye, v. 6, no. 2, 1963, 74-77.   S/140/63/006/002/008/010

The conversion of a gyroscope into a device which simultaneously indicates the
latitude and the direction of the geographic meridian (latitude gyrocompass) by
incorporating special torque transducers is described. An astatic gyroscope
with three degrees of freedom installed on a platform with gymbal suspension
and stabilized with respect to the horizon is used as a sensing element. The
input signals to the torque transducers are produced by a computing device
which receives all data necessary to obtain a required torque. To obtain a
signal proportional to the latitude angle, a torque proportional to a vertical
component of the daily rotation of the earth and to the velocity of the moving
object must be applied to the horizontal gymbol axis. On the basis of preces-
sion theory, equations of motion of the device are derived. The work was done at
the Leningrad Institute of Precision Mechanics and Optics.   [AS]

Card 1/1

PROKOPCHUK, B.I.; IZRAILEV, L.M.; IL'IN, P.A.; LEONOV, B.N.; SUSOV, M.V.;
        KOSTRYUKOV, M.S.

    Diamond potential of the Lena Valley; new diamond-bearing area
    in the northeastern part of the Siberian Platform. Trudy IAFAN
    AN SSSR Ser. geol. no.9:115-122 '63.   (MIRA 16:12)

IL'IN, P.V., novator-avtosvarshchik

Automatic-welding operator and innovator. Mashinostroitel' no.1:
18-19.N.'56.   (MIRA 12:1)
          (Electric welding)

IL'IN, P.V., inzhener.

Caps for chemical water purification filters. Energetik 5 no.8:20
Ag '57.
(MIRA 10:10)
(Water--Purification)

AUTHOR: Il'in, P.V., Engineer

91-58-8-4/34

TITLE: The Quality of Chemical Water Purifying Filter Caps (O
              kachestve kolpachkov fil'trov khimvodoochistok)

PERIODICAL: Energetik, 1958, Nr 8, pp 11 (USSR)

ABSTRACT: The author discusses the various types of filter caps pro-
              duced, criticizes their shoddy quality and defectiveness,
              attacks the indiscriminate use of unsuitable types in the
              wrong equipment, quotes an example of the unnatural wear
              of three filters in a TETs, and calls for the quality to
              be improved. There is 1 photo.

              1. Water--Purification   2. Filters--Applications

Card 1/1

Il'in, R.

Filming with polarising light filters. Sov. foto 17 no.3:53-55 Mr '57.
(Photography--Light filters)   (MIRA 10:6)

IL'IN, R.

Bias lightening and darkening in full exposure. Sov. foto
23 no.5:38-39 My '63.   (MIRA 16:10)

IL'IN, R., kand. iskusstvovedeniya, kinooperator; DUBSON, Ya., tekhn. red.

[Special lighting in television] Spetsial'noe osveshchenie v televidenii. Moskva, Gos. kom-t po radioveshchaniiu i televideniiu, 1961.
85 p. (MIRA 14:10)
(Television) (Lighting)

BLYUSKIN, Ye. M., inzh.; IL'IN, R.A., inzh.; PANKRATOV, V.P., inzh.

Operation of equipment subjected to boiler inspection without
accidents. Bezop. truda v prom. 3 no.6:29-30 Je '59.
(MIRA 12:10)

1. Dolgoprudnenskiy savod krasiteley.
(Industrial safety)

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 7, p 12 (USSR)

SOV/124-58-7-7415 D

AUTHOR: Il'in, R.F.

TITLE: On the Dynamics of the Ascending and Descending Sections of a Hoisting Cable (K dinamike opuskayushcheysya i podymayushcheysya vetvey pod"yemnogo kanata)

ABSTRACT: Bibliographic entry on the author's dissertation for the degree of Candidate of Physical and Mathematical Sciences, presented to the In-t matem. AN UkrSSR (Institute of Mathematics, Academy of Sciences, Ukrainian SSR), Kiyev, 1957

ASSOCIATION: In-t matem. AN UkrSSR (Institute of Mathematics, Academy of Sciences, Ukrainian SSR), Kiyev

1. Hoists--Mathematical analysis   2. Cables--Performance

Card 1/1

AUTHOR: Il'in, R.P.   SOV/21-58-2-8/28

TITLE: On the Mutual Influence of Mine Rope Branches (O vzaimov-
               liyanii vetvey pod''yemnogo kanata)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 2,
               pp 147-152 (USSR)

ABSTRACT: Making use of the Lagrange method the author presents a sy-
               stem of differential equations for hoisting equipment with
               a friction pulley treating the mine rope as a visco-elastic
               thread. Under the assumption that kinetics of the motion
               proceeds according to a trapezoidal tachogram, the author
               gives an approximate solution of this system by the asymp-
               totic method. The solution makes it possible to investigate
               dynamic stresses in the mine ropes for the shallow depths
Card 1/2   of hoisting (up to 300 m) taking into account their im-

On the Mutual Influence of Mine Rope Branches   SOV/21-58-2-8/28

perfect elasticity. A criterion for dying out of dynamic
stresses in the mine ropes has been found. There are:
1 schematic diagram, 4 graphs and 7 Soviet references.

