Ayukhanov, A.

Method of investigating the secondary emis-
sion by bombarding conductors with ion... U. A.
... A. KH. AYUKHANOV and S. V. STARODUBTSEV.
...oper, 1954; 913, 29, 470 6, 714-22 (1954) In
...ssian

Usually the phenomena of secondary emission
while ion impact are investigated by directing an ion
beam from a suitable source on a target, the secondary
electron and ion emission being measured by circuits
containing galvanometers and permitting primary and
secondary ion currents and secondary electron
emission to be separated by suitable change-over
circuits. The main difficulty in investigating the
secondary emission resides in obtaining a pure target
surface, and even more, in maintaining the purity of
the target surface during the long duration measure-
ments by galvanometric methods. That is why in
most cases the results were obtained not really on the
target surface but on undefined adsorbed layers on
the target. If, on the other hand, the target is main-
tained at high temperature to assure desorption of the
adsorbed layers, the bombarding ions would also be
absorbed and therefore be measured with the secon-
dary particles, thus vitiating the secondary emission
coefficients measured. Comprehensive investigations
led to the conclusion that only very rapid methods of

measurements permit exact determinations of secon-
dary emission to be carried out, the influence of
temperature and other factors on magnitude and
character of the emission to be established and clear
and reliable results to be obtained. Only e.r.o.
methods can satisfy the requirements; a promising
new oscillographic method is that of double modula-
tion, by which the actual secondary emission can be
effectively separated from the current of surface
ionization of the target. The circuits and set-ups
for these methods are described and the possibility
of the separation of the various components is proved
theoretically. A series of oscillograms of V.A.-
characteristics of the secondary emission of tantalum
and tungsten targets of temperatures 300-1350°K
shows the possibilities of the new methods.

P. P. KRAUS

Physicotech. Inst., AS Uzbek SSR

Ayukhanov, A. KH.

USSR

999. Angular distribution of secondary ions in the bombardment of a tantalum target with ions of alkali metals. A. KH. AYUKHANOV. Zh. eksper. teor. Fiz., Vol 27, No 1 (7), pp -- (1954). In Russian.

The energy and intensity distribution of secondary ions of Na and K ions was investigated in dependence on the angle of incidence of the primary and angle of emission of the secondary, ions in the bombardment of a pure heated tantalum target. An angular relation of the maximum energy of the scattered ions was established, this maximum coinciding with the values of the energy of the elastic impact of colliding particles. A linear relation between the intensity of the secondary ions and their emission angle was also found to exist. The number of secondary ions emitted in the direction of the perpendicular to the target is independent of the angle of incidence of the primary ions whereas the number of secondary ions emitted under various angles does not follow the cosine law and may in a first approximation be represented by a linear law.

B. P. KRAUS

Physicotechnical inst. acad. sci. Uzbek SSR.

AYUKHANOV, A. KH.

Secondary emission of metals bombarded by positive ions [U. A. Arifov and A. Kh. Ayukhanov] Dokl. Akad. Nauk S.S.S.R., Ser. Fiz. 20, 165–78, 1956. — The coeffs. of secondary electron emission (K) and of secondary ion emission (γ) and of secondary ion emission of W, Ta, Mo bombarded by Li, Na, K, Pb, and Cs ions of 150–1000 e.v. passing of the were detd. after thorough purification and the of halogen target. The metal ions were obtained by evapn. of heated alkali and imitation on a charged coil. The the those conditions K had high temp. for several days, until a 400-e.v. for all reproducible value ($\sim$ 30% for all elements decreases rapidly energy). When the target cools down, K decreases all metal and electron emission from layers of the all measurements, there-settled on the target increases. All measurements just before the point of were made on targets heated $< 1\%$, here is a cor-thermionic emission. At 1250°K, of secondary ions and correspondence of the threshold energy the threshold energies the energy and mass of primary ion at high temps. is dif-decreasing with increasing mass. K at high Cs 90% Most of the ferent for different ions (K 72, Rb other ions are secondary ions are scattered primary ions titles. Some ionized on evapn. They have thermal velocities namely the tests were made with double beam modulation, wave of 500-primary ion beam was modulated by a square ted on a col-1000 cycles. The secondary emission was coll cycles. This being modulated by a saw-tooth voltage to plate of a sawtooth voltage was placed on the horizontal tinguish be-scope. With this method it is possible to tween inertia-free emission and processes with inertia. An analysis of the oscillograms shows the presence of a group with large lifetimes on the surface and this group is attributed to collisions of initial ions diffused long target to a depth of several at. layers. These and high primary ion appear at high temp. ($>$1000°K) and high energy (E $>$250 to 800 e.v.).

