Long high-pressure arcs

30095
S/057/61/031/011/010/019
B104/B108

losses in the electrodes were determined by measuring the quantity of heat set free in the electrodes and in the casing of the chamber. As the arc length is increased from 1 to 5 cm, the portion of electrode losses drops from 80 to 45 %. The volt-ampere characteristics of a helium arc are shown in Fig. 4, and the arc voltage as a function of helium pressure is plotted in Fig. 5. Finally, the results are compared with the theory of the "channel model" of arcs (H. Maecker, Erg. d. ex. Naturw., 25, 293, 1951; W. Finkelburg, H. Maecker, Handb. d. Phys., 22, 254, 1956). Summing up: 1) If the gas surrounding the arc rotates, it is possible to obtain stable long arcs at helium pressures of 1 - 100 atm. 2) In arcs longer than 5 cm the greater part of energy is set free in the column. 3) At pressures above 20 - 30 atm, radiation losses will predominate. 4) A study of the interconnection between pressure, voltage drop, and current in the arc makes it possible to calculate the radius of the arc channel, the plasma temperature, and the ionization degree. There are 5 figures and 10 references: 1 Soviet and 9 non-Soviet.

SUBMITTED: March 20, 1961

Card 2/4

S/126/62/013/003/022/023
E039/E135

AUTHORS: Borovik, Ye.S., and Usikova, N.G.

TITLE: The properties of mixed ferrites of barium and
             strontium

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.3, 1962,
             470-474

TEXT: Barium and strontium ferrites belong 'to the class of
hard ferromagnetic materials but, by comparison with magnetic
alloys, these ferrites have a lower induced residual Br and low
magnetic energy $(BH)_{max}$, although they have an increased
coercive force H_c.   According to the literature the magnetic
energy of hard ferrites can be increased by the introduction of
certain oxides. In this paper is described an investigation of
the mechanical and magnetic properties of mixed hard ferrites of
the composition: $Ba_{1-x}Sr_xO \cdot 6Fe_2O_3$. These ferrites were
prepared from the appropriate mixture of barium and strontium
carbonates and iron oxide, initially fired at 1100 °C. The
resulting ferrite was ground and pressed into samples of
Card 1/3

The properties of mixed ferrites ... S/126/62/013/003/022/023
E039/E135

1 cm length and 0.18 cm^2 cross-section at 17 tons/cm^2. They
were then fired at 1200-1300 °C. The magnetic measurements were
made by the field reversal method for fields up to 7000 oersted
at room temperature. In this system of ferrites there appears
to be a non-monotonic dependence of properties on composition.
For the optimum temperature of sintering the ferrite
$Ba_{0.75}Sr_{0.25}O.6Fe_2O_3$ possesses better, and the ferrite
$Ba_{0.25}Sr_{0.75}O.6Fe_2O_3$ worse properties than pure ferrites. The
better properties of the former are a measure of its superior
sintering qualities. All the magnetisation measurements were
reduced to a single value of density 4.8 g/cm^2 for comparison
(sintering temperature 1230 °C). The maximum on the $(BH)_{max}$
curve occurs at x = 0.25, and the minimum at x = 0.75.
Values of the microhardness of samples of ferrites of different
composition were also measured. It is clear that a mixed
ferrite of the composition $Ba_{0.7}Sr_{0.3}O.6Fe_2O_3$ is a better

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The properties of mixed ferrites.. S/126/62/013/003/022/023
E039/E135

magnetic material than the pure ferrite of barium and strontium.
Professor B.Ya. Pines is thanked for his advice.
There are 5 figures and 2 tables.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet imeni
A.M. Gor'kogo
(Khar'kov State University imeni A.M. Gor'kiy)

SUBMITTED: Initially, May 3, 1961;
After revision, September 12, 1961.

Card 3/3

39757

S/126/62/014/001/016/018
E194/E435

$2\%, \gamma\gamma_{00}$

AUTHORS: Borovik, Ye.S., Mamaluy, Yu.A.

TITLE: The magnetic susceptibility of coarse grained
hexagonal ferrites

PERIODICAL: Fizika metallov i metallovedeniye, v.14, no.1, 1962,
146-147

TEXT: In previous articles the authors studied as functions of
temperature the susceptibility of hexagonal ferrites of Ba, Sr,
Pb, whose special feature is the absence of an increase in the
initial susceptibility on approaching the Curie point (absence of
Hopkinson effect).   This feature could be due to some special
feature of magnetic structure leading to a higher coercive force
and might not be a typical property of the materials.   It was
accordingly of interest to test these ferrites when produced at
higher firing temperatures, i.e. when they had coarse grains.
The barium and strontium ferrite specimens were prepared as before
but were twice fired at 1400°C for 1.5 hours, during which the
grain size grew to 1 mm in cross-section.   The result was a
Card 1/2

The magnetic susceptibility ...

S/126/62/014/001/016/018
E194/E435

considerably reduced coercive force, for instance for the barium
ferrite from 3050 to 300 Oe, yet the Hopkinson effect remained
absent.   Its absence is therefore typical of hard hexagonal
ferrites and is not due to special features of the domain
structure in the condition of high coercivity.   There is 1 figure.

ASSOCIATION: Khar'kovskiy gosuniversitet im. A.M.Gor'kogo
             (Khar'kov State University imeni A.M.Gor'kiy)

SUBMITTED: October 17, 1961

Card 2/2

$2\mathcal{Y}.\mathcal{7}\mathcal{7}\mathcal{O}\mathcal{O}$

AUTHORS: Borovik, Ye.S., Yakovleva, N.G.

TITLE: The influence of texture on the magnetic properties of mixed ferrites of barium and strontium

PERIODICAL: Fizika metallov i metallovedeniye, v.14, no.6, 1962, 927-930

TEXT: Of the statistically isotropic mixed ferrites, the ferrite $Ba_{0.75}Sr_{0.25}O.6Fe_2O_3$ has the highest magnetic energy, reaching 1.45×10^6 Gauss Oe.   Mixed ferrites of this system which were statistically anisotropic, due to texture, were investigated from the point of view of determining the possibility of increasing the residual induction B_r and maximum magnetic energy $(BH)_{max}$. The anisotropy was produced by applying a magnetic field (5500 Oe at the beginning, 10000 Oe at the end) during the process of pressing the powder-water mixture; after which the powder was additionally compressed (4 tons/cm^2) in the same die.   The pressings were then dried and sintered at 1100 to 1260°C for 1 hour.   To permit accurate determination of the influence of the anisotropy, identical isotropic specimens were produced by
Card 1/2

The influence of texture ....

S/126/62/014/006/016/020
E073/E420

pressing in the absence of a magnetic field. The optimum sintering temperature proved to be 1230°C and for this temperature the ferrite $Ba_{0.75}Sr_{0.25}O \cdot 6Fe_2O_3$ had the highest $(BH)_{max}$, equalling 2.9×10^6 Gauss Oe, a residual induction B_r equalling 4000 Gauss and a coercive force $_IHc$ of about 3000 Oe. $(BH)_{max}$ of the anisotropic specimens was almost twice as high and B_r and $_IHc$ were almost the same as the respective values of the isotropic control specimens. The obtained results are reproducible. There are 5 figures.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet
(Khar'kov State University)

SUBMITTED: October 14, 1962 (initially)
May 12, 1962 (after revision)

Card 2/2

$94,2300$

AUTHORS: Borovik, Ye. S., and Limar', A. G.

TITLE: Production of pulsed magnetic fields in coils cooled to low
                  temperatures

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 32, no. 4, 1962, 441-444

TEXT: The problem of the maximum possible strengths pulsed magnetic fields
is considered from the view point of the mechanical properties of coils
cooled to low temperatures. Two types of coils were investigated: Coil
no. 1: 1230 turns of .62 mm copper wire d = 0.6 cm, D/d = 12.5,
l/d = 16; $\varrho_{300}/\varrho_{20}$ = 120. When a capacitor bank of 0.1 F and 740 v was
discharged across the coil, a field of 300 koe was produced, lasting
0.05 sec from the start of the pulse up to the field maximum. This field
was accompanied by a scarcely noticeable increase in resistivity at
hydrogen temperature. Coil no. 2: 266 turns of 0.35-mm wire; d = 0.26 cm,
D/d = 7.5, l/d = 7.5; to increase the strength glass cloth impregnated with
БФ-4 (BF-4) glue was placed between the wire layers. On the outside the
coil was also wrapped with a few layers of impregnated glass cloth. After
Card 1/2

Production of pulsed magnetic ...

S/057/62/032/004/008/017
B162/B102

the coil was prepared the glue was polymerized. During the experiments the coils were immersed in liquid hydrogen. The mechanical stresses in multi-layer magnetic coils were investigated. The stresses were measured as dependent on the current passing through the coil. This function is most sensitive to the central cross-section of the coil. Radial forces proved to be most dangerous. A formula is given for the maximum mechanical stresses developing in long single-layer short-impulse coils as well as a general expression for the mechanical stresses in the coil. The results of these calculations and experiments show that to obtain the maximum fields it is expedient to design coils with a high ratio of outer external diameter to the inner D/d and high ratio of the coil length to the inner diameter $(1/d)$. By using pulsed coils cooled to low temperatures, it is possible to carry out investigations in strong fields with low consumption of energy. Glass-cloth packing makes it possible to use fields of up to ≈ 500 koe. There is 1 figure.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR Khar'kov (Physico-technical Institute AS UkrSSR Khar'kov)

SUBMITTED: May 19, 1961

Card 2/2

S/781/62/000/000/030/036

AUTHORS: Borovik, Ye. S., Limar', A. G.

TITLE: Production of pulsed magnetic fields of long duration

SOURCE: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza;
            doklady I konferentsii po fizike plazmy i probleme upravlyayemykh
            termoyadernykh reaktsiy. Fiz.-tekh. inst. AN Ukr. SSR. Kiev,
            Izd-vo AN Ukr. SSR, 1962. 144-148

TEXT: Experiments were made to determine the increase in the current-
carrying capacity of coils wound with commercial wire (copper) cooled with liquid
hydrogen. When a pulse is discharged in such a coil, the buildup of the mag-
netic field is not limited by the resistance and more energy goes into the
field, which can be made both more intense and longer. The tests have shown
that the heating conditions of the coil placed in liquid hydrogen are nearly
adiabatic, which helps the production of longer pulsed magnetic fields, but that
not all the energy stored in the discharge capacitors is utilized, only about
one-third going into the magnetic energy and one-half remaining in the capacitors.

Card 1/2

Production of pulsed magnetic fields ...   S/781/62/000/000/030/036

Better utilization of the stored energy is obtained when the period is reduced.
The mechanical stresses arising during the discharge do not harm the coil.
There are five figures.

Card 2/2

S/781/62/000/000/031/036

AUTHORS: Borovik Ye. S., Busol F. I., Grishin S. F.

TITLE: Investigation of possibility of obtaining stationary magnetic fields
            in coils cooled with liquid hydrogen

SOURCE: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza;
            doklady I konferentsii po fizike plazmy i probleme upravlyayemykh
            termoyadernykh reaktsiy. Fiz.-tekh. inst. AN Ukr. SSR. Kiev, Izd-vo
            AN Ukr. SSR, 1962. 148

TEXT: The possibility is discussed of reducing the energy consumed in the
production of large stationary magnetic fields with the aid of coils made of pure
copper and aluminum, cooled with liquid hydrogen. For the purest commercial
aluminum the power excited in the cooled coil decreases by about 500 to 1000 times.
The overall gain in energy, with allowance for modern liquefaction equipment, is
five-fold. The maximum heat loads were investigated under different cooling con-
ditions for coils made of copper wire, the resistance of which is 100 times less
at 20.4°K than at room temperature. Passage of liquid hydrogen through the coil
increases the heat removal by several times compared with natural convection.

Card 1/2

Investigation of possibility of obtaining ...   S/781/62/000/000/031/035

The increase rises with the Reynolds number. In the case of natural convection the heat load is approximately 0.2 watt/sq.cm and rises to 0.45 watt/sq.cm when liquid-hydrogen cooling is used. For a coil with inside diameter 2.2 cm, o.d. 7 cm, and length 6.2 cm a field of 43 kOe was maintained about 1 second, and 34 kOe was maintained more than 10 seconds. By replacing the winding in this coil with one made of pure aluminum and by lengthening the coil, a theoretical value of 80 kOe is attainable. Larger coils should yield not less than 100 kOe.

Card 2/2

S/781/62/000/000/032/036

AUTHORS: Borovik, Ye. S., Busol, F. I., Kovalenko, V. A.

TITLE: Investigation of the possibility of using a helium condensation pump for magnetic traps

SOURCE: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza; doklady I konferentsii po fizike plazmy i probleme upravlyayemykh termoyadernykh reaktsiy. Fiz.-tekh. inst. AN Ukr. SSR. Kiev, Izd-vo AN Ukr. SSR, 1962. 148-155.