ASSOCIATION   Dnepropetrovskiy gosudarstvennyy universitet (Dnepropetrovsk
               State University)

PRESENTED: By Member of the AS UkrSSR, G.N. Savin

SUBMITTED: April 22, 1957

NOTE: Russian title and Russian names of individuals and insti-
               tutions appearing in this article have been used in the
               transliteration

Card 2/2

IL'IN, R.F. [Il'in, R.P.] (Dnepropetrovsk)

Dynamics of mine hoists with a driving rope pulley. Prykl.
mekh. 6 no.2:186-191 '60.   (MIRA 13:8)

1. Dnepropetrovskiy gosudarstvennyy universitet.
                (Mine hoisting)

IL'IN, R.F. [Il'in, R.P.] (Dnepropetrovsk)

Slightly nonlinear three-dimensional movement of elastic rods.
Prykl. mekh. 10 no.4:450-453 '64.   (MIRA 17:10)

1. Dnepropetrovskiy sel'skokhozyaystvennyy institut.

IL'IN, R. N., AFROSIMOV, V. N., and FEDORENKO, N. V.

"Ionization of Molecular Hydrogen by Protons,"

paper presented by Fedorenko at Conf. on Physics of Electronic & Atomic Collision, New York University, 27-28 Jan 1958.

B - 3,102,929

24(7)

AUTHORS:

Afrosimov, V.V., Il'in, R.N.,
Fedorenko, N.V.
SOV/57-28-10-27/40

TITLE:

Ionization of Argon by Hydrogen Ions (Ionizatsiya argona ionami vodoroda)

PERIODICAL:

ABSTRACT:

This work was intended to furnish information on the charge composition of the secondary ions and on the total cross section, which can be ascribed to the production of free electrons and of secondary ions in the collision of hydrogen ions with the argon atoms. Argon was used as a gas target for the reason that it yields the most detailed data on the ionization by electrons and ions. The experimental method has already been described accurately in the papers cited by references 1 and 2. The experimental set-up as a whole has been described in the paper cited by reference 9. In this paper only a short description of the experimental conditions is included. The charge composition of the secondary ions of argon which are produced by a single collision of the H^+, H_2^+, and H_3^+ ions with the argon atoms was the object of study in this work. The energy interval of the primary ions extended from

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Ionization of Argon by Hydrogen Ions   SOV/57-28-10-27/40

5 - 180 keV. The following quantities were determined: The total cross section of electron capture by hydrogen ions (σ_0) and the

total cross section of free electron production (σ_-) and of Ar^+, Ar^{2+}, Ar^{3+}, and Ar^{4+} secondary ion production, which are denoted by σ_{01}, σ_{02}, σ_{03}, and σ_{04}, respectively. It was found that σ_0

in all cases decreases continuously with an increase in the velocity of the primary ions, whereas the curves $\sigma(v)$ exhibit a maximum. This maximum is located near velocities which are about the value $e^2/\hbar$ (according to Bohr (Bor) the velocity of the electron in the hydrogen atom equals $2,2.10^8$ cm/sec). The curves $\sigma_{02}(v)$, $\sigma_{03}(v)$ and $\sigma_{04}(v)$ exhibit a maximum in the same velocity region. The maximum values of the corresponding cross sections for an electron impact are, according to data provided by W. Bleakney (Blik - ni) (Ref 3) by many times smaller. The cross sections of the pro-

Card 2/3   duction of secondary argon ions by ions H^+, H_2^+, and H_3^+ are

Ionization of Argon by Hydrogen Ions   SOV/57-28-10-27/40

compared to those of the production by He^+ and Ne^+ ions travelling with the same velocity, the pertaining data being provided by reference 2. It appears that the cross sections of the production of Ar^{2+}, Ar^{3+} and Ar^{4+} ions increase with the nuclear charge of the ionizing particles. If the ionizing particles are multi-atomic molecules the corresponding cross sections increase with the increase in the number of the nuclei contained in the primary ion. Professor V.M. Dukel'skiy and O.B. Firsov discussed the work with the author. There are 8 figures, 1 table, and 14 references, 8 of which are Soviet.

SUBMITTED: January 17, 1958

Card 3/3

AUTHORS: Afrosimov, V. V., Il'in, R. N.,   SOV/56-34-6-5/51
Fedorenko, N. V.