E. Pakswer

AUTHORS: Arifov, U. A., Ayukhanov, A.KH., Starodubtsev, S. V., 56-4-3/54

TITLE: On the Coefficient of Diffusion of Ions as a function of the Ratio of the Masses of Colliding Particles (O zavisimosti koeffitsiyenta rasseyaniya ionov ot scotnosheniya mass stalkivayushchikhsya chastits)

PERIODICAL: Zhurnal Eksperim i Teoret. Fiziki, 1957, Vol. 33, Nr 4, pp. 845-850, (USSR)

ABSTRACT: By means of the method of double modulation the secondary emission of ions was investigated for the case that the masses of the bombarding ions are larger than the atom masses of the target. The following conclusions may be drawn.
1) Positive Cs-ions enter into interaction with nickel atoms according to the condition V_i φ, m_1 m_2:
a) Neither in the case of a cold ($300°K$) nor of a hot nickel surface ($1350°K$) may there be detected any secondary ion-electron emission
b) The secondary ion emission from a pure nickel surface (at high temperature) contains only the vaporized ions which formed on the surface of the target after a diffusion process.
2) Positive Ba-ions enter interaction with molybdenum atoms according to the condition V_i φ, m_1 m_2:
a) Neither in the case of a cold ($300°K$) nor of a warm molybdenum surface ($1300°K$) may there be detected any secondary ion-electron

Card 1/2

ARIPOV, U.A.; ATUKHANOV, A.Kh.; STARODUBTSEV, S.V.

Secondary emission of negative particles during the bombardment
of foreign films on pure metals with alkali metal ions. Izv. AN
Uz.SSR. Ser. fiz.-mat. nauk no.2:107-115 '58.   (MIRA 11:10)

1. Fiziko-tekhnicheskiy institut AN UzSSR.
        (Ion beams)   (Alkali metals)

ARIFOV, U.A.; AYUKHANOV, A.Kh.; STARODUBTSEV, S.V.; KHADZHIMUKHAMEDOV, Kh.Kh.

Methods for investigating secondary processes caused by ions at high target temperatures during thermoelectronic emission. Izv. AN Uz.SSR.Ser.fiz.-mat.nauk no.5:15-22 '58.   (MIRA 11:12)

1. Fiziko-tekhnicheskiy institut AN UzSSR.
                    (Electron emission)

9(3)   SOV/20-124-1-16/69

AUTHORS: Arifov, U. A., Academician, AS Uzbekskaya SSR, Ayukhanov, A. Kh.,
            Starodubtsev, S. V., Academician, AS Uzbekskaya SSR, Khadzhimukha-
            medov, Kh. Kh.

TITLE: On a Method of Investigating the Secondary Processes Which Are
            Caused by Ions at High Temperatures of the Target in the Case of
            a Thermoelectronic Emission (O metodike issledovaniya vtorichnykh
            protsessov, vyzyvayemykh ionami pri vysokikh temperaturakh misheney
            v prisutstvii termoelektronnoy emissii)

ABSTRACT: It was interesting to perfect the method of double modulation used
            for the investigation of secondary ion processes at high tempera-
            tures (at which a flux of thermal electrons exists). The apparatus
            used was similar to one that has already been described (Ref 2),
            with the exception that an electrically heated filament was sub-
            stituted for the plane target. A schematical drawing shows the
            principles of the electric wiring diagram. Target temperature was
            determined from the heating current and from the diameter of the
            filament; the work function was determined by the method of
            Richardson straight lines, taking a correction for the Schottky
Card 1/3   effect into account. The primary and secondary ion fluxes and also