TEXT: The investigation is devoted to the limiting heat loads that can be withstood by a helium condensation pump for a magnetic trap, and to a method for reliable heat shielding with maintenance of a sufficiently large evacuation rate. The maximum heat loads are determned for surfaces cooled with liquid helium, and it is concluded that a helium-cooled surface can serve as a pump for evacuation of hydrogen only if the rate of heat supply to this surface is much less than 2 to 5 x 10⁻⁴ watt/sq. cm. The possible shielding of a helium condensation pump against excessive heat release into the volume of a heated plasma while still maintaining a sufficient pumping rate was investigated by means of a model, the

Card 1/2

Investigation of the possibility ...   S/781/62/000/000/032/036

construction of which is described in detail. It is concluded that a helium con-
densation pump can be reliably protected against appreciable radiation and is thus
well suited for pumping of magnetic trap. A preliminary project of magnetic trap
with helium condensation pump and with coils cooled with liquid hydrogen is des-
cribed. There are two figures. The only foreign work referred to is an article
by Varnerin and Carmichael (ref. 1, J. Appl. Phys. 28, 913 (1957).

Card 2/2

BOROVIK, Ye.S.; MIKHAYLOV, I.F.; KOSIK, N.A.

Hydrogen liquefiers with high-efficiency heat exchangers. Prib.
i tekh. eksp. 8 no.3:165-168 My-Je '63.   (MIRA 16:9)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.
(Liquid hydrogen) (Heat exchangers)

45638

S/126/63/015/001/026/029.
E073/E420

AUTHORS: Borovik, Ye.S., Yakovleva, N.G.

TITLE: Investigation of the magnetic properties of binary
             systems of the mixed ferrites lead-barium and
             lead-strontium

PERIODICAL: Fizika metallov i metallovedeniye, v.15, no.1, 1963,
             151-153

TEXT: The investigation of the binary system $Ba_{1-x}Pb_xO.6Fe_2O_3$
and $Sr_{1-x}Pb_xO.6Fe_2O_3$ may lead to new high-coercivity materials.
These ferrites were produced by solid-phase reaction between
ferric oxide and carbonates of barium, strontium and lead. Mixed
Ba-Pb ferrites were produced from the powders $BaCO_3$, $PbCO_3$ and
Fe_2O_3, whilst Sr-Pb ferrites were produced from the powders
$SrCO_3$, $PbCO_3$ and Fe_2O_3 in weight ratios corresponding to the
respective stoichiometric compositions. The powders were
carefully mixed with water for several hours and then roasted for
5 hours at 900°C; blanks were pressed from the roasted powders
and sintered for 1 hour at various temperatures to produce
cylindrical specimens 0.7 to 1 cm long and about 0.16 cm^2 cross-
Card 1/3

Investigation of the magnetic ...

S/126/63/015/001/026/029
E073/E420

section. The magnetic properties were measured in fields of up to 7000 Oe. The maximum magnetic energy $(BH)_{max}$ for the mixed ferrites did not exceed appreciably the respective value of the pure barium ferrite, whatever the sintering temperature, but for the sintering temperatures of 1200 and 1230°C it was considerably greater than that of the pure lead ferrite. $(BH)_{max}$ reached 1.5×10^6 gauss Oe for ferrites with $x < 0.5$ and a sintering temperature of 1230°C. B_r showed a nonmonotonic dependence on composition for all the sintering temperatures; the maximum residual induction was 5000 gauss for $Ba_{0.25}Pb_{0.75}O.6Fe_2O_3$ and a sintering temperature of 1230°C. With increasing lead content the coercive force of mixed Ba-Pb ferrites decreased and the coercive force also decreased with increasing sintering temperature from 1100 to 1230°C. For the ferrite $Sr_{1-x}Pb_xO.6Fe_2O_3$ the best results were obtained with a sintering temperature of 1200°C, 1.55×10^6 gauss Oe for $(x \sim 0.25)$. For these compositions as well as for compositions with $x \sim 0.75$ the maxima on the $(BH)_{max} = f(x)$ curves were observed for all the sintering temperatures. With optimum sintering B_r reached

Card 2/3

Investigation of the magnetic ...

S/126/63/015/001/026/029.
E073/E420

2800 to 2900 gauss for mixtures with low contents of Pb. The
coercive force of Sr-Pb ferrites decreased with increasing Pb
content; the absolute values of $_IH_c$ decreased with increasing
sintering temperature.   The results show that these mixed
ferrites are of practical interest as good, hard ferromagnetic
materials and it is advisable to investigate the ternary system of
the mixed ferrites barium, strontium and lead.   There are
4 figures.

ASSOCIATION: Khar'kovskiy gosuniversitet im. A.M.Gor'kogo
              (Khar'kov State University imeni A.M.Gor'kiy)

SUBMITTED: April 4, 1962

Card 3/3

S/126/63/015/002/026/033
E032/E314

AUTHORS: Borovik, Ye.S. and Mamaluy, Yu.A.

TITLE: A study of the temperature dependence of the
             susceptibility of strontium and lead ferrites above
             the Curie point

PERIODICAL: Fizika metallov i metallovedeniye, v. 15, no. 2,
             1963, 300 - 302

TEXT: The ferrites $PbO.(Fe_2O_3)_6$ and $SrO.(Fe_2O_3)_6$ were
prepared from stoichiometric mixtures of the carbonates of Sr and
Pb and Fe_2O_3. They were pressed into specimens of 60 x 5 x 5 mm
and annealed at 900 °C for one hour. They were then reduced to
1.5 x 1.5 x 60 mm by a grinding wheel and baked at 1 200 °C. The
paramagnetic susceptibility was measured by the Gouy method
(Borovik-Romanov and Kreynes - ZhETF, 1955, 29, 6, 790) and the
results obtained are shown in Fig. 1, in which 1 represents the
strontium ferrite and 2 the lead ferrite. As can be seen, these
curves do not follow the Curie-Weiss law. The constants of Neel's
theory (Ann. de Phys., 1948, 3, 137) are evaluated for the
strontium and lead ferrites and for the Ba, Mg, Ni and Mn ferrites,
Card 1/3

A study of ....

S/126/63/015/002/026/033
E032/E314

for which data have been published. It is concluded that since
these constants are not very different, the molecular field
constants of hexagonal and cubic ferrites are approximately the
same. The atomic Curie constant for the Fe ion in the Ba, Pb and
Sr ferrites is found to be 4.75, 5 and 4.25, respectively, which
is in fair agreement with the result reported by Neel for Fe^{3+}.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet
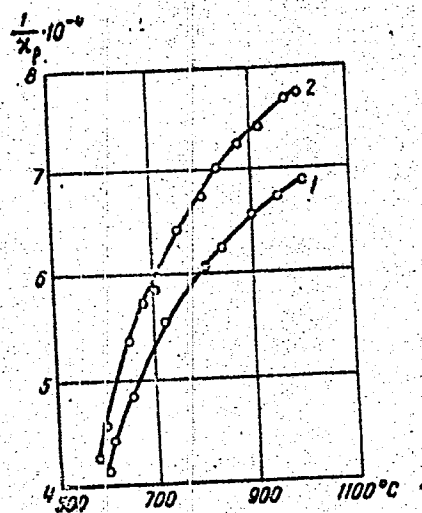   (Khar'kov State University)

SUBMITTED: July 10, 1962

Card 2/3

A study of ....

S/126/63/015/002/026/033
EO32/E314

Fig. 1:

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L 13406-63   EWP(q)/BDS/EWT(1)/EWT(m)/EED-2   AFFTC/ASD   JD
ACCESSION NR: AP3000093   S/0126/63/015/004/0511/0517

AUTHOR: Borovik, Ye. S.; Yakovleva, N. G.

TITLE: Magnetic properties of the ternary composite ferrites of barium, strontium, and lead

SOURCE: Fizika metallov i metallovedeniye, v. 15, no. 4, 1963, 511-517

TOPIC TAGS: ternary ferrite system, ferrite magnetic property, Ba, Sr, Pb, highly coercive ferromagnetic material

ABSTRACT: The present work is a continuation of an earlier investigation by the authors. However, in the present case ternary instead of binary systems of composite Ba, Sr, and Pb ferrites were analyzed. The goal was to produce higly coercive ferromagnetic materials. A new technique was used in the preparation of hexagonal ferrites. It differed from the standard procedure in the the first stage (a preliminary annealing of $BaCO_3$ and Fe_2O_3 powder) was omitted. The relations between the magnetic properties of the ternary ferrite systems to the ferrite composition were determined. The variations in the maximum magnetic energy in a ternary system were also defined and are illustrated in a trilinear chart. The magnetic properties of the best triple-ferrite compositions were

Card 1/2

L 13406-63

ACCESSION NR: AP3000093

tabulated, as were the calculated lattice constants for certain hexagonal ferrites. The authors conclude that the changes in the technique used considerably improve the properties of the compounds. The optimal sintering temperature was 1230C maintained for one hour. According to X-ray analysis, the composite ferrites of binary and ternary systems represent solid replacement solutions with a hexagonal lattice. The increase in BH is due mostly to the increase in residual induction and to an improvement in the hysteresis loop. The reason for this improvement is not clear and requires further study. In conclusion the authors express their appreciation to B. Ya. Pines, for valuable advice and the discussion of the results. Orig. art. has: 2 tables and 6 figures.

ASSOCIATION: Khar'kovskiy gosudarstvenny*y universitet im A. M. Gor'kogo (Kharkov State University)

SUBMITTED: 14Jun62   DATE ACQ: 12Jun63   ENCL: 00

SUB CODE: 00   NO REF SOV: 005   OTHER: 004

Card 2/2

L 18522-63   EWT(1)/EWP(q)/EWT(m)/BDS/EED-2   AFFTC/ASD/ESD-3   JD/JG
ACCESSION NR: AP3000112   8/0126/63/015/004/0633/0635

AUTHORS: Borovik, Ye. S.; Yakovleva, N. O.   65
                                                                       64
TITLE: Magnetic properties of mixed anisotropic Ba, Sr, and Pb ferrites

SOURCE: Fizika metallov i metallovedeniye, v. 15, no. 4, 1963, 633-635

TOPIC TAGS: magnetic property, ferrite, anisotropic ferrite, Ba, Sr, Pb, barium, strontium, lead

ABSTRACT: The influence of grain orientation on the magnetic properties of mixed ferrites was studied. The textured samples were prepared from the isotropic ferrites by the wet grinding, pressing between the poles of an electromagnet, and sintering. Their magnetic properties were measured in the direction of the magnetic field imparted during the texturing process. The average values of the magnetic parameters obtained for several sample groups of given compositions are tabulated. The maximum magnetic energies of all the ternary systems approach the high level found in anisotropic Ba ferrite. The textured ferrite $Sr_{0.75}Pb_{0.25}O \times 6Fe_2O_3$ has the highest magnetic energy of 4.4×10^6 gauss-ergs. Since the hysteresis loops obtained are not ideally rectangular, the authors conclude that the magnetic properties of the ferrites may be advanced further by improving the texturing procedure. Orig. art. has: 2 figures and 1 table.

Card 1/2/ ASSN: KHAR'KOV STATE UNIVERSITY

44753
S/057/63/033/001/012/017
B125/B186

𝒾𝒷. V3V𝐼

AUTHORS: Borovik, Ye. S., Busol, F. I., and Kovalenko, V. A.

TITLE: The investigation of the possibility of using a helium con-
           densation pump for evacuation of magnetic traps

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 33, no. 1, 1963, 100 - 104

TEXT: This report deals with the extreme thermal loads that arise in a helium
condensation pump, operating under radiation condition at $\sim 3°K$, and with
how to combine sufficiently effective thermal screening of the source with
a sufficiently high pumping velocity. The experiments were carried out in
a vacuum chamber enclosing small metallic containers of liquid helium. A
surface cooled by liquid helium can evacuate hydrogen only if the heat
added to this surface is considerably less than $q_{crit} = (3 \text{ to } 5) \cdot 10^{-4}$ w/cm^2.
At the critical heat load the temperature of the walls of the container
increases by jumps. The helium condensation pump constructed with a view
to studying the possibility of screening such a pump against a large re-
lease of heat in the region of the heated plasma proved to be suitable for
the evacuation of magnetic traps. It consists essentially of a cylindrical
Card 1/2

The investigation of the ...