TITLE: The Ionization of Molecular Hydrogen by the Ions H^+, H_2^+ and H_3^+ (Ionizatsiya molekulyarnogo vodoroda ionami H^+, H_2^+ and H_3^+)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 34, Nr 6, pp 1398 - 1405 (USSR)

ABSTRACT: This paper investigates the ionization of hydrogen by the ions H^+, H_2^+ and H_3^+ and the distribution of the secondary ions with respect to e/m in the energy interval from 5.- 180 keV. The experimental device and the method of the investigation were described in a previous paper of the authors (Refs 14,15). The beam of the primary ions (which is homogeneous with respect to the energy and composition) entered a collision chamber. The low pressure (from 1.10^{-4} to $1,5.10^{-4}$ torr) implied the homogeneousness of the collisions of the primary ions with the gas molecules. For the analysis of the secondary ions with respect to e/m a magnetic mass spectrometer (with sectors) was

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H^+, H_2^+ and H_3^+

connected with the collision chamber. The ion currents
in the analysator amounted to $2.10^{-16} - 2.10^{-13}$A. Three
diagrams show the total cross sections of the capture
of the ions H^+, H_2^+ and H_3^+; these cross sections are

plotted against the velocity of the primary ions. The
first diagram gives also the theoretical dependence for
the charge-exchange of protons in atomar hydrogen. The
pair H_2^+ - H_2 is not a resonance pair. It seems that the

electron is captured to an excited level of the molecule
H_2. The capture of an electron by the ion H_3^+ is a
complex process as the stable state of the molecule H_3

is not known. This capture probably causes the dissociation
of H_3^+ into a molecule H_2 and a hydrogen atom. The cross
section $\sigma_{H_2^+}$ of the production of the secondary ions

H_2^+ is the sum of the cross sections of the ordinary charge
exchange and of the ionization with the removal of one
electron. In the region of the velocities of the primary

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ions $v < e^2/\hbar$ the cross section of the ordinary charge ex-
change forms the main portion of the cross section
$\sigma_{H_2^+}$. But in the region $v > e^2/\hbar$ the principal part of $\sigma_{H_2^+}$

is formed by the cross section of the ionization. In the
region $v > e^2/\hbar$ the cross section $\sigma_{H_2^+}$ is the greater the

more nuclei make up the primary ion. In the same region $\sigma_{H_2^+}$

decreases continuously when the velocity of the primary
ions increases, and it is greater than the corresponding
cross section of the electronic impact. The following
part of this paper deals with the production of secondary
protons. The cross section of this production is smaller
than the cross section of the production of the molecular
ions H_2^+. The secondary protons are produced mainly by the
dissociation of H_2^+ ions. The last part of this paper
deals with the productions of free electrons. The authors
thank V.M.Dukel'skiy, Professor, and O.B.Firsov for the
discussion of this paper and for useful critical remarks.

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H^+, H_2^+ and H_3^+

There are 7 figures, 1 table, and 16 references, 4
of which are Soviet.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR(Lenin-
grad Physical-Technical Institute AS USSR)

SUBMITTED: January 8, 1958

FEDORENKO, N.V.; AFROSIMOV, V.V.; IL'IN, R.N.; SOLOVYEV, E.S.

"Ionization of Inert Gases by Protons."

report presented at the 4th Intl Conference on Ionization Phenomena in Gases, Uppsala,
17-21 August 1959.

IL'IN, R. N., Candidate of Phys-Math Sci (diss) -- "Ionization, electron cap-

ture, and dissociation in collisions between hydrogen ions with kilo-electron-volt

energies and atoms and molecules of gases". Leningrad, 1959. 11 pp (Leningrad

Order of Lenin State U im A. A. Zhdanov, Phys-Tech Inst of the Acad Sci USSR),

150 copies (KL, No 20, 1959, 109)

24(5)
AUTHORS: Il'in, R. N., Afrosimov, V. V.,   SOV/56-36-1-7/62
                Fedorenko, N.-V.

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
Card 1/4   the secondary ions was carried out by means of a mass

Ionization of Air by H^+ and H_2^+ -Ions   SOV/56-36-1-7/62

spectrometer. Also the production cross sections for these
ions was determined. The measuring method was already des-
cribed 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 $1.5\ 10^{-4}$ 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 measure-
ments. 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 5.10^{-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

Card 2/4   references 4, 7, 6).

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Total ionization cross section σ_-: Energy dependence $\sigma_-(E_{kin})$ is shown by figure 4, the velocity dependence by figure 5. For H^+ at 60 keV, $\sigma_- \approx 6.3.10^{-16}$ cm^2 and for H_2^+ at 140 keV: $\sigma_- \approx 1.2.10^{-15}$ cm^2 is given. The maximum in an energy range of 50 - 120 keV is given as amounting to $(8.6 - 12.5).10^{-16}$ 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 $v \approx (1 - 1.5) e^2/\hbar$: $\sigma_{O^{++}} \approx 1.10^{-17}$ cm^2 and $\sigma_{N^{++}} \approx 8.3.10^{-18}$ cm^2 and in the case of ionization by H_2^+: $\sigma_{O^{++}} \approx 2.9.10^{-17}$ cm^2

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and $\sigma_{N++} \approx 2.4.10^{-17}$ cm². 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
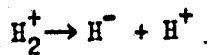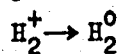Il'in, R. N., Kaminker, D. M.