SOV/20-124-1-16/69

On a Method of Investigating the Secondary Processes Which Are Caused by Ions
at High Temperatures of the Target in the Case of a Thermoelectronic Emission

the current intensity of the thermal electrons were determined
from the coordinates of oscillograms. In the case under investiga-
tion the application of the method of double modulation is reduced
to the following: the primary ion beam accelerated by the field is
modulated with respect to intensity by a generator for rectilinear
pulses with a frequency of 500 - 1000 cycles (first modulation)
and directioned on to the target. The flux of the secondary emission
from the target is then collected by a collector and is transmitted
to the input of the vertical amplifier of an oscillograph. The
horizontal development of this oscillograph is synchronized with
the generator of the saw-tooth pulses. Three oscillograms of a

filament-like W-target (which was bombarded with 840 ev K^+-ions)
are added at $1800°$ K. Secondary ion emission consists of 3 components.
On the basis of the here discussed examples it is possible to de-
fine the coefficient of the secondary ion emission as the ratio of
the sum of components of the secondary ion fluxes to the primary
ion flux. The amount of this coefficient depends in a complicated
manner on the energy, the ionisation potential, the mass of ions,
the temperature, the work function, and the mass of the ions con-
Card 2/3   tained in the target. It is thus possible, by the here discussed

SOV/20-124-1-16/69

On a Method of Investigating the Secondary Processes Which Are Caused by Ions
at High Temperatures of the Target in the Case of a Thermoelectronic Emission

improved method of double modulation, separately to investigate
the individual components of secondary emission, viz: the amperages
of the scattered, evaporated, and diffused ions, as well as the
thermoelectrons occurring in the bombardment of pure metal targets
by positive ions (at high temperature in the presence of consider-
able thermoelectronic emission). There are 2 figures and 3 Soviet
references.

ASSOCIATION: Fiziko-tekhnicheskiy Institut Akademii nauk UzSSR
(Physico-Technical Institute of the Academy of Sciences, Uzbekskaya
SSR)

SUBMITTED: August 29, 1958

Card 3/3

Ayukhanov, A. Kh.

9,3120

82170
S/048/60/024/06/15/017
B019/B067

AUTHORS: Arifov, U. A., Ayukhanov, A. Kh., Gruich, D. D.

TITLE: On the Problem of Scattering of Slow Alkali Ions From a
               Metal Surface

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya,
               1960, Vol. 24, No. 6, pp. 710-714

TEXT: This is the reproduction of a lecture delivered at the 9th All-
Union Conference on Cathode Electronics from October 21 to 28, 1959 in
Moscow. For the experiments described here the authors used the experimen-
tal arrangement described by Arifanov et al. (Refs. 4, 5, and 6) in
previous papers with minor modifications. Figs. 1, 2 and 3 show the de-
pendences of the scattering coefficient on the energy of Na^+ and K^+ ions
in the bombardment of a pure tungsten surface, on the energy of Cs^+-ions
in the bombardment of a well purified Ni-surface and a less well purified
Ni-surface, and the dependence of η on the energy of Na^+ and K^+ ions in
the bombardment of a pure tungsten surface. η denotes the ratio of the
limiting energy of scattered ions and the energies of primary ions.

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On the Problem of Scattering of Slow Alkali Ions
From a Metal Surface

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B019/B067

Furthermore, the voltampere characteristics of secondary ion emissions
are shown in Figs. 4 and 5. In the discussions of the results it is pointed
out that the scattering coefficient attains its maximum value when the
energy of primary ions attains the value of the bonding energy of atoms
in the target. For this maximum value, 45 and 43 ev are given for pure
tungsten, and 42 ev for pure Ni. In the further discussion of the results
the dependence of η on the energy of primary ions (Fig. 3) is explained
by the influence exercised by the bonding energy of target atoms.
There are 5 figures and 8 references: 7 Soviet and 1 German.

Card 2/2

Ayukhanov, A. Kh.

9.3170

82171
S/048/60/024/06/16/017
B019/B067

AUTHORS: Ayukhanov, A. Kh.,   Iskhakov, G. I.