S/057/63/033/001/012/017
B125/B186

tank containing several annular screens filled with liquid helium or hydro-
gen. It is protected by a copper screen, cooled by liquid nitrogen from
the radiation of the walls of the vacuum chamber and by a water screen and
a nitrogen screen from the radiation in the working volume. A helium con-
densation pump can be effectively protected against a rather intense radia-
tion. The radiation transmissivity coefficient η can be brought down even
below $3.5 \cdot 10^{-5}$ by a careful preparation of the "nitrogen screen". In the
present model a pump velocity of 1.25 l/sec nitrogen or 4.68 l/sec hydrogen
is attained per cm^2 of the inner surface of the water screen. This is
about 1/g of the critical pump velocity. For more critical heat load, a
helium condensation pump with continuous liquid current and simultaneous
evacuation of the helium vapor should be designed. Preliminary experi-
ments show promising results. There are 3 figures and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR, Khar'kov (Physico-
               technical Institute AS UkrSSR, Khar'kov)

SUBMITTED: May 30, 1960
Card 2/2

L 18483-63   EPR/EPA(b)/EWT(1)/BDS   AEDC/AFFTC/ASD/AFMDC   Ps-4/Pd-4   WW
ACCESSION NR: AP3005510   S/0057/63/033/008/0973/0981

AUTHOR: Borovik,Ye.S.; Busol,F.I.; Yuferov,V.B.; Skibenko,Ye.I.   70
                                                                              67

TITLE: Investigation of a supersonic carbon dioxide jet as a target for ionic
charge exchange

SOURCE: Zhurnal tekhnicheskoy fiziki, v.33, no.8, 1963, 973-981

TOPIC TAGS: high energy noutral beam , charge exchange target , CO_2, H, hydrogen

ABSTRACT: As part of a continuing program directed toward obtaining high energy
beams of neutral hydrogen and deuterium atoms, the charge exchange between a high
energy proton beam and a supersonic carbon dioxide jet was investigated. The proton
beam was produced in an arc source of the type described by J.Kistemaker and H.L.
Dowes Dekker (Physica, 16, 198, 1950); it was focused by a three element electro-
static lens and emerged through a 1 mm aperture. The beam current was about 1 mA
and the proton energy was varied from 15 to 25 keV. After horizontally traversing
the 30 cm diameter metal charge exchange chamber, the beam impinged on a calorime-
ter contained within a Faraday cup. Thus both the beam current and the beam energy
flux could be measured and the fraction of neutral atoms present could be obtained.

Card 1/2

L 18483-63
ACCESSION NR: AP3C05510

3

The jet of purified carbon dioxide issued from a Lavale nozzle below the proton beam and was caught on a condenser cooled with liquid nitrogen above it. When the carbon dioxide flux was increased from 0 to 15 cm^3/sec the pressure within the chamber rose from $(1-4)\times10^{-6}$ to $(8-10)\times10^{-5}$ mm Hg. This is ascribed to incomplete condensation of the carbon dioxide. A further small rise in pressure would occur when the beam was turned on; this is ascribed to the formation of CO and O_2 molecules, but the relevant cross sections could not be obtained. The fraction of neutral atoms in the beam rose with increasing carbon dioxide flux, and at a flux of 10-15 cm^3/sec it attained a saturation value of 70-75%, which agrees with the theoretical equilibrium value for a thick target. "In conclusion, we consider it our pleasant duty to express our deep gratitude to Yu.M.Fogel, D.V.Pilipenko and O.G.KonovaKov who, at our request, measured the cross sections for capture and loss of electrons by fast protons and hydrogen atoms in CO_2." Orig.art.has: 10 formulas, 4 figures, and 1 table.

ASSOCIATION: none

SUBMITTED: 02Jul62   DATE ACQ: 06Sep62   ENCL: 00

SUB CODE: PH   NO REF SOV: 007   OTHER: 003

Card 2/2

L 16906-63   EWT(1)/EWG(k)/EWP(q)/EWT(m)/BDS/EEC(b)-2   AFFTC/ASD/IJP(C)

P2-4   AT/JD
ACCESSION NR: AP3005241   · S/0056/63/045/002/0046/0048

AUTHOR: Borovik, Ye. S.; Volotskaya, V. G.; Fogel', N. Ya.   68

TITLE: Deviations from Kohler's rule in pure aluminum

SOURCE: Zhur. eksper. i teoret. fiz., v. 45, no. 2, 1963, 46-48

TOPIC TAGS: aluminum, purity, magnetoresistance, Kohler's rule

ABSTRACT: The dependence of the resistance on the magnetic field was investi-
gated for very pure aluminum samples at $20.4^\circ K$. The purpose was to check whether
Kohler's rule is valid when $R_{273}/R_{4.2}$ exceeds 2000. A noticeable deviation from
Kohler's rule is noted for high-purity aluminum sample, and it is pointed out
that both the behavior of the resistance in the magnetic field and the temperature
dependence of this resistance are anomalous, for reasons that are not clear as
yet. Orig. art. has 1 figure.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR
(Physicotechnical Institute, Acad. Sci. Ukrainian SSR)

SUBMITTED: 15Feb63   DATE ACQ: 06Sep63   ENCL: 00
SUB CODE: PH   NO REF SOV: 005   OTHER: 001
Card 1/1

SINEL'NIKOV, Kirill Dmitriyevich; RUTKEVICH, Boris Nikolayevich;
    BOROVIK, Ye.S., prof., otv. red.; VAYNBERG, D.A., red.

[Lectures on plasma physics] Lektsii po fizike plazmy.
Khar'kov, Izd-vo Khar'kovskogo gos. univ. im. A.M.Gor'kogo,
1964. 241 p.   (MIRA 17:7)

BOROVIK, Ye. S.; MIKHAYLOV, I. F., kand. tekhn. nauk; KOSIK, N. A., inzh.

Calculation of the heat exchangers of liquefying machines. Izv.
vys. ucheb. zav.; energ. 7 no.5:118-120 My '64   (MIRA 17:7)

1. Fiziko-tekhnicheskiy institut AN UkrSSR. 2. Chen-korrespondent
AN UkrSSR (for Borovik).

ACCESSION NR: AT4036071   S/2781/63/000/003/0283/0294

AUTHORS: Borovik, Ye. S.; Busol, F. I.; Yuferov, V. B.; Skibenko,
Ye. I.

TITLE: Investigation of supersonic jet of carbon dioxide as a tar-
get for charge exchange of ions

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo
termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i prob-
lemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and
problems of controlled thermonuclear synthesis); doklady* konferen-
tsii, no. 3. Kiev, Izd-vo AN UkrSSR, 1963, 283-294

TOPIC TAGS: supersonic gas flow, gas jet, charge exchange, magnetic
trap, cryogenic treatment, carbon dioxide, condensation

ABSTRACT: The described investigation is one of the stages of re-
search done by the authors to develop a hydrogen-cooled magnetic

Card 1/5

ACCESSION NR: AT4036071

trap and produce intense beams of fast neutral hydrogen or deuterium atoms. On the basis of cryogenic methods developed at the author's institute, it is proposed to use as charge-exchange targets supersonic jets of gases such as CO_2, N_2, O_2, Ar, and H_2 flowing in vacuum and completely condensed on a cooled surface (78K). The experiments reported were made with carbon dioxide. The main parameters of a supersonic jet of this gas are first derived, after which the experimental setup, the test procedures, and the results are described. The investigations give grounds for assuming that in spite of the fact that the gas was not fully condensed and that an inverse flux of CO_2 molecules was observed, the use of carbon dioxide as a charge-exchange medium is feasible particularly if the purity of the gas and the pumping-on rate are increased. The possibility of the maximum amounts of carbon dioxide that can be frozen on the condenser and the possibility of constructing a closed-cycle system are also discussed. Future experiments are planned at ascertaining the possible use of other gases and deeper cooling. "The authors thank

Card 2/5

ACCESSION NR: AT4036071

Ya. M. Fogel', D. V. Pilipenko, and S. G. Konovalov for measuring
the capture cross section and electron loss of fast protons and hy-
drogen atoms in CO_2." Orig. art. has: 4 figures, 7 formulas, and 1
table.

ASSOCIATION: None

SUBMITTED: 00   DATE ACQ: 21May64   ENCL: 02

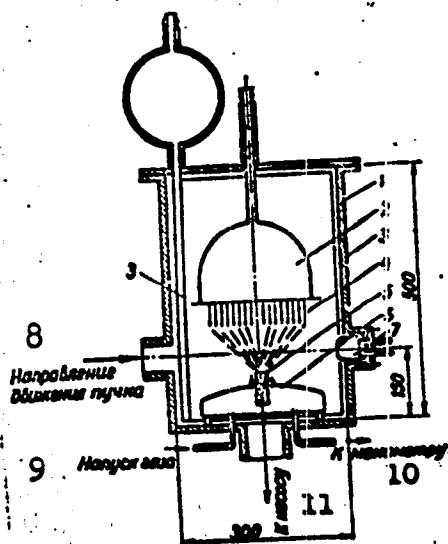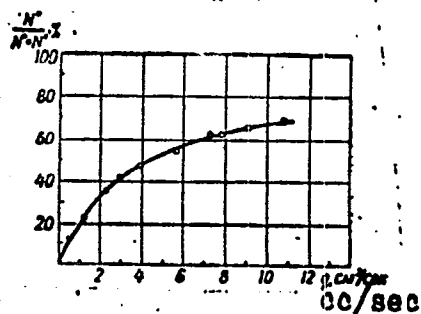SUB CODE: ME, NP   NR REF SOV: 007   OTHER: 003

Card   3/5

Diagram of charge-exchange chamber:

1 - chamber, 2 - condenser, 3 - screen,
4 - copper plates, 5 - outflow chamber,
6 - Laval nozzle, 7 - Faraday cup with
calorimeter, 8 - direction of beam motion,
9 - gas inlet, 10 - to manometer, 11 - to pump
pump

8

Направление
движения пучка

9   Напуск газа

10

11

Card 4/5

ACCESSION NR: AT4036071

Yield of neutral atoms as a function of
the CO_2 flow. Mixed beam of hydrogen
ions, E = 19.5 keV

Card 5/5.

ACCESSION NR: AT4036072   S/2781/63/000/003/0294/0299

AUTHORS: Borovik, Ye. S.; Busol, F. I.; Yuferov, V. B.

TITLE: Investigation of supersonic jets of nitrogen and argon

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3. Kiev, Izd-vo AN UkrSSR, 1963, 294-299

TOPIC TAGS: supersonic gas flow, gas jet, charge exchange, magnetic trap, cryogenic treatment, argon, nitrogen, vacuum technique

ABSTRACT: This is a continuation of a companion paper (Accession Nr. AT4036071), except that the gases tested were argon and nitrogen, and the condenser was cooled to hydrogen temperature (20.4K). In addition, in the present setup it was possible to protect the working

Card 1/3

ACCESSION NR: AT4036072

volume of the trap against the entry of jet molecules by an "abso-
lutely black" channel, constituting a tube cooled to low tempera-
ture. The experiment demonstrated the feasibility of the use of
hydrogen cooling for the development of supersonic gas target jets,
and that no additional technical problems arise in this connection;
in fact, the vacuum can be improved somewhat. The experiments have
also shown that tubes which are cooled with liquid hydrogen or
liquid helium are practically "absolutely black" to the molecules
of all gases with sufficiently low vapor tension at the correspond-
ing temperature. It is suggested that in conjunction with effective
pumping methods this method of protection will find application in
thermonuclear and other devices where large pressure drops are neces-
sary in high or superhigh vacuum. Orig. art. has: 3 figures, 2 for-
mulas, and 1 table.

ASSOCIATION: None

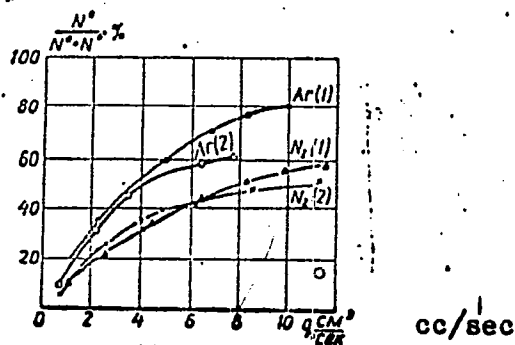SUBMITTED: 00
SUB CODE: ME
Card 2/3

DATE ACQ: 21May64
NR REF SOV: 002

ENCL: 01
OTHER: 001

ACCESSION NR: AT4036072
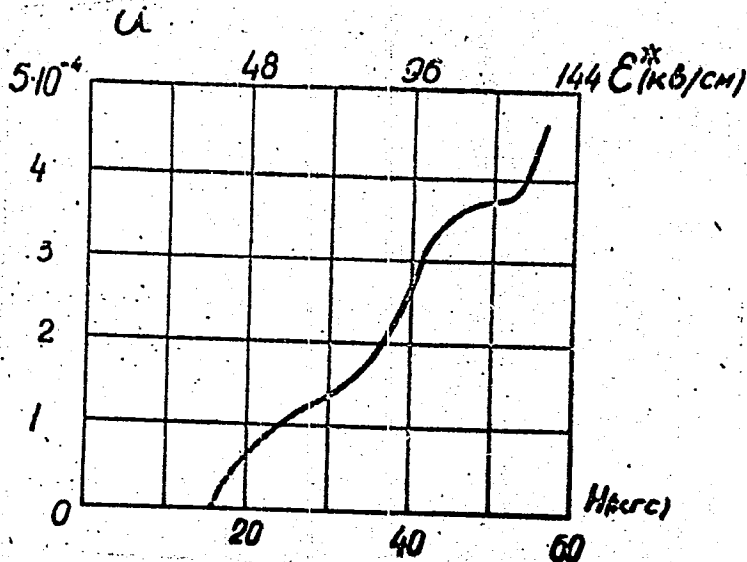
Yield of neutral molecules as a function of the gas flow. E = 15 (1) and 23.5(2) keV

Card 3/3

L 8318-66   EWT(1)/EWP(m)/EWA(d)/T/FCS(k)/EWA(m)-2/EWA(1)   IJP(c)   WW

ACC NR: AT5022296   SOURCE CODE: UR/3137/64/000/052/0001/0006

AUTHOR: Borovik, Ye. S.; Busol, F. I.; Kovalenko, V. A.; Skibenko, Ye. I.; Yuferov,
V. B.