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

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

$$H_2^+ \rightarrow H_2^0 \qquad\qquad H_2^+ \rightarrow H^- + H^+$$

$$H_2^+ \rightarrow H^0 + H^0 \qquad\qquad H_2^+ \rightarrow H^+ + H^0$$

$$H_2^+ \rightarrow H^- + H^0 \qquad\qquad H_2^+ \rightarrow H^+ + H^+$$

$$H_2^+ \rightarrow H^- + H^-$$
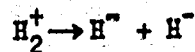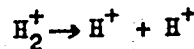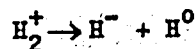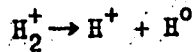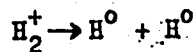
The publications dealing with this subject, Fogel' et al. (Ref 1),
Salpeter (Ref 2), Effat (Ref 3), Fedorenko (Ref 4), Damodaran (Ref 5)
and others are discussed.

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in Collisions in a Gas

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).

Card 2/3   The cross section of the formation of negative ions was measured

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only in argon for 12 kev σ_{H^+} $1.6.10^{-18}$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 (θ) in
collision chambers with 5.10^{-6}torr and $1.5.10^{-4}$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-tekhnicheskiy institut Akademii nauk SSSR
(Leningrad Physico-Technical Institute of the Academy of Sciences,
USSR)

SUBMITTED: July 29, 1958
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IL'IN, Roman Nikolayevich; IOFIS, Ye.A., kand.tekhn.nauk, red.; BOGATOVA,
V.S., red.; GORINA, V.A., tekhn.red.

[Photography with natural light] Fotografirovanie pri estestvennom
osveshchenii. Pod red. E.A.Iofisa. Moskva, Gos.izd-vo "Iskusstvo,"
1960. 71 p. illus. (Biblioteka fotoliubitelia, no.19)
                                                    (MIRA 14:6)
          (Photography--Lighting)

S/057/60/030/06/17/023   81596
B012/B064

24.6600

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

TITLE: Capture of Electrons by Protons in Rare Gases

PERIODICAL: 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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Capture of Electrons by Protons in
Rare Gases

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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 cap-
ture 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 cap-
ture of two electrons decreases at $T > 100$ kev with the increase in veloci-
ty 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 in-
creases 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.

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

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Capture of Electrons by Protons in
Rare Gases

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SUBMITTED: January 30, 1960

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Reports presented at the 5th Intl. Conference on Ionization Phenomena in Gases. Munich, 28 August - 1 September 1961.

a. G A Lyubimov, A N Andrianov, V P Belcher and V I Vasilyev
"Investigation of a Pulse Discharge in a Hollow Cylindrical Gas Sheet"

b. B G Brechner Ye S Vakulev
"Energy Measurements of Fast Electrons Formed During a Powerful Pulse Discharge" Chamber

c. A B Berezin, A N Zaydel, and G N Malyshev
"On a Method of Spectrillogople Investigation of the Hydrogen Discharge Chamber Walls Interactions"

d. V P Kiteyeri A N Sobolev
"On the Hydrogen Lines Broadening Under the Carbon Arc and Detonation Wave Conditions"

e. S G Alikhanov R A Bazhilevich, A V Knoch, G G Podlessny, G L Pesteryev
"An Investigation of Plasma Diffusion in the Magnetic Field"

f. V S Komelkov, Yu V Skvortsov V N Terashchenko S G Tserevitinov
"Dynamical Current Cord"

g. N N Sobolev
"A Spectroscopically Studied State of Gases Following the Detonation Wave"

h. R N Ilin, Ye S Solovyev N V Fedorenko
"Molecular Hydrogen Ionization by Gas Hydrogen Atoms"

i. I P Flaks, G N Chernov
"Ionization of Gases Induced by Multi-charged Ions"

j. P N Hogdsky, L N Piltsov
"The Source for Molecular Hydrogen Ions Formation at the Core Device"

k. A L Bridatchenko V V Kuznetsov N P Malakhov N N Chernov
"Injection of an Ionic Beam into the Core Magnetic Trap"

l. V Ye Yurasova
"On Directed Emission of Particles from a Copper Single Crystal Sputtered by Bombardment with Ions"

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S/057/61/031/006/007/019
B116/B203

26.23/2

AUTHORS: Il'in, R. N. and Solov'yev, Ye. S.