TITLE: Use of Mass Spectrometers of the Dynamic Type to Investigate
              Secondary Processes

PERIODICAL: Investiya Akademii nauk SSSR. Seriya fizicheskaya,
              1960, Vol. 24, No. 6, pp. 715-722

TEXT: This is the reproduction of a lecture delivered at the 9th All-
Union Conference on Cathode Electronics from October 21 to 28, 1959 in
Moscow. In the introduction to the present paper, the authors demonstrate
that new methods must be developed to study secondary emission of con-
taminated surfaces which make it possible to study the electron component
and the component of negative ions of secondary emission. The investigation
of secondary emission by means of ordinary magnetic mass spectrometers is
impossible, and the authors tried to study secondary emission of surfaces
of different states in their bombardment with ions. This was done by using
a magnetic mass spectrometer in which the energies of the ions were mo-
dulated and multiplier was used to record the ions. The device with which

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82171

Use of Mass Spectrometers of the Dynamic Type to   S/048/60/024/06/16/017
Investigate Secondary Processes   B019/B067

the secondary particles were analyzed is discussed with the aid of Fig. 1.
A rectangular generator is used to modulate the primary ions. The study
of the secondary effects on rapid change in the state of the bombarded
surface is regarded as the main problem. This was achieved by applying
various films of alkali metals and of alkali halide salts. The experimental
results shown in Figs. 2 to 6 are discussed in detail, and the energy
distribution of secondary ions (Figs. 7, 8) is discussed. It was found
that on the application of an alkali metal film to a Ta-surface very strong
changes in the ion component of secondary emission occur. Above all, al-
ready a small amount of alkali atoms showed an intensive sputtering of
adsorbed gases in the form of negative ions on the surface. In general,
a sputtering of atoms in the form of negative ions could only be observed
when the formation of chemical compounds on the bombarded surface was
possible and when it was accompanied by a dissociation of molecules.
In conclusion, the difficulties in determining secondary ion emission
for negative ions are pointed out. There are 8 figures and 6 references:
4 Soviet, 1 German, and 1 American.

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

Card 2/2

31062
S/166/61/000/006/003/010
B102/B138

26. 23 12

AUTHOR: Arifov, U. A., Academician AS Uzbekskaya SSR, Ayukhanov, A.Kh.

TITLE: The nature of secondary emission arising when alkaline
            coatings of metals are bombarded with alkaline ions

PERIODICAL: Akademiya nauk Uzbekskoy SSR. Izvestiya. Seriya fiziko-
            matematicheskikh nauk, no. 6, 1961, 34 - 39

TEXT: The charge and composition of secondary emission from tantalum
and tungsten bombarded with alkaline ions were studied in dependence
on the steadlily increasing alkaline coating, its composition, and the
rate of deposition.   Standard experimental technique was used.   The
electrons were separated from the negative ions by a magnetic field of
400 oe.   The pressure in the apparatus was 10^{-6}mm Hg.   Measurements at low
rates of deposition showed that the negative component of the secondary
emission was relatively high and increased with the density of the film.
At higher rates (~20 monatomic layers per sec) the secondary emission of
negative ions increased rapidly with density, reaching a maximum after
about 2 sec, then falling, almost to the initial value.   Ion-induced

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31062

The nature of secondary emission...

S/166/61/000/006/003/010
B102/B138

electron emission is almost independent of layer density. The coeffi-
cient of negative secondary ion emission depends on the method of target
treatment. If ion bombardment is carried out immediately after high
temperature treatment ($2500^{\circ}K$) the peak can be lowered. At higher
densities the nature of the backing had almost no effect on the secondary
emission. The presence of negative ions in the secondary emission is
attributed to the lowering of the work function of Ta or W surfaces by
alkaline ion bombardment, possibly to a value below that of electron
affinity for certain gases, especially oxygen, which are adsorbed and
ejected again by the bombardment as negative ions. This is a source of
error which must be taken into account in measurements of ion-induced
electron emission. There are 3 figures and 10 references: 8 Soviet and 2
non-Soviet. The reference to the English-language publication reads as
follows: P. B. Moon, Proc. Cambr. Phi. Soc. 1931, 27, 570.