ORG: Academy of Sciences UkrSSR, Physicotechnical Institute (Akademiya nauk UkrSSR,
Fiziko-tekhnicheskiy institut)

TITLE: Ionization of fast hydrogen atoms in strong magnetic fields

SOURCE: AN UkrSSR. Fiziko-tekhnicheskiy institut. Doklady, no. 052/P-011, 1964.
Ionizatsiya bystrykh atomov vodoroda v sil'nom magnitom pole, 1-6

TOPIC TAGS: supersonic flow, gas ionization, strong magnetic field, fast particle

ABSTRACT: The ionization of fast (30 kev) hydrogen atoms moving through a strong mag-
netic field was measured. The magnetic field, reaching a maximum of 60 kg, was pro-
duced by a multi-turn solenoid having a good field uniformity. The neutral beam was
obtained through charge exchange of the ions passing through a supersonic gas flow.
A schematic diagram shows the set of electrodes used in determining ions and electrons.
The neutral beam current (about 10^{-4} amp) was obtained by using a sensitive calori-
meter calibrated by an ion beam. Typical ion and neutral currents and magnetic field
oscillograms are shown. Such data was used to obtain the graph of the fraction of
ionized specie as a function of the magnetic field (figure 1). This result and other

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L 8318-66

ACC NR: AT5022296

data lead the authors to con-
clude that at lower magnetic
fields (in the range 32-51 kg)
the atoms with the principal
quantum number $n = 9$ are ioniz-
ed predominantly. At higher
values of the magnetic field,
atoms with $n = 8$ are also
ionized and the fraction of
ionized atoms begins to in-
crease rapidly. This work
agrees with the measurements of
the fraction of the hydrogen
atoms which are ionized in
other reported experiments.
Orig. art. has: 3 figures.

Fig. 1.

SUB CODE: 20/   SUBM DATE: 00/   ORIG REF: 004/   OTH REF: 005

Card 2/2

L 53869-65   EWT(l)/EWT(m)/EPF(c)/EPF(n)-2/EWG(m)/EWR/T   Pr-4/Pa-4/Pu-4
ACCESSION NR: AP5017237   WW/DJ   UR/0170/64/000/007/0003/0008

AUTHOR: Borovik, Ye. S.; Mikhaylov, I. F.; Kosik, N. A.

TITLE: Hydraulic friction and heat transfer in spiral counterflow heat exchange

SOURCE: Inzhenerno-fizicheskiy zhurnal, no. 7, 1964, 3-8

TOPIC TAGS: heat transfer, hydraulic resistance, industrial heat exchanger

ABSTRACT: Experiments on heat transfer and hydraulic resistance in
counterflow heat exchangers are described. The exchangers were built
of tubes of various sizes welded together to ensure good thermal con-
tact. The tubes were formed into spirals. Large diameter tubes were
for low pressure gas flow and the small diameter tubes were for the
high pressure flows. The exchanger is fashioned so that each gas flow
passes through the tube of optimum diameter. The experiments showed
that heat exchangers of this type can be used in large liquifying
machines. They are lighter than ribbed tube heat exchangers of simi-
lar capacity. Orig. art. has: 1 figure, 12 formulas, 1 graph, 1 table.

Card 1/2

L 53869-65

ACCESSION NR: AP5017237

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR, Khar'kov (Physico-Technical Institute AN UkrSSR)

SUBMITTED: 13Feb63   ENCL: 00   SUB CODE: TD, IE

NR REF SOV: 005   OTHER: 003   JPRS

Card 2/2

L 60352-65   EWT(1)/EWT(m)/EPF(c)/EPF(n)-2/EWG(m)/EPA(w)-2/EWP(t)/EWP(b)
Pz-6/Po-4/Pr-4/Pb-4/Pu-4/Pi-4   IJP(c)   JD/AT

ACCESSION NR: AP5018290   UR/0057/65/035/007/1210/1217
                                                 533.9

AUTHOR: Mitin, R. V.; Knyazev, Yu. R.; Petrenko, V. I.; Borovik, Ye. S.

TITLE: Pulse heating of a high pressure argon arc. I.

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 7, 1965, 1210-1217

TOPIC TAGS: plasma source, dense plasma, high pressure arc, fully ionized plasma, argon

ABSTRACT: The authors have continued their previous investigation of high
pressure argon arcs (ZhTF, 31, 1329, 1961; 34, 340, 1964; 34, 1224, 1964) and in
the present paper they report experiments in which a 4500 μ microfarad capacitor
charged to 3 kV or less was discharged through the low voltage arc. The low vol-
tage arcs up to 16 cm long burned between tungsten electrodes in argon at pres-
sures from 5×10^5 to 8×10^6 N/cm² in chambers constructed as described in the
references cited above. The arcs were stabilized by rotation of the gas; the ro-
tation was effected either by rotating vanes within the chamber or by tangential
injection of the gas. The arc chamber was provided with two 2 cm diameter obser-
vation ports, through which the arc was photographed, the luminous intensity was
measured, the spectrum (from 250 to 650 mμ) was recorded, and streak photographs

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L 60352-65

ACCESSION NR: AP5018458

showing the time variation of the arc diameter were made. The period of the dis-
charge was of the order of a millisecond. The current through the arc, the vol-
tage across it, and the luminous flux were displayed on an oscilloscope. The
portions of the current-voltage characteristic corresponding to rising current
in arcs of the same width and at the same pressure but with the capacitor charg-
ed initially to different voltages differed appreciably from each other, but the
portions of the characteristics corresponding to decreasing current were all co-
incident; this shows that the arc reached equilibrium by the time the current
reached its maximum. During the discharge the arc increased in diameter, the
maximum diameter increasing monotonically with increase of the maximum current,
and the luminous flux increased by a factor 2500 over its value for the 100 A
low voltage arc when the maximum current was 42 kA. The arc was stable during
the discharge; no ejection of arc plasma toward the walls of the chamber was
observed. The spectrum of the 100 A low voltage arc showed strong bright lines
of neutral argon and many weak lines of tungsten, copper, and silver arising
from the tungsten electrodes, the copper electrode holders, and the silver solder
used to join them. During a pulse at currents less than about 20 kA the spectrum
consisted of very many bright lines of roughly equal intensity, among which
lines of neutral argon could not be found. At currents from 30 to 40 kA the

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L 60352-65

ACCESSION NR: AP5018298

spectrum was continuous and was crossed by a few absorption lines, of which the strongest were due to copper and silver. It is concluded that by pulsing a long stable high pressure arc with millisecond current pulses having amplitudes of tens of kiloamperes, one can produce rather large volumes of highly ionized dense plasma in a quasistationary state. Orig. art. has: 5 figures.

ASSOCIATION: none

SUBMITTED: 20Jul64   ENCL: 00   SUB CODE: ME

NO REF SOV: 004   OTHER: 001

Card 3/3

L 60353-65   EWT(l)/EWT(m)/EPF(c)/EPF(n)-2/EWG(n)/EPA(w)-2/EWP(t)/EWP(b)
Pz-6/Po-4/Pr-4/Ps-4/Pi-4/Pu-4   IJP(c)   JD/AT

ACCESSION NR: AP5018299   UR/0057/65/035/007/1218/1224
                                              533.9

AUTHOR: Mitin, R. V.; Knyazev, Yu. R.; Petrenko, V. I.; Borovik, Ye. S.

TITLE: Pulse heating of a high pressure argon arc. 2

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 7, 1965, 1218-1224

TOPIC TAGS: plasma source, dense plasma, high pressure arc, fully ionized
plasma, argon

ABSTRACT: In this paper the authors discuss the experimental data on high pres-
sure pulsed argon arcs which they reported in the first paper of this series
(ZhTF, 35, 1210, 1965 /see abstract ACC NR AP5018298/). The properties of the
arcs at different pressures and of different lengths when pulsed with pulses of
different amplitudes were compared at their respective points of maximum current
where, as was shown in the previous paper (cited above), they were in equilibrium.
At fixed pressure and current the voltage across the arc was a linear function of
its length. The constant electric field in the arc column derived from this re-
lation was found to be approximately proportional to $I^{1/3}p^{1/4}$, where I is the
current and P is the pressure. When P was 4×10^4 N/cm^2 and I was 40 kA, the elec-
tric field was 60 V/cm. The luminance of the pulsed arc was found to be propor-

Card 1/2

L 60353-65

ACCESSION NR: AP5013299

tional to the power dissipated per unit length, and the proportionality constant $(1.3 \times 10^4$ nit cm/w) was the same as for low voltage arcs. The luminance of the brightest arcs (carrying 40 kA) was about 4×10^{10} nit; this corresponds to a black body surface temperature of 12 000 °K. The conductivity of the arc column was derived from the electric field strength and the current by assuming the column diameter to be approximately 1 cm. The conductivity of the 40 kA 4×10^6 N/cm^2 arc was approximately 275 mho/cm. From this was derived a charged particle density of 10^{19} cm^{-3} and a temperature of 30 000 °K. The temperature of the arc plasma was also derived from the energy balance equation with the two limiting assumptions of transparency and radiative heat transport; the limiting temperatures derived in this way were 25 000 and 70 000 °K. Orig. art. has: 19 formulas and 4 figures.

ASSOCIATION: none

SUBMITTED: 20Jul64   ENCL: 00   SUB CODE: ME

NO REF SOV: 005   OTHER: 002

Card 2/2

ACCESSION NR: AP4041997   S/0057/64/034/007/1224/1230

AUTHOR: Knyazev,Yu.P.; Mitin,R.V.; Petrenko,V.I.; Borovik,Ye.S.

TITLE: Radiation of a high pressure argon arc

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.7, 1964, 1224-1230

TOPIC TAGS: arc radiation, arc stability, high pressure arc, argon plasma

ABSTRACT: The authors have previously described a method for stabilizing a high pressure arc by causing the surrounding gas to rotate, and have reported experimental results obtained with helium and argon arcs (Ye.S.Borovik,R.V.Mitin and Yu.R. Knyazev,ZhTF 31,1329,1961; R.V.Mitin, Yu.R.Knyazev and V.I.Petrenko,ZhTF 34,340,1964. Now they describe two new methods for inducing the stabilizing rotation of the gas. In one series of experiments a disc bearing a number of vanes was rotated at one end of the arc chamber. With this apparatus arcs up to 8 cm long could be investigated at pressures up to 10 MN/cm². In another series, gas was injected tangentially to the cylindrical wall of the arc chamber by nozzles, withdrawn through openings in the end plates, and recirculated by a pump. With this apparatus arcs up to 25 cm long could be investigated at pressures up to 2.5 MN/cm². High pressure rotation

Card 1/2

ACCESSION NR: AP4041997

stabilized argon arcs between water-cooled metallic electrodes were investigated
with the apparatus mentioned above. Currents up to 150 A were employed. With fixed
pressure and arc current, the voltage across the arc increased linearly with the
length of the arc for arcs more than a few centimeters long. The electric field
within the arc column was assumed to be equal to the rate of increase of arc vol-
tage with length. The electric field increased with gas pressure and was approxi-
mately 15 V/cm at a pressure of 8 MN/cm^2. The radiation of the arc column was mea-
sured with a thermocouple taken from a radiation pyrometer and calibrated with sol-
ar radiation against a calorimeter. The radiation was large near the electrodes,
but the power radiated per unit length by the arc column was constant and only a
few percent less than the product of the arc current by the electric field in the
column. This confirms a previous conjecture that the energy loss from the arc col-
umn by convection is small. Most of the energy supplied to arcs more than a few
centimeters long was lost by radiation. Orig.art.has: 3 formulas, 5 figures and 1
table.