TITLE: Ionization of argon by oxygen and nitrogen ions

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 6, 1961, 680-687

TEXT: The authors measured the total ionization cross sections (σ_-), the total electron capture cross sections (σ_0), and the argon secondary ion production cross sections (σ_{on}) for the ions N^+, O^+, N_2^+, O_2^+, NO^+, and NO_2^+ with energies of 15-180 kev in argon. They found that σ_- and the production cross sections of doubly, triply, and quadruply charged argon ions (σ_{o2}, σ_{o3}, and σ_{o4}) increased with an increasing number of atoms in the primary ion. They established a relationship between the capture of two electrons leading to the transition $O^+ \longrightarrow O^-$ and the formation of multiply charged ions. Argon was chosen as gas target because ionization and electron capture by hydrogen ions have been thoroughly studied for this gas by V. V. Afrosimov, R. N. Il'in, and N. V. Fedorenko (Ref. 2: ZhETF,

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Ionization of argon by oxygen and ...   B116/B203

34, 1398, 1958). Test plant and measuring method had been thoroughly
described in previous papers of the authors' laboratory (Ref. 1: N. V.
Fedorenko, V. V. Afrosimov. ZhTF, XXVI, 1941, 1956; Ref. 3: N. V.
Fedorenko, V. V. Afrosimov, D. M. Kaminker. ZhTF, XXVI, 1929, 1956;
Ref. 4: N. V. Fedorenko, R. N. Il'in, V. V. Afrosimov, D. M. Kaminker.
ZhETF, $\underline{36}$, 385, 1959). Fig. 1 shows the function $\sigma_o(v)$, where v is the
velocity of the primary ions, as well as data obtained by H. B. Gilbody
and J. B. Hasted (Ref. 7: Proc. Roy. Soc. A, $\underline{240}$, 382, 1957). It is
shown that the first maximum on the $\sigma_o(v)$ curve for the pair N_2^+ - Ar
corresponds to the capture of an electron in the ground state, and the
second, blurred maximum to the capture in various excited electron states.
The $\sigma_-(v)$ curves form three groups corresponding to one-, two-, and
three-atomic primary ions. These groups lie in such a position that the
ionization cross section becomes larger with the increase of atoms in the
primary ion, these cross sections being nearly in the ratio of 1:2:3 with
equal velocities. Thus, the total ionization cross section for nitrogen-
and oxygen molecular ions evidently depends on the inner structure of the
primary ions. Since, in the case of molecular particles of the same

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charge, the number of nuclei with given Z is inseparably connected with the total quantity of electrons and the particle dimension, it cannot be stated which of these factors has a determining effect. Without considering the Z of the nuclei, the nuclear quantity itself does evidently not play the main part. The cross section σ_{01} is composed of the cross-section σ_{01}^c of the single-electron charge exchange and the cross section σ_{01}^i of the single-electron ionization. The corresponding processes may be written down in the following manner: $I^+ + A \longrightarrow I + A^+$ (1)

$I^+ + A \longrightarrow I^+ + A^+ + e$ (2), where I^+ is a primary ion, A a gas atom. The course of the $\sigma_{01}(v)$ curve is mainly determined by (1). This is confirmed by the following characteristics of the curve: (1) The $\sigma_{01}(v)$- and $\sigma_0(v)$ curves show a certain similarity. (2) At $v < 1 \cdot 10^8$ cm/sec, σ_- is much smaller than σ_{01}. For all primary ions studied, the σ_{01} differ very slightly in the range of $(5 \div 10) \cdot 10^7$ cm/sec. At the same time, however, σ_- is smaller and σ_0 larger for atomic ions than for molecular ions. This

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suggests that for the molecular ions N_2^+, NO^+, O_2^+, and NO_2^+ the relative role of ionization is considerably larger in the formation of Ar^+ ions. σ_{o1} and σ_o show no dependence on the inner structure of colliding particles. The essential difference between the cross sections σ_{o2} for the ions O^+ and N^+ is related with the fact that doubly charged ions may be formed in three different processes: pure ionization (cross section σ_{02}^1), ionization with capture of one electron (σ_{02}^{1o}), and ionization with capture of two electrons (σ_{02}^{oo}). For the latter process, $I^+ + A \longrightarrow I^- + A^{2+}$ (5) holds. The difference $\Delta\sigma_{o2}$ with equal ion velocity may be ascribed to process (5). This is confirmed by a comparison of the values obtained here with those obtained by Ya. M. Fogel', R. V. Mitin, A. G. Koval' (Ref. 11: ZhETF, 31, 397, 1956): course and order of magnitude of $\Delta\sigma_{o2}(v)$ and $\sigma_{1-1}(v)$ are equal. Also the difference of the cross sections σ_{o3} for O^+ and N^+ can be explained by process (5). The capture of two

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Ionization of argon by oxygen and ...

electrons proceeds, on the one hand, with smaller impact parameters than the capture of one electron (which is confirmed by the authors' studies of the scattering in the transition $H^+ \rightarrow H^-$), and, on the other hand, the electron excitation of the negative ion (due to collision) should not be large. The authors thank N. V. Fedorenko and V. M. Dukel'skiy for a discussion. There are 7 figures and 12 references: 11 Soviet-bloc and 1 non-Soviet-bloc.