ASSOCIATION: Akademiya nauk UzSSR (Academy of Sciences Uzbekskaya SSR)

SUBMITTED: August 21, 1961

Card 2/2

31066
S/166/61/000/006/007/010
B102/E138

26. 2312

AUTHORS: Arifov, U. A., Academician AS Uzbekskaya SSR, Ayukhanov, A. Kh., Aliyev, A. A.

TITLE: The angular distribution of alkaline ions scattered from a metal surface

PERIODICAL: Akademiya nauk Uzbekskoy SSR. Izvestiya. Seriya fiziko-matematicheskikh nauk, no. 6, 1961, 57-64

TEXT: After an introductory discussion of the results of own and other previous papers, the authors give a detailed description of the apparatus and procedure. The electrical measurements were based on an oscilloscopic method with double modulation. The primary ion beam, modulated in square pulses, was focused on the target, a 0.02 mm thick Ta or Mo plate. The target was encompassed by a cylindrical collector shielded against parasitic currents. Between target and collector wall a movable probe was installed, for measuring the secondary-ion intensities. The targets were purified by rapid heating up to 2400^{0}K, the measurements were made at

Card 1/3

The angular distribution of alkaline ...

31066/S/166/61/000/006/007/010
B102/B138

$1350°K$ and a pressure of $(2-3)10^{-6}$ mm Hg. The target was bombarded by Na ions with energies between 300 and 1700 ev. The number of scattered ions was found to be inversely proportional to the ion energy, and the angular distribution was independent of energy. Angular distributions of the intensity of scattered ions did not depend on target temperature

$(300 - 1500°K)$. Angular distribution was also almost independent of the angle of incidence of the primary ion beam. The coefficient of secondary emission increased with the angle of incidence θ. If the mass m_2 of the

bombarding ion is less than that (m_1) of the target atom, the angular

distribution of the scattered ions will be almost a cosine-θ curve. The cosine-θ shaped distribution is independent of the angle of incidence. M. A. Yeremeyev and M. V. Zubchaninov (ZhETF, 1942, No. 12, 358) are mentioned. There are 6 figures and 16 references: 6 Soviet and 10 non-Soviet. The four most recent references to English-language publications read as follows: Langacre A. Phys. Rev. 1934, 46, 407; Massey H. S., Smith G. Proc. Rcy. Soc., 1933, 16, 570; Rcuse O. Phys. Rev., 1937, 52, 1238; Amdur J, Pedrelman, J. Chem. phys. 1940, 8, 7; 1943, 11, 57.

Card 2/3

AS UZ SSR

45133

S/166/62/000/006/008/016
B104/B186

$\mathcal{26./6.40}$

AUTHORS: Sharipov, N., Ayukhanov, A. Kh,

TITLE: The correlation between thermionic emission and secondary
electron·emission from some types·of oxide-coated cathodes
on activation

PERIODICAL: Akademiya nauk Uzbekskoy SSR. Izvestiya. Seriya fiziko-
matematicheskikh nauk, no. 6, 1962, 66-70

TEXT: The change in the thermionic emission density i and the secondary
electron emission. coefficient σ during activation of the cathodes of
6Ц7 (6N7) and 6Ц8 (6N8) tubes and of the carbonate-coated
($BaCO_3$ 50%, $SrCO_3$ 50%, $BaCO_3$ 100%) cathodes in glass envelopes
at $1 \cdot 10^{-7}$ mm Hg were measured by an inertia-free double modulation method.
Results: With the double modulation method the thermionic emission and the
secondary electron emission could be measured simultaneously and for the
same state of the oxide-coated cathode when the voltage of the heated
cathode was 2.7 v, the energy E_0 of the primary electrons was in the
Card 1/2

The correlation between thermionic ...   S/166/62/000/006/008/016
                                          B104/B186

region of 1200 ev and the collector voltage was 65 v. σ increases rapidly
in the initial stages of the activation and somewhat more slowly later;
it is practically the same for (BaSr)O and (BaSrCa)O at current densities
of $(5-55) \cdot 10^{-8}$ a/cm^2, and somewhat higher than for activation energy. The
form of $\sigma(E_O)$ remains practically unchanged. There are 6 figures.