ASSOCIATION: none

SUBMITTED: 04Jul63

SUB CODE: EM,ME   NR REF SOV: 002   ENCL: 00
Card
2/2   OTHER: 002

BOROVIK, Ye.S.; BATRAKOV, B.P.; KOBZEV, P.M.

Helium liquefier with flow-through liquid heat exchangers.
Prib. i tekh. eksp. 9 no.4:197-200 Jl-Ag '64.   (MIRA 17:12)

L 42119-65   EPF(n)-2/EPA(w)-2/EWP(z)/EWT(1)/EWT(m)/EWG(m)/EWP(b)/EWA(c)/EWP(t)
Pi-4/Po-4/Pz-6/Pab-10   IJP(c)   AT/DM/WW/MJW/JD
ACCESSION NR: AP5005796   B/0089/65/018/002/0091/0096

AUTHOR: Borovik, Ye. S.; Katrich, N. P.; Nikolayev, G. T.

TITLE: Penetration of atomic hydrogen ions into the surface of stainless steel

SOURCE: Atomnaya energiya, v. 18, no. 2, 1965, 91-96

TOPIC TAGS: hydrogen ion, ion penetration, stainless steel, magnetic trap, high
vacuum

ABSTRACT: Since earlier tests were not made under vacuum conditions, and since
the penetration of gas ions in various materials is of interest in connection with
the design of magnetic plasma traps and the accompanying high-vacuum requirements,
the authors describe an installation and report the results of first measurements
of the coefficient of penetration of 35-keV hydrogen ions H_1^+ in a target made of
stainless steel (1Kh18N9T). A diagram of the apparatus is shown in Fig. 1 of the
Enclosure. The apparatus, its preparation for measurements, and the measurements
themselves are described in detail. The use of hydrogen and helium condensation
pumps ensured ultra-high vacuum in the installation. The coefficient of penetra-

Card 1/2

L 42119-65
ACCESSION NR: AP5005796

tion for an ion density range 10^{18} - 2×10^{19} was found to be 0.93, independently
of the number of penetrating ions. The results suggest that under conditions of
magnetic traps the rate of pumping out of slow neutral particles can be taken at
least one order of magnitude lower than the rate established from the drift of the
fast particles from the plasma region. Orig. art. has: 5 figures.

ASSOCIATION: None

SUBMITTED: 15Jul63   ENCL: 00   SUB CODE: NP, MM

NR REF SOV: 003   OTHER: 006

Card 2/3

L 5354-66   EWT(1)/EWT(m)/EPF(n)-2/EWA(d)/EWP(t)/EWP(z)/EWP(b)   IJP(c)
ACCESSION NR: AP5021105   JD/WW/JG/GG   UR/0056/65/049/002/0438/0446

AUTHOR: Borovik, Ye. S.; Fogel', N. Ya.; Litvinenko, Yu. A.

TITLE: Study of magnetic flux jumps in hard superconductors in pulsed magnetic fields

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 2, 1965, 438-446

TOPIC TAGS: ferromagnetic superconductivity, niobium, niobium compound, superconducting alloy, phase transition

ABSTRACT: The authors investigated the magnetic-flux jumps occurring in Nb_3Sn and $NbZr$ in pulsed magnetic fields. The samples were prepared by a procedure described elsewhere (V. D. Brodich et al., ZhETF v. 44, 110, 1963), and the technique of producing strong magnetic-flux pulses was one developed by one of the authors earlier (Borovik, with A. G. Limar', ZhETF v. 31, 939, 1961). The main measurements were made at 4.2K, but some of the measurements of Nb_3Sn were made in the temperature range 14.5—18K. The changes in flux accompanying the jumps ranged from 1×10^{-2} to 4 G-cm^2, and the jump durations ranged from 2×10^{-5} to 5×10^{-4} sec. Each jump is connected with a partial penetration of the flux into the superconductor. The relation between the jumps and the critical fields of the super-

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L 5354-66   6

ACCESSION NR: AP5021105

conductor is discussed, as are various factors governing the magnitudes and dura-
tions of the jumps. It is concluded that the experimental data do not show con-
clusively whether the observed flux jumps are associated with the existence of in-
dividual regions of superconductivity with different parameters, or whether they
are connected with some microscopic processes which limit the rate of phase transi-
tion. "The authors thank Professor M. I. Kaganov for a discussion of the work."
Orig. art. has: 5 figures and 1 formula.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR (Physico-
technical Institute, Academy of Sciences, Ukrainian SSR)

SUBMITTED: 15Mar65   ENCL: 00   SUB CODE: SS, EM

NR REF SOV: 004   OTHER: 011

Card 2/2

BOROVIK, Ye.S.; VOLOTSKAYA, V.G.

Anisotropy of the galvanomagnetic properties of pure aluminum in strong effective fields. Zhur. eksp. i teor. fiz. 48 no.6: 1554-1561 Je '65.
(MIRA 18:7)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.

L 57814-65   EPR/EWP(k)/EWT(m)/EWP(b)/T/EWA(d)/EWP(w)/EWP(t)   Ps-4
IJP(c)   JD

ACCESSION NR: AP5008793   S/0126/65/019/003/0451/0455
                                                     539.4.019.L

AUTHOR: Borovik, Ye. S.; Mamedov, M. Sh.; Volotskaya, V. G.

TITLE: Pulse strength of metals

SOURCE: Fizika metallov i metallovedeniye, v. 19, no. 3, 1965, 451-455

TOPIC TAGS: metal mechanical property, copper alloy, aluminum alloy, metal wire

ABSTRACT: The strength of a copper and aluminum wire was studied under current pulses of $\tau = 0.8 \times 10^{-4}$ and 2×10^{-3} sec duration and at temperatures of 293, 77 and 20°K. Coils of the wire were positioned between the poles of a magnet; upon passing current through the circular coil, the plane of which was perpendicular to the field, radial forces appeared which stretched the coil. Under single pulse loadings of 0.8×10^{-4} sec duration the strength of the aluminum and copper wire was about two times higher than the static strength and at $\tau = 2 \times 10^{-3}$ sec the strength of the copper wire was about the same as the static strength. Under multipulse loading the strength was less by a factor of approximately 1.7 when compared with static values, and was equal for both pulse durations. A graph is given which shows the

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L 57814-65
ACCESSION NR: AP5000793

relationship between the destructive load and the rate of plastic deformation.
Orig. art. has: 4 figures, 3 tables.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR (Physicotechnical Institute,
AN UkrSSR)

SUBMITTED: 13Jan64   ENCL: 00   SUB CODE: MM, EM

NO REF SOV: 004   OTHER: 004

Card 2/2

L 61721-65   EWA(h)/EWT(1)/EWT(m)/EWP(b)/T/EWA(d)/EWP(w)/EWP(t)   Ps-4/Peb   IJP(c)
JD

ACCESSION NR: AP5016545   UR/0056/65/048/006/1554/1561

AUTHOR: Borovik, Ye. S.; Volotskaya, V. G.

TITLE: Anisotropy of the galvanomagnetic properties of pure aluminum in strong effective fields

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 6, 1965, 1554-1561

TOPIC TAGS: galvanomagnetic property, magnetoresistance, aluminum, low temperature research, purity effect, magnetic field effect, Fermi surface

ABSTRACT: This is a continuation of an earlier investigation of the galvanomagnetic properties of aluminum (ZhETF v. 44, 80, 1963), except that the purity of the aluminum was greatly increased (R_{272}/R_{42} = 6400--20,000). The measurements were made at 4.2K. The earlier study of the anomalous behavior of the resistivity of pure aluminum as compared with more contaminated aluminum (ZhETF v. 45, 46, 1963) is repeated at a lower test temperature (4.2K). The samples were made from aluminum purified by zone melting. Since the resistance remained practically unchanged below 4.2K, it can be assumed that the resistance at 4.2K is the residual resistance and characterizes the purity of the sample. The results show that the magnetoresistance of aluminum of very high purity increases with the magnetic field at all

Card 1/2

L 61721-65
ACCESSION NR: AP5016545

investigated directions of the magnetic field. A check was made to see whether this increase can be attributed to some side effects occurring in the aluminum with increasing purity (bending of the current line, size effect, static skin effect), but it is concluded that none of these side effects can cause the large anisotropy and the growth of the resistance with magnetic field. The results are interpreted by assuming the existence of a narrow layer of open trajectories in the Fermi surface of aluminum. "The authors thank M. I. Kaganor for a discussion of the results and valuable advice." Orig. art. has: 5 figures, 1 formula, and 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR (Physico-technical Institute, Academy of Sciences, Ukrainian SSR)

SUBMITTED: 25Dec64   ENCL: OO   SUB CODE: SS

NR REF SOV: 011   OTHER: 006

Card 2/2

ACC NR: AT5028591   EWT(l)   IJP(c)   WW/GS

AUTHOR: Ye. I. Borovik, Ye. S.; Busol, F. I.; Kovalenko, V. A.; Yuferov, V. B.; Skibenko,

ORG: none

SOURCE CODE: UR/0000/65/000/000/0421/0431

TITLE: 2/, 44, 5 5 Magnetic trap with a strong magnetic field

SOURCE: Konferentsiya po fizike plazmy i problemam upravlyayemogo termoyadernogo sinteza. 4th, Kharkov, 1963. Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza (Physics of plasma and problems of controllable thermonuclear synthesis); doklady konferentsii, no. 4. Kiev, Naukova dumka, 1965, 421-431

TOPIC TAGS: strong magnetic field, magnetic mirror, charge exchange, vacuum pump, plasma injection, liquid nitrogen, liquid hydrogen, magnetic mirror, charge exchange, plasma injection

ABSTRACT: The design of the magnetic mirror with a very strong magnetic field described in this work is similar to that of other machines which generate high magnetic fields. The features of a neutral beam are described by injection of neutral hydrogen atoms. The features of a neutral beam charge exchange cell and beam trap are described. The method of magnetic fields necessary in such machines depends on a ...

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L 18838-66

ACC NR: AT5028591

which is described in this work. Magnetic fields in the magnetic trap of 10 tesla
were attained by cooling multiturn (4280 turns) coils with an inner diameter of 5
cm. Two-stage cooling with liquid nitrogen followed by liquid hydrogen to 20.4°K
made it possible to energize the coil twice an hour. The coils and cooling system
construction are described in detail. The inductance and resistance of such coils
was determined to be 0.8 h and 0.21 ohms at low temperature. Two coil sections
with variable separation along their axis can be used to provide a suitable magnet-
ic field configuration normally forming a working volume of $3.35 \cdot 10^{-4}$ m^{-3} with a
very uniform field. The entire assembly was placed in a vacuum jar in which the
neutral injection experiment is performed. Very high capacity pumps (70 m^3/sec)
provide the necessary vacuum conditions. Orig. art. has: 6 figures.

SUB CODE: 20/   SUBM DATE: 20May65/   ORIG REF: 014/   OTH REF: 006

Card 2/2   vmb

L   18837-66   EWT(1)   IJP(c)   GS

ACC NR: AT5028592

AUTHOR: Borovik, Ye. S.; Busol, F. I.; Sinel'nikov, K. D. (Academician AN UkrSSR)

SOURCE CODE: UR/0000/65/000/000/0431/0441

ORG: none

TITLE: Computation of filling a GVL-2 magnetic trap with plasma

SOURCE: Konferentsiya po fizike plazmy i problemam upravlyayemogo termoyadernogo sinteza. 4th, Kharkov, 1963. Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza (Physics of plasma and problems of controllable thermonuclear synthesis); doklady konferentsii, no. 4. Kiev, Naukova dumka, 1965, 431-441.

TOPIC TAGS: fluted magnetic field, magnetic trap, Coulomb collision, strong magnetic field, plasma density, magnetic mirror, ion density

ABSTRACT: The process of filling a magnetic mirror configuration of small volume, formed by very strong magnetic field, is studied. The system considered is a magnetic trap of the GVL-2 device described in Borovik, Ye. S., Busol, F. I., Kovalenko, V. A., Yuferov, V. B. and Skibenko, Ye. I., p. 421, Konferentsiya. The system has a mirror ratio which can be varied from 1.5 to 4. To predict the ion den-

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L 18837-66

ACC NR: AT5028592

sity attainable in this system, rate equations are given for the ionization of neu-
trals by magnetic fields and by collisions, recombinations, and end losses. Compu-
tations are carried out for two values of the neutral capture coefficients. It is
shown that when Coulomb collisions are not important, initial plasma density of
about $7 \cdot 10^{12}$ particles per m^3 can be obtained in 1 sec for $5 \cdot 10^{12}$ particles per m^3
in 2 sec for a capture coefficient of $5 \cdot 10^{-3}$ and $1 \cdot 10^{-3}$, respectively. It is esti-
mated that densities of 10^{12} particles per m^3 can be obtained if Coulomb collisions
are accounted for and instabilities can be suppressed. The estimate of plasma be-
havior indicates that the most prevalent flute instability may not be very effective
since a relatively small portion of reflected particles have an unsuitable drift
velocity. Additionally, the magnetic field increasing in time should have a stabi-
lizing effect. It is posited that reduced charge recombination and increased ioni-
zation can result from the use of magnetic screens as well as from multiple excita-
tion. Orig. art. has: 2 figures, 12 formulas.