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

SUBMITTED: July 16, 1960

Card 5/6

28922
S/056/61/041/004/005/019
B108/B102

Ж.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 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 ±12% for work with fast ions, and ±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
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28922
8/056/61/041/004/005/019
Ionization of argon by atoms and by ...   B108/B102.

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., $\underline{A240}$, 382, 1957. Mention is
made of D. M. Kaminker (ZhTF, $\underline{25}$, 1843, 1955) and O. B. Firsov (ZhETF, $\underline{36}$,
1517, 1959).

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

SUBMITTED: May 13, 1961

Legend to Fig. 1: C - collision chamber, M - measuring capacitor,
A - mass analyzer for slow ions, F - collector for fast particles; H_1, H_2,
and H_3 are pumps evacuating the collision chamber to about $1 - 2 \cdot 10^{-6}$
mm Hg.

Card 3/4

IL'IN, Roman Nikolayevich

[IUrii Ekel'chik; the skill of a motion-picture cameraman]
IUrii Ekel'chik; masterstvo kinooperatora.   Moskva, Iskus-
stvo, 1962. 144 p.   (MIRA 16:2)
      (Ekel'chik, IUrii Israil'evich, 1907-)

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

TITLE: Ionization of gases by fast hydrogen atoms and protons

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42,
             no. 3, 1962, 659 - 668

TEXT: The ionization of H_2, N_2, He, Ne, Ar, and Kr by fast hydrogen atoms
and protons of 10 - 180 kev was studied, and the ionization cross section,
the stripping cross section for fast hydrogen atoms, and the production
cross section for slow ions with various e/m ratios were systematically
measured to obtain information on the ionization of inert gases and
nitrogen. The measurements were made by the well-known condenser method
which was supplemented by the mass analysis of the composition of slow
ions. The experiments were carried out with a previously described device
(Ref. 19: N. V. Fedorenko, V. V. Afrosimov, D. M. Kaminker, ZhTF, 26,
1929, 1956; Ref. 20: N. V. Fedorenko, V. V. Afrosimov, ZhTF, 26, 1941,
1956; Ref. 21: V. V. Afrosimov, R. N. Il'in, V. A. Oparin, Ye. S. Solov'yev,

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Ionization of gases by fast...

N. V. Fedorenko, ZhETF, $\underline{41}$, 1048, 1961). Accidental errors did not exceed $\pm$ 15%, except the cross sections σ_{H^+} and $\sigma_{N^{2+}}$ ($\pm$ 30%). Theoretical and

experimental data were comparable only to a limited extent. The stripping cross sections calculated in the Born approximation showed satisfactory agreement for energies above 60 kev. When the energies were lowered, the divergence between the relevant experimental and theoretical curves increased. Analysis of the experimentally obtained ionization cross sections proved the applicability of the Born approximation for the range of high velocities $v > v_o$. For the range of low velocities $v < v_o$, however, it

could not be applied any more, since the cross sections for ionization by fast atoms were always a little greater than those for ionization by protons. In addition, the cross sections for ionization processes of the same kind increased with increasing target atom Z. The stripping curves of the fast atom (cross section σ_1) and the curves of the production of

singly charged ions of inert gases (cross section σ_{01}) have shown that in

most cases they reach maxima at velocities $v \approx v_o$. The peaks observed at

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S/056/62/042/003/004/049
B117/B112

lower velocities are qualitatively interpreted by a quasimolecular model, in which, owing to the drop of ionization potential, the peaks of the ionization cross sections are shifted toward lower velocities $v < v_0$, and where the ionization cross sections are interrelated by $\sigma(H)/\sigma(H^+) > 1$. From the point of view of the quasimolecular model, the proton-atom system of the inert gas seems more stable with regard to ionization than the H-atom-atom system of the inert gas. The probability that a particle will be ionized after the decay of the quasimolecule depends on the electron binding in the atom in question and on the ratio of statistical weights of possible states of charge. These two factors may effect a "competition" between the ionization processes, which must influence the position of the peaks of the ionization cross section. The curves for the production of singly charged ions of inert gases and for the stripping of the hydrogen atom confirmed the assumption that the position of the peaks depends not only on the ionization potential of the relevant atom but also on other factors. The maxima for velocities $v \sim (1 - 1.5)v_0$ were determined for cross sections $\sigma_1(H)$ and $\sigma_1(H^+)$ of ionization by atoms and protons, respectively. The experimentally obtained position of the peaks on the

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curves of cross sections for production of slow argon and krypton atoms is also given. It is noted that, as in the case of krypton, the peaks on the curves for two-electron and three-electron ionization ($\sigma_{02}(v)$, $\sigma_{03}(v)$) of argon correspond to about the same velocity $v_{max} \sim v$. As in the case of interatomic collision, the position of the peaks is presumably determined by the ratio of the internal electron velocity of the second particle to the velocity of the relative motion. V. M. Dukel'skiy and O. B. Firsov are thanked for valuable hints. There are 7 figures and 23 references: 10 Soviet and 13 non-Soviet. The four most recent references to English-language publications read as follows: R. Curran, T. M. Donahue, Phys. Rev., 118, 1233, 1960;. J. W. Hooper, E. M. McDaniel, D. W. Martin, D. S. Harmer, Phys. Rev., 121, 1123, 1961; J. W. Hooper, E. M. McDaniel, D. W. Martin, D. S. Harmer, Abstr. of the II Intern. Conf. Electronic and Atomic Collisions, Boulder, USA, 1961, p. 61 - 80; H. B. Gilbody, J. B. Hasted. Proc. Roy. Soc., A240, 382, 1957.

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

SUBMITTED: July 21, 1961

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SOLOV'YEV, YE.S., ILIN, R.N., OPARIN, V.A., FEDORENKO, N.V.

"Ionization of gases by helium ions and fast helium atoms."

Report submitted to the Third, Intl. Conf. on Physics of Electronics and Atomic Collisions,   London, England   22-26 July 1963

SOLOV'YEV, Ye. S.; IL'IN, R. N.; OPARIN, V. A.; FEDORENKO, N. V.

Ionization of Gases by Fast Helium Atoms and Singly-Charged Helium Ions

report presented at the 14th Meeting of the Intl. Committee for Electrochemical Thermodynamics and Kinetics (CITRE) Moscow, 19-25 Aug 1963.

Ioffe Physico-Tech Inst. Acad. Sci. USSR, Leningrad USSR

SOLOV'YEV, Ye.S.; IL'IN, R.N.; OPARIN, V.A.; FEDORENKO, N.V.

    Ionization of gases by fast atom and singly charged helium
    ions. Zhur. eksp. i teor. fiz. 45 no.3:496-502 S '63.
                                                    (MIRA 16:10)
    1. Fiziko-tekhnicheskiy institut imeni A.F. Ioffe AN SSSR.
            (Ionization of gases)   (Helium)

IL'IN, R.N., kand. iskusstvovedcheskikh nauk, dots.; LEBEDEVA, L., red.

[Work of a television cameraman] Rabota operatora na televidenii. Moskva, Vses. gos. in-t kinematografii, 1964. 67 p.
(MIRA 18:6)

ACCESSION NR. AP4031139   S/0056/64/046/004/1208/1211

AUTHORS: Il'in, R. N.; Kikiani, B. I.; Oparin, V. A.; Solov'yev,
Ye. S.; Fedorenko, N. V.

TITLE: Dissociation of positive hydrogen ions in collisions with
atoms and gas molecules

SOURCE: Zh. eksper. i teor. fiz., v. 46, no. 4, 1964, 1208-1211

TOPIC TAGS: proton cross section, hydrogen, nitrogen, helium, ar-
gon, particle collision, ionization phenomena

ABSTRACT: The purpose of the work was to repeat the measurements of
the cross section for the production of protons following dissocia-
tion of molecular ions H_2^+ with energy 10--180 keV in hydrogen, nitro-
gen, helium, and argon, using the same setup as previously (ZhETF v.
36, 385, 1959), but with a more thorough elimination of the main
sources of the systematic errors. Comparison of the data obtained

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on these cross sections with the work published by others shows that
over ia wide energy range the majority of the curves obtained in re-
cent work lies between the data of Sweetman (Proc. Roy. Soc. v. A256,
416, 1960 and private communication) and the early work by the
authors, with the exception of the early data by C. F. Barnett (Second
UN Intern. Conf. on Peaceful Uses of Atomic Energy, Geneva, 1958,
Report 1789) which lie considerably below. Taken together, the
various data cover almost the whole range of kiloelectron volt ener-
gies. For hydrogen, the maxima discovered and reported in the early
work are confirmed, the first being due to the predominant contribu-
tion of the dissociation of H_2^+ ions into atoms and protons, and the

second being related to the dissociation into two protons. A
separate measurement of these two cross sections by J. Guidino (C. R.
Paris, v. 253, 829, 1961) confirms these results. Orig. art. has:
4 figures and 1 formula.

Card   2/3

ACCESSION NR: AP4031139

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR
(Physicotechnical Institute AN SSSR)

SUBMITTED: 18Oct63   DATE ACQ: 07May64   ENCL: 00

SUB CODE: NP, GP   NR REF SOV: 005   OTHER: 006

Card   3/3

hydrogen, charge exchange, excited state, proton inter-

Cord   2/4

3 formulas, and 2 tables.