SUB CODE: 20/   SUBM DATE: 20May65/   ORIG REF: 009/   OTH REF: 008

Card 2/2   vmb

L 24047-66   EWT(1)   IJP(c)   WW/GS/AT/GW
ACC NR: AT6008842   SOURCE CODE: UR/0000/65/000/000/0040/0044

AUTHOR: Borovik, Ye. S.; Busol, F. I.; Kovalenko, V. A.; Skibenko, Ye. I.; Yuferov,
V. B.   7.2
                                                                    Bil
ORG: none
        2/   2/
TITLE: Ionization of fast hydrogen atoms in a strong magnetic field

SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova dumka, 1965,
40-44

TOPIC TAGS: strong magnetic field, hydrogen plasma, gas ionization, charge exchange,
plasma physics, atom, fast particle

ABSTRACT: Data are given from preliminary experiments on determining the fraction of
α-hydrogen atoms with an energy of 30 kev ionized by the Lorentz force in a magnetic
field with an intensity of up to 60 kev. In contrast to Sweetman's experiments (D. R.
Sweetman, Nuclear Fusion Suppl. 1962, part 1, p 279) where the quantity α was evaluat-
ed from the stream of fast atoms generated during charge exchange between trapped
ions, the authors of this paper measured directly the number of ions formed when a
beam of neutral hydrogen atoms passes through a magnetic field. A strong magnetic
field was produced by two copper solenoids with internal and external diameters of 5
and 22 cm respectively. The solenoids were cooled to low temperatures and supplied

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L 24047-66

ACC NR: AT6008842

by a battery of capacitors. The buildup time for a maximum field intensity of about
60 kilogauss in the center of the gap between the coils was 0.26 seconds. There was
a 4.5% reduction in the field at a radius of 2.5 cm from the axis. The beam of neu-
tral hydrogen atoms was produced by charge exchange between an ion beam and a super-
sonic jet of carbon dioxide frozen on a surface cooled by liquid hydrogen. The charge
exchange target was 0.9 meters from the axis of the magnetic system. The fraction of
the particles ionized in the central region of the field (with a radius of about 2.2
cm) was determined by simultaneously measuring the equivalent "current" of the neutral
atoms and the ion current through the central collector (see figure) situated with re-
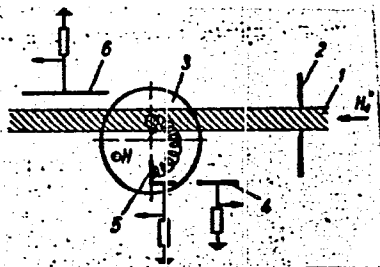spect to the beam and to the two other collectors (input and output) in such a way

Diagram showing the location of the ion
collectors in the magnetic field:
1--beam of hydrogen atoms; 2--diaphragm; 3--
central region of the field; 4--input collect-
or; 5--central collector; 6--output collector

that all ions formed in this region are incident on the central collector due to azi-

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L 24047-66

ACC NR: AT6008842   O

muthal drift in the nonhomogeneous field only for the case of fields exceeding 25 kilogauss. In the case of weaker fields, some of the ions from the central region are incident on the input and output collectors and when the fields are still weaker (below 12-15 kilogauss) not one of the particles ionized in this region of the field can reach the central collector. A curve is given showing the fraction of atoms ionized in the central region of the field as a function of field intensity. A comparison between this curve and the data in the literature on ionization thresholds and regions for individual levels of the hydrogen atom with a given principal quantum number n shows that atoms with $n = 9$ are ionized in magnetic fields ranging from approximately 32 to 51 kilogauss. Ionization of atoms with $n = 8$ takes place in still stronger fields. Even in extremely strong fields, α continues to grow rapidly with an increase in H. In some experiments the current through the output collector was much greater than could have been expected for residual gas ionization. This shows that a considerable number of hydrogen atoms may have been excited to levels which allowed them a mean free path of several centimeters in strong magnetic fields without ionization. Orig. art. has: 3 figures.

SUB CODE: 20/   SUBM DATE: 20Oct65/   ORIG REF: 004/   OTH REF: 005

Card 3/3 dla

L 24050-66   EWT(d)/EWT(1)/EWT(m)/EWP(f)/EPF(n)-2/T/ETC(m)-6   IJW/DJ/GG/GS/GW

ACC NR: AT6008848   SOURCE CODE: UR/0000/65/000/000/0105/0113

AUTHOR: Borovik, Ye. S.; Nikolayev, G. T.; Sharevskiy, B. A.

ORG: none

TITLE: Heated condensation pumps

SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova dumka, 1965, 105-113

TOPIC TAGS: high vacuum pump, ultrahigh vacuum, low temperature effect, liquid helium

ABSTRACT: Heated condensation pumps which operate at hydrogen or helium temperatures are designed for producing a superhigh vacuum ($\sim 10^{-10}$–10^{-11} mm Hg) in large metal vessels for a relatively short time. The authors discuss the development of the heated hydrogen condensation pump and data from preliminary experiments on the use of liquid helium in a heated condensation pump. It is pointed out that a nitrogen screen has an extremely low coefficient of absorption for thermal radiation under ultrahigh vacuum conditions unless it is specially darkened and therefore the hydrogen condensation pump is practically unprotected by this type of screen from thermal radiation. It is also noted that an oil diffusion pump which has not been subjected to the action of atmospheric air may operate without a nitrogen trap with no reduction in the ultrahigh vacuum characteristics of the installation. These facts were used to simplify the con-

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L 24050-66

ACC NR: AT6008848

struction of a heated hydrogen condensation pump by eliminating the nitrogen screen as
well as to simplify and perfect the system for breaking in the installation by using
oil diffusion pumps. The system of hot conditioning was also simplified by reducing
the temperature and duration of heating. It was found that normal heating of the in-
stallation reduces the pressure to a minimum, after which it slowly increases at a rate
equivalent to leakage of noncondensed gases into the system: $\sim 10^{-8}$ $\mu\ell$/sec when the
valve connecting the installation to the diffusion pump is closed. If the hydrogen
vapor is evacuated from the hydrogen pump, the increase in pressure begins 1.5-2 hours
later. The mechanism responsible for this phenomenon has not yet been studied in
detail. However it has been established that the sources of uncondensed gas are the
glass lead-ins of the monometric tube, and also the flange connections which are cool-
ed later than the walls of the installation. Additional cooling of the glass leads
or flanges reduces the effect. Preliminary experiments on the use of liquid helium
in heated condensation pumps showed that these pumps produce a higher and more stable
vacuum, other conditions being equal. These experiments are still in progress. Orig.
art. has: 4 figures.

SUB CODE:/3,20/   SUBM DATE: 20Oct65/   ORIG REF: 005/   OTH REF: 001

Card 2/2 dd

L 23566-66   EWT(m)/T/EWP(t)/EWA(h)   JD/HW/GS

ACC NR: AT6008852   SOURCE CODE: UR/0000/65/000/000/0130/0136

AUTHOR: Borovik, Ye. S.; Katrich, N. P.; Nikolayev, G. T.

ORG: none

TITLE: Vaporization of stainless steel by H_1^+ ions and penetration of these ions into the surface

SOURCE: AN UkrSSR. Magnitnyye lovushki (Magnetic traps). Kiev, Naukova, dumka, 1965, 130-136

TOPIC TAGS: hydrogen, stainless steel, vaporization, charged particle

ABSTRACT: The authors studied the vaporization coefficient for stainless steel bombarded by H_1^+ ions as well as the penetration factor for these ions. A diagram of the measurement chamber is shown in the figure. Before bombardment, the target was degassed by heating to approximately 400°C for three hours. Target 3 (made from 1X18N9T stainless steel) is fastened in holder 4. The target holder is insulated from the measurement chamber by a glass junction so that the ion current may be measured directly during bombardment of the target. The target was heated simultaneously with the measurement chamber by an external heater to approximately 300°C for three hours. Collector 6 (made from 0.05 mm aluminum foil) is a truncated cone with a diameter of 35 mm at the base and 24 mm at the apex. The collector is 70 mm long and is protected from the ion beam by screen 5 (made from stainless steel). A hydrogen condensation
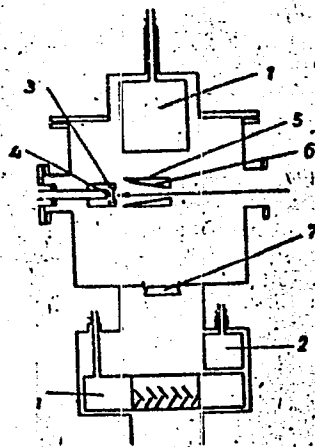
Card 1/3

L 23566-66

ACC NR: AT6008852   O

pump was used for evacuating the measurement chamber during degassing. After heating, liquid helium was poured into the helium condensation pumps and liquid hydrogen was poured into hydrogen condensation pump 1. The measurement chamber was then disconnected from hydrogen condensation pump 2 by heated metal valve 7. This method gave a final pressure of no more than $1 \cdot 10^{-9}$ mm Hg. A beam of 35 kev H_1^+ ions incident on target 3 was electrically recorded by applying a blocking potential across collector 6. The current of the ion beam was ordinarily 100--180 µa. The hydrogen ions penetrate part way into the target as they strike and the vaporized metal of the target is accumulated by the collector. The following formulas are given for calculating the coefficient of vaporization a and the penetration factor η:

$$\alpha = \frac{\Delta P_\alpha}{9.3 \cdot 10^{-21} l/qt}$$

$$\eta = \frac{\Delta P_K + \Delta P_M}{1.67 \cdot 10^{-21} l/qt}$$

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ACC NR: AT6008852

where ΔP_t is the reduction in the weight of the garget; ΔP_0 is the increase in the weight of the collector; i is the current of the H_1^+ ion beam in amperes; q is the charge of an electron in coulombs; t is the time of target bombardment in seconds; $9.3 \cdot 10^{-23}$ is the weight of a single iron atom in grams and $1.67 \cdot 10^{-24}$ is the weight of a single hydrogen atom in grams. The results show a coefficient of $9 \cdot 10^{-3}$ for vaporization of stainless steel by H_1^+ ions with an energy of 35 kev, and a penetration factor of 0.5. Orig. art. has: 2 figures, 1 table, 2 formulas.

SUB CODE: 20///   SUBM DATE: 20Oct65/   ORIG REF: 004/   OTH REF: 002

Card 3/3

L 47037-66   EWT(1)/EWT(m)/EWP(t)/ETI   IJP(c)   AT/JD

ACC NR: AP6029801   SOURCE CODE: UR/0089/66/021/002/0130/0131

AUTHOR: Borovik, Ye. S. (deceased); Busol, F. I.; Glasov, B. V.; Kovalenko, V. A.;
Skibenko, Ye. I.; Yuferov, V. B.