Akademi

..., N.V.; Ankudinov,V.A.; Il'in,R.N.   40

L 9813-66   EWT(m)/T/EWP(t)/EWP(b)/EWA(m)-2   LJP(c)   JD/JG

SOURCE CODE: UR/0386/65/002/007/0310/0314

ACC NR: AP5027990

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

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

TITLE: Charge exchange of protons in alkaline metal vapor with formation of highly excited hydrogen atoms

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. (Prilozheniye), v. 2, no. 7, 1965, 310-314

TOPIC TAGS: proton, charge exchange, alkali metal, hydrogen, excited state

ABSTRACT: The charge exchange of 10--180 kev protons in vapor of Li, Na, K, Cs, and Mg was investigated with an aim at using this process to obtain highly excited hydrogen atoms. An atomic beam, obtained by charge exchange of the protons in the vapor of these metals and purified to eliminate the charged particles, was fed into a region with strong electric field, of intensity E < 160 kv/cm. The ratio of the current field E, to the total current of the atoms I(E) was measured. This ratio characterizes the relative charge-exchange yield of the highly excited atoms. The total cross section for proton charge exchange and the ratio of the total number of atoms produced by charge exchange to the number of protons in the primary beam were also measured in individual experiments. These made it possible in turn to determine the cross section for the charge exchange accompanied by production of highly excited

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L 9813-66

ACC NR: AP5027990

atoms. Plots of the cross sections against proton energy are presented both for metallic targets and (for comparison) for He, Ne, Ar, and H_2. The plots show that the cross sections for alkaline metals and for magnesium above 15 kev decrease with increasing energy. A characteristic kink was observed for both cross sections in the region 30--70 kev, beyond which the decrease of the cross sections slows down. The presence of the kink on the curves can be attributed to the fact that at low energies the outer weakly-bound electron of the metal atom takes part in the charge exchange, while at high energies a greater role is played by charge exchange with participation of the electrons from the filled shell, analogous to the outer shell of an inert gas. The latter is confirmed by the similarity of the plots for the alkaline metals and magnesium and the similar plots for inert gases at high energies. The main conclusion of the investigation is that vapors of alkaline and alkali-earth metals are more suitable targets for the production of highly excited atoms of hydrogen at energies below 50 kev, and that molecular hydrogen and inert gases are preferable at higher energies. Orig. art. has: 3 figures.

SUB CODE: 20/   SUBM DATE: 26Jul65/   ORIG REF: 002/   OTH REF: 002

Card 2/2

L 02273-67   EWT(1)/EWT(m)/EWP(t)/ETI   IJP(c)   JD/WW/JG/AT

ACC NR: AP6025252   SOURCE CODE: UR/0057/66/036/007/1241/1250

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

ORG: Physicotechnical Institute im. A.F.Ioffe, AN SSSR, Leningrad (Fiziko-tek-hnicheskiy institut)

TITLE: Electron attachment to protons in alkali metal vapors with the formation of highly excited hydrogen atoms

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 7, 1241-1250

TOPIC TAGS: proton, charge exchange, gas target, atom, excited state, alkali metal, inert gas, hydrogen, carbon dioxide, plasma injection,

ABSTRACT: The authors have measured the cross sections of Li, Na, K, Cs, He, Ne, Ar, and H_2 for the electron attachment reaction of 10 to 180 keV protons with particular attention to the cross sections for production of highly excited hydrogen atoms. The measurements were undertaken because of their interest in connection with injection of plasma into magnetic traps. The beam, initially of protons, successively traversed the 12 cm long heated target chamber, a weak transverse electric field which removed the charged particles, a strong (up to 160 kV/cm) electric field which ionized the highly excited atoms, and a magnetic field which separated the ions from the remaining neutral atoms. The neutral atoms were recorded with a secondary emission detector

UDC: 539.186

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L 02273-67

ACC NR: AP6025252

which was calibrated against a calorimeter. The alkali metals were introduced directly into the target chamber, and the pressure of the vapor target was determined from the temperature of the chamber. Thin target data were obtained for all the target materials, and thick target (up to 0.4 cm torr) data were obtained for Na and Ne and, at some values of the incident proton energy, for K, Cs, and CO_2. The results are presented graphically and in tabular form; they are discussed at some length and are compared with theoretical calculations and with data of other investigators. It is concluded that at incident proton energies up to 30 keV the alkali metal vapors are efficient targets for producing both highly excited and moderately or unexcited hydrogen atoms, but that at higher proton energies the inert gas and H_2 targets are more effective for producing highly excited atoms. The authors thank Yu.N.Demkov for discussing the results. Orig. art. has: 7 formulas, 7 figures, and 3 tables.

SUB CODE: 20   SUBM DATE: 06Aug65   ORIG. REF: 006   OTH REF: 013

Card   2/2   vmb

IL'IN, R. S.

IL'IN, R. S.= "Investigation of systems of combining a precision eche-
     lot'e with supplementary dispersion adaptation." Min Higher Edu-
     cation USSR. Moscow Order of Lenin and Order of Labor Red Banner
     Higher Technical School imeni Bauman. Moscow, 1956. (Dissertations
     for the Degree of Candidate in Technical Sciences).

SO: Knizhnaya Letopis' No. 22, 1956