ORG: none

TITLE: VGL-2 cryogenic magnetic trap

SOURCE: Atomnaya energiya, v. 21, no. 2, 1966, 130-131

TOPIC TAGS: MAGNETIC TRAP DEVICE, magnetic trap, hydrogen plasma, deuterium, plasma heating, plasma injection, cryogenic liquid cooling/VGL-2 magnetic trap DEVICE

ABSTRACT: Since one of the means of producing a hot plasma is to inject intense
beams of fast neutral hydrogen or deuterium atoms into a magnetic field, where they
can be ionized, the authors describe the processes accompanying the filling of a small
magnetic trap in which a strong magnetic field is produced. (Fig. 1) The trap differs from earlier designs in that the strong magnetic field up to (105 kG) is produced by a copper coil cooled with liquid nitrogen which is also used to cool the
outside of the vacuum chamber and thus permits a vacuum as low as $\sim 5 \times 10^{-10}$ Torr to
be maintained in it. An Ardenne type source is used for the hydrogen-ion beam, the
charge exchange being in a supersonic CO_2 stream condensed on a surface cooled to
20.4K. The fraction of the neutral beam ionized in the wording region of the chamber

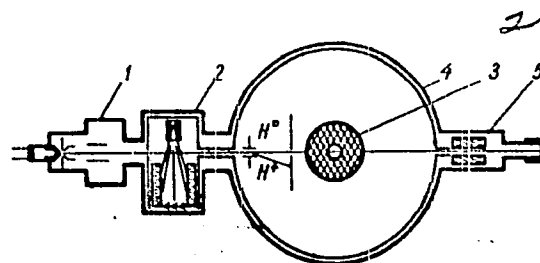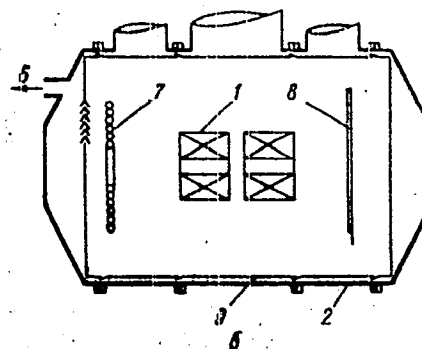Card 1/3   UDC: 533.9

L 47037-66

Fig. 1. Diagram of VGL-2 trap. a- section
along beam axis, b - along field axis; 1 -
ion source, 2 - charge exchange chamber, 3 -
magnetic system, 4 - vacuum jacket, 5 - beam
inlet, 6 - to pump, 7 - helium condensation
pump, 8 - hydrogen pump, 9 - nitrogen screen

Card 2/3

L 47037-66

ACC NR: AP6029801

was of the order of 5×10^{-5}. The plasma density was determined from the intensity of flux of fast atoms leaving the plasma as a result of charge exchange between the ions and the residual gas, and also from the value of the injected current in the trap. The values obtained were ~ $(3-4) \times 10^7$ and ~ 3×10^8 cm^{-3}, respectively, the difference being due to a small redistribution of the ion velocities in the plasma. Orig. art. has: 2 figures and 2 formulas   [02]

SUB CODE: 20/ SUBM DATE: 01Apr66/ ORIG REF: 003/ OTH REF: 003 / ATD PRESS: 5089

Card 3/3

BOROVIK, Ye.S. [Borovyk, L.S.]; MIKHAYLOV, I.F. [Mykhailov, I.F.]; KOSIK, L.A. [Kosyk, M.A.]

Study of heat transfer and hydraulic resistance in coil-pipe counterflow heat exchangers. Ukr. fiz. zhur. 9 no.7:749-758 Jl '64.

(MIRA 17:10)

1. Fiziko-tekhnicheskiy institut AN UkrSSR, Khar'kov.

BOROVIK, Ye.S.; MAMALUY, Yu.A.

Temperature dependence of the magnetic permeability and anisotropic energy in certain systems of mixed ferroxplana. Fiz.met. metalloved. 18 no.5:703-710 N '64.   (MIRA 18:4)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M.Gor'kogo.

BOROVIK, Z.G.

BLINOVA, V.N.; DEMIDOV, A.A.; KOLIN, Ya.S.; MAKUSHKIN, Ya.G.; MYZIN, L.M.;
PERMYAKOV, N.P.; PONEDILKO, A.I.; BOROVIK, Z.G.; YEFREMOV, I.A.;
KOPAYGORODSKIY, A.B.; MARINOV, A.N.; NEKHOROSHKOVA, O.I.; POKROVSKIY,
A.F.; ROMANOVSKIY, A.A.; RASSADNIKOV, Ye.I., red.; SAVEL'YEV, V.I.,
red.; FRIDKIN, A.M., tekhn.red.

[Electric power in the Urals during the past 40 years] Energetika
Urala za 40 let. Moskva, Gos. energ. izd-vo, 1958. 141 p.

(MIRA 11:5)

(Ural Mountain region--Electric power)

BOROVIK, Z.G.

BOROVIK, Zinoviy Grigor'yevich; MARKOV, K.M., inzh., retsenzent;
KOVALENKO, A.V., inzh., red.; DUGINA, N.A., tekhn. red.

[Technological innovations for saving electric power] Tekh-
nicheskie usovershenstvovaniia dlia ekonomii elektroenergii.
Pod red.A.V.Kovalenko. Moskva, Mashgiz, 1961. 30 p.
                                               (MIRA 15:4)

    (Electric furnaces)   (Electric power)

BAGROV, O.N.; BOROVIK, Z.G.

      Accelerate preparations for conversion to gas. Stroi. truboprov.
8 no.3:4-5 Mr '63.   (MIRA 16:5)

      1. Sredne-Ural'skiy sovet narodnogo khozyaystva, Sverdlovsk.
                            (Gas, Natural)

BOROVIK-ROMANOV, A. S.

USSR/Physics

Spectrophotometers

Color - Measurements

Jul/Aug 1947

"Photoelectric Spectrophotometer for Investigating the Chromatic Microstructure of Painted Surfaces and Solutions," A. S. Borovik-Romanov, L. M. Ivantsov, 5 pp

"Iz Ak Nauk, Ser Fiz" Vol XI, No 4, 443 - ?

This work is a record of investigations on the comparative attainments of photoelectric equipment used for various methods of spectral analysis. During a change of intensity of the spectrum lines in the emission spectrums, some difficulty was met during the experiments, in that it was difficult to separate the lines.

28T92

USSR/Physics (Contd)   Jul/Aug 1947

and eliminate radio-technical interference. Discussed the construction of the apparatus. Submitted at the Physics Laboratory of the Research and Investigation Section, Militie Administration, Moscow.

28T92

BOROVIK-ROMANOV, A. S.

USSR/Physics - Magnetic Susceptibility   Nov 51

"Magnetic Susceptibility of Solid Oxygen at Low
Temperatures," A. S. Borovik-Romanov, Inst of
Phys Problems, Acad Sci USSR

"Zhur Eksper i Teoret Fiz" Vol XXI, No 11,
pp 1303-1308

Measured absolute values of magnetic susceptibili-
ties of liquid O_2 at 77°K and of solid O_2 at 20°K
and studied the thermal behavior of susceptibility
of solid O_2 between 20 and 14°K and between 4.2
and 1.5°K. Established that susceptibility of O_2
decreases 9% following square law between 20 and

USSR/Physics - Magnetic Susceptibility   Nov 51
          (Contd)

204T99

14°K, at 4.2 K keeps same value as at 14 K and ex-
hibits a weak linear increase reaching 5% between
4.2 and 1.5 K. Processed research by modified
ballistic method, improving sensitivity. Acknowl-
edges assistance of P. G. Strelkov and N. Ye.
Alekseyevskiy. Submitted 8 Dec 50.

204T99

BOROVIK-ROMANOV, A. S.

USSR/Physics - Low Temperatures   Oct 52

"A Method of Disconnection to Heighten the Sensi-
tivity of the Ballistic Method," A. S. Borovik-
Romanov

"Zhur Tekh Fiz" Vol 22, No 10, pp 1669-1676

Develops a procedure for measuring the magnetic
susceptibility of weakly magnetic bodies, which is
convenient for operation at low temps. Acknowledge
assistance of P. G. Strelkov and N. Ye. Alekseyevskiy,

the latter of whom suggest subject method of dis-
connection. Author was also assisted by A. Avatkova,
a student at Moscow State U, in setting up of the
circuit and time measurements.

236T97

236T97

BOROVIK-ROMANCV, A. S.

FA 234192

USSR/Physics - Low Temperatures   1 Mar 52
Liquid Hydrogen

"A New-Type Gas Thermometer and the Determination of the Temperature of Boiling Hydrogen," A. S. Borovik-Romanov, P. G. Strelkov, Moscow State Inst of Measures and Measuring Instruments

"Dok Ak Nauk SSSR" Vol 83, No 1, pp 59-61

By subject instruments the authors obtain the following value for subject temp of boiling hydrogen: 20.380 ± 0.0022°A. Submitted 9 Jan 52 by Acad M. M. Dubinin.

234T92

Brovik - Romanov, A S

USSR/Fitting Out of Laboratcries - Instruments, Their Theory, Construction, and
Use, H

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 62010

Author: Brovik-Romanov, A. S., Orlova, M. P., Strelkov, P. G.

Institution: None

Title: Apparatus for Duplicating Boiling Point of Hydrogen

Original
Periodical: Zh. tekhn. fiziki, 1954, 24, No 7, 1219-1223

Abstract: The apparatus consists of a dual condensation thermometer set in
sockets of a copper block, immersed in a hydrogen bath together
with a thoroughly checked platinum resistance thermometer. Errors
in duplication of the boiling point of hydrogen by means of this
procedure do not exceed 0.003°.

Card 1/1

Borovik-Rom...

2

62

Thermodynamic studies at low temperatures. I. Measurement of temperatures between 12° and 300°K. P. G. Strelkov, A. S. Borovik-Romanov, and M. P. Orlova (Moscow State Inst. Measures and Measuring App.). Zhur. Fiz. Khim. 28, 345-52(1954); cf. C.A. 46, 8440e.— A technique is described for construction and calibration of Pt resistance thermometers on the international scale. The b.p. of an equil. mixt. of ortho- and para-H was measured in an illustrated app. consisting of 2 condensation thermometers (A and B). In A, H was condensed in a bulb (1) contg. Cr₂O₃ gel (for catalysis of ortho-para conversion of H) which was connected through tubing to a manometer. In B, the bulb (2) (without catalyst) was connected to a manometer and to a Pt spiral (4), a tube (3) filled with ortho-para conversion catalyst, and a bulb (5). Gas was driven through 3 by heating or cooling 5. With the b.p. of H so measured as reference point, thermometers could be calibrated with a max. error of 0.003-0.004°. The b.p. of natural H, measured with a gas thermometer, with 20.38°K. on the abs. international scale. This technique permits measurement of temps. from 12 to 300°K. with a deviation not over 0.04° from the thermodynamic scale and a sensitivity of 0.0001-0.0005°. II. Measurement of heat capacity of solid bodies and liquids between 12° and 300°K. P. G. Strelkov, E. S. Itskevich, V. N. Kostryukov, G. G. Mirskaya, and B. N. Samoilov. Ibid. 459-71.—A vacuum calorimeter is described and illustrated for the precise measurement of temps. and heat capacities in the 12-300°K. range of bodies which are solid or liquid at room temp. The app., equipped with screens contg. thermocouples for the measurement of i. at flow and an elaborate elec. relay system, will measure temps. near 300°K. and 12°K. within ± 10⁻⁴ and 5 × 10⁻⁴ degree, resp. Supplied energy is measured within 0.03%.

W. Lowterg, Jr.

BOROVIK-ROMANOV, A.S.

Magnetic and thermal properties of the three modifications of solid oxygen. A. S. Borovik-Romanov, M. P. Orlova, and P. G. Strelkov (State Inst. of Measures and Measuring Apparatus, Moscow). *Doklady Akad. Nauk S.S.S.R.* 99, 699–702(1954); cf. *C.A.* 46, 10725b.—Solid O exists in 3 modifications: α (below 23.88°K.), β (23.88–43.80°K.), and γ (from 43.80° to the triple point, 54.87°K.). The heat capacity was measured in the region of the transition points. The data show that the $\beta \to \gamma$ transition is of the first order and the $\alpha \to \beta$ transition is of the second order. The magnetic permeability ψ of solid O was measured between 20.5 and 77.5°K. For the γ-modification (as for liquid O) ψ obeys the Curie-Weiss law. Upon transition to the β-modification, ψ decreases sharply and continues to decrease with decreasing temp. This is characteristic of antiferromagnetic substances. The large heat effect of the $\beta \to \gamma$ transition is attributed to the change to the antiferromagnetic state.   J. Roytar Leach

FD-3249

USSR/Physics - Magnetic properties of ions

Card 1/1   Pub. 146 - 8/44

Author   : Borovik-Romanov, A. S.; Kreynes, N. M.

Title   : Magnetic properties of trivalent ions of europium and samarium

Periodical : Zhur. eksp. i teor. fiz., 29, No 6(12), Dec 1955, 790-797

Abstract   : Measurements of the magnetic susceptibility of Eu_2O_3, Sm_2O_3 (in two crystalline modifications) and of $Sm_2(C_2O_4)_3 \cdot 10 \ H_2O$ from 12 to 300°K. The authors discover a strong dependence of the magnetic properties of samarium ion upon the crystalline structure of the compound in which it is a constituent. With decrease in the influence of the crystalline field the experimental curves of the temperature dependence of magnetic susceptibility approach the theoretic curve of Van Fleck for free ions. They describe the apparatus used for the measurement of the magnetic susceptibility in a wide range temperature. The authors thank Professor P. G. Strelkov for his interest and Professor I. N. Zaozerskiy for supplying specimens and giving advice. Twelve references.

Institution : Moscow State Institute of Measurements and Measuring Instruments

Submitted   : August 10, 1954

BOROVIK-ROMANOV, A. S. and ORLOVA, M. P. (Moscow)

"Magnetic Properties of Co and Mu Carbonates and Mu-Oxydes," Paper presented at the International Conference on Physics of Magnetic Phenomena, Sverdlovsk, USSR, 23-31 May 1956.

BOROVIK-ROMANOV, A. S. , KARASIK, B. R. and KREYNES, N. M. (Moscow)

"Anti-ferromagnetis m of anhydrous Sulphates of Ni^{++}, Fe^{++}, Co^{++}, Cu^{++},"
paper presented at the International Conference on Physics of Magnetic Phenomena,
Sverdlovsk, USSR, 23-31 May 1956.

BOROVIK-ROMANOV, A. S.

Magnetic properties of trivalent ions of europium and samarium. A. S. Borovik-Romanov and N. M. Kreines. Soviet Phys. JETP 2, 657-661(1956)(English translation).— Sec C. A. 50 01144. B. M. P.

<u>Apparatus and samples</u>: Magnetic susceptibility is measured by the FARADAY method by means of an apparatus developed by BOROVIK-ROMANOV and KREJNES. This apparatus is suited for measuring within the temperature range of $12-300°K$. Temperature was measured by means of a copper-constantan thermocouple. Susceptibility was measured at different values of field strength of from 500-2500 oersted. All samples examined were won by eliminating water from the corresponding crystal hydrates.

<u>Measuring results</u>: The magnetic susceptibility of all 4 dehydrated sulphates was measured at temperatures of from 13 to $300° K$. For the molar susceptibility of $NiSO_4$, $FeSO_4$ and $CoSO_4$ 4,97; 12,4 and 9,87 respectively was found. All these three sulphates have a characteristic maximum of susceptibility at the CURIE temperature of T_C = $37°K$ for $NiSO_4$; $21°K$ for $FeSO_4$, and $15,5°K$ for $CoSO_4$. At temperatures that are considerably higher than CURIE-temperature the CURIE-WEISS rule χ = $C/(T + \Theta)$ holds good for all sulphates. The susceptibility of $CuSO_4$ increases noticeably at temperatures below $20° K$, and it diminishes considerably at ~ $35° K$. Various differences as against the results obtained by

BOROVIK-ROMANOV, A.S.

SUBJECT   USSR / PHYSICS   CARD 1 / 2   PA - 1780
AUTHOR   ·   BOROVIK-ROMANOV,A.S., ORLOVA,M.P.
TITLE   The Magnetic Properties of the Carbonates of Cobalt and Manganese.
· PERIODICAL Žurn.eksp.i teor.fis,31, fasc.4, 579-582 (1956)
              Issued: 1 / 1957

Here the temperature dependence of the magnetic susceptibility of $MnCO_3$ and of
a waterless $CoCO_3$ preparation is investigated within the temperature range of
from 14 to 300°. Three different $MnCO_3$ samples were investigated: an undried
industrial preparation, and the same preparation dried at 160° C; the third
preparation was made by the authors themselves by means of the heating for 20
hours (at 160° C) of a saturated solution of $MnCl_2$ with $CaCO_3$ in a sealed test
glass. The values obtained in the case of the first and third sample were al-
ways lower than in the case of the second. This is due to the presence of water
in the first sample and of $CaCO_3$-remains in the second sample. After the
necessary corrections the susceptibilities of all three samples were in agreement
within the limits of measuring errors throughout the entire temperature range.

Further, two samples of waterless $CoCO_3$ were examined, which had been produced,
like the $MnCO_3$, by the heating of $CoCl_2$ and $CaCO_3$ in a sealed ampule. The results
obtained for both samples were in agreement within the limits of measuring errors.
Susceptibilities were measured by FARADAY'S method. The temperature dependence
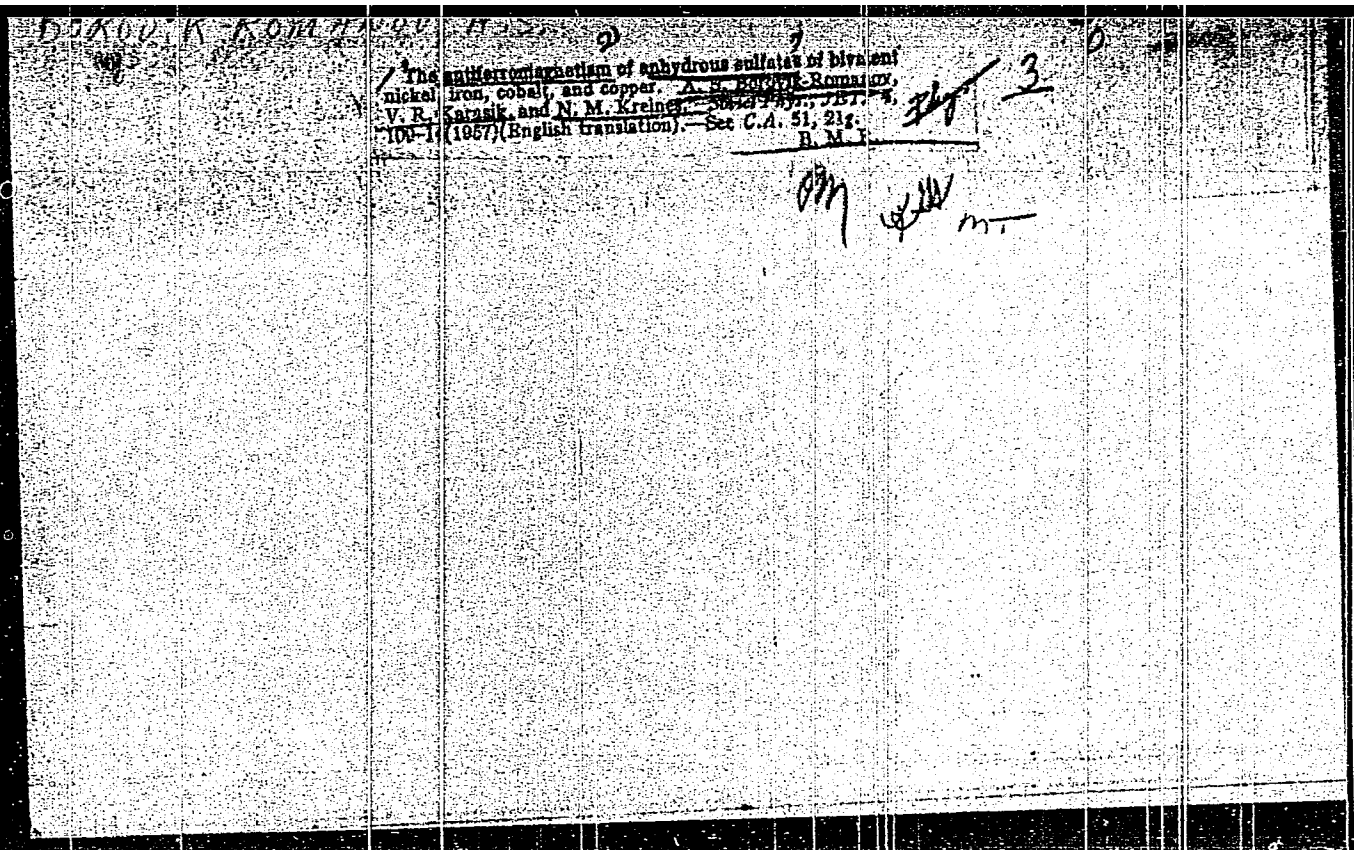of the magnetic susceptibility of both carbonates at higher temperatures satisfies

Žurn.eksp.i teor.fis,31,fasc.4,579-582 (1956) CARD 2 / 2   PA - 1780

the law by CURIE-WEISS $1/\chi_m = C_M(T + \Theta)$. The values of the constants C_M and Θ are shown in a table. The same table contains the values of μ_{eff} computed from the here measured values of C_M and the theoretical values of μ_{eff} computed on the assumption of the total "freezing in" of the orbital moments.
Below a certain critical temperature T_c permeability increases sharply and depends considerably on field strength. Also a slight hysteresis is found. At temperatures of less than T_c and at field strengths of more than 600 Ørsted the dependence of the magnetic moment M on the field strength H can be represented as the sum of two terms $M = M_0 + \chi'H$. Similar isothermes were obtained also for $CoCO_3$. The temperature dependence of M_0 in the case of $MnCO_3$ and $CoCO_3$ has the shape which is characteristic of the "settling curve". However, at $T \rightarrow 0$ the value of M_0 tends towards a considerably lower value than might be expected in the case of ferromagnetic saturation: For $MnCO_3$: $M_0 = 68$, $M_{ferr} = 32000$, for $CoCO_3$: $M_0 = 400$ to 1000, $M_{ferr} = 27200$. The results obtained can be explained qualitatively by assuming that an antiferromagnetic process occurs in manganese- and cobalt manganate below T_c.

INSTITUTION: All-Soviet Institution for Physical, Technical, and Radiotechnical
            Measuring.

The antiferromagnetism of anhydrous sulfates of bivalent nickel, iron, cobalt, and copper. A. S. Borovik-Romanov, V. R. Karasik, and N. M. Kreines. — See C.A. 51, 21g.

BOROVIK-ROMANOV, A.S.

56-5-49/55

AUTHOR:
TITLE: BOROVIK-ROMANOV, A.S., ORLOVA, M.P.
The Magnetic Properties of Manganese Oxides at Temperatures of 20 - 300° K. (Magn'tnyye svoystva kislorodnykh soyedineniy margantsa pri temperaturakh ot 20 do 300° K, Russian)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 5, pp 1255- 1256 (U.S.S.R.)

ABSTRACT: In connection with the anomalous magnetic behavior of manganese carbonate below 31° K becoming known the following manganese oxides were investigated with a temperature range of 20 - 300° K, on which occasion the following was found with respect to their magnetic behavior.
1.) Mn_3O_4 has ferromagnetic properties below 42,5° K,
2.) Mn_2O_3 remains a paramagnetic substance within the entire investigated temperature domain of 20-300° K.

ASSOCIATION:
PRESENTED BY: All-Union Scientific Research Institute for Physical-Technical and Radiotechnical Measurements
SUBMITTED:
AVAILABLE: Library of Congress

Card 1/1

BOROVIK - ROMANOV, A.S.

56-3-49/59

AUTHORS   Astrov, D.N., Borovik-Romanov, A.S., Orlova, K.P.

TITLE   The Magnetic Properties of Cobalt Fluoride in the Antiferromagnetic State.
(Magnitnyye svoystva ftorida kobal'ta v antiferromagnitnom sost-oyanii) (Letter to the Editor)

PERIODICAL   Zhurnal Eksperim.i Teoret.Fiziki,1957,Vol 33,Nr 3,pp 812-814(USSR)

ABSTRACT   From the measured dependence of reciprocal susceptibility on tempera-ture a minimum for CoF_2 at 38°K is observeable which occurs simul-taneously with the jump on the occasion of the measuring of heat capacity.The magnetic susceptibility obeys the Curie-Weiss relation above 55°K with the constants (Θ =-5o and Cm = 0,875 (per mol.) A strong anisotropy of the Co^{++} -ions in the paramagnetic state was further observed as a peculiarity for CoF_2.There are 2 figures.

ASSOCIATION   All-Union Institute for Physical -Technical and Radiotechnical Mea-surements. (Vsesoyuznyy institut fiziko-tekhnicheskikh i radiotekh-nicheskikh izmereniy).

SUBMITTED   June 2o, 1957

AVAILABLE   Library of Congress.

Card 1/1

Borovik - Romanov, A.S.

AUTHORS: Borovik-Romanov, A.S., Kreynes, N.M.   56-5-6/46

TITLE: An Anomalous Magnetic Transition in Anhydrous Copper Sulphate
(Anomal'nyy magnitnyy perekhod v bezvodnom sul'fate medi)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1957
Vol. 33, Nr 5, pp. 1119-1122 (USSR)

ABSTRACT: Two anhydrous small crystalline $CuSO_4$ -preparations (approx.
1 x 0,2 x 0,2 mm^3) obtained by different ways, were examined
within the temperature range of 1,5 to 300 K with respect to their
magnetic properties.
It results from the curve of functional relationship of temper-
ature of the reciprocal molecular susceptibility $(1/\chi)$ that
between 300 and 120°K, with the parameters $\theta = -77,5°$ and $C = 0,517$, the low of Curie-Weiss is complied with. At $T_c = 34,4°K$
a clear break occurs from which on $CuSO_4$ is likely to become
anti-ferromagnetic. The transition into the anti-ferromagnetic
state is accompanied by an anomalous increase of the susceptibi-
lity up to the double value, within a temperature interval of
~1,5°K. This phenomenon occurs with all investigated field
strengths of 3370, 6660, 9700, 11780 and 12900 Oe. There are 4
figures and 5 references, 3 of which are Slavic.

Card 1/2   *Inst. Physical Problems of AS USSR, Inst. of Physical
Technical & Radiotech. Measurements.*