ASSOCIATION: Institut yadernoy fiziki AN UzSSR
              (Institute of Nuclear Physics AS UzSSR)

SUBMITTED: September 15, 1962

Card 2/2

S/109/62/007/009/013/018
D409/D301

AUTHORS: Ayukhanov, A.Kh., Vostrilova, N.V., and Shustrov, V.A.

TITLE: Evaporation of oxide-cathode components during its operation

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 9, 1962, 1598 - 1607

TEXT: The evaporation of the components of barium-strontium oxide coatings of various composition was studied by the method of radio-active isotopes. Earlier studies of the temperature dependence of the rate of evaporation of the components were mostly of a compara-tive nature; the dependence of the rate of evaporation on the compo-sition of the coating was not ascertained and the dynamics of eva-poration were not studied. The method used in the present investiga-tion made it possible to obtain quantitative results and to study the evaporation over sufficiently small time-intervals; in addition it also permitted to perform a large number of various operations with the same cathode specimen under the same vacuum conditions. The experimental lamp was continuously evacuated by two mercury
Card 1/4

Evaporation of oxide-cathode ...

S/109/62/007/009/013/018
D409/D301

coating. Evaporation at increased temperatures of the activated ca-
thode, is apparently related to the formation of a solid solution
(Ba, Sr)O and the appearance (in the latter) of free Ba and Sr. The
change in the rate of evaporation of Ba as a function of time, was
studied over a temperature range of 1000-1500°K. A figure shows the
change in rate of evaporation from coatings which contain 30 % and·
100 % Ba, respectively. Another figure shows the dependence of the
mean rate of non-equilibrium evaporation of Ba and Sr, on the com-
position of the coating. These curves are characterized by a maxi-
mum for coatings which contain 70 % of the respective carbonate.
Hence the presence of the maximum is not a property of the solid
solution (Ba, Sr)O, and the obtained curves are related to the be-
havior of the free metal in the crystalline lattice. In the process
of heating the cathode, depletion of the Ba-layer sets in at a cer-
tain temperature. This leads to the paradoxical conclusion that
(from a certain temperature on) the rate of evaporation slows down.
It is concluded that evaporation of Ba and Sr was practically not
observed during the decomposition of the carbonates. Evaporation
becomes significant only during the activation process, at tempera-
tures above 1000°K. At that stage, the evaporation is related to
Card 3/4

S/048/62/026/011/001/021
B102/B186

AUTHORS: Moroz, L. P., and Ayukhanov, A. Kh.

TITLE: On a possibility of determining the effective depth of ion-
              induced yield of secondary electrons from dielectrics

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya,
              v. 26, no. 11, 1962, 1322-1327

TEXT: The coefficient γ of ion-induced electron emission plotted versus
the thickness of an alkali-halide layer on a metal backing, shows
saturation. The depth from which the secondary electrons are emitted can
be determined from this saturation. Measurements were made with NaCl
films deposited on molybdenum sheets. These were bombarded by ions of
energies ranging from 0.2 to 2.5 kev. A special method of energy modula-
tion was applied so that the dependence of the coefficients γ of
.secondary emission on the film thickness could be measured simultaneously
for two different energies of the incident ions. The target was exposed
to square pulses of the ion current; the frequency was varied between 50
and 100 cps, the amplitude between 0 and 700 v. The curves $\gamma/\gamma_{sat} = f(t)$

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Some properties of the ion ...

S/048/62/026/011/014/021
B125/B102

particles leaving the surface of target 1 could reach target 2. The existence of end-point energies of the scattered ions indicate an individual elastic collision of the incident ion with an atom of the target unaccompanied by charge exchange. For a part of the elastic collisions of the primary ion with target atoms, an electron is captured and the ion is neutralized. When this neutral beam, hits target 2, it causes surface ionization and secondary emission. The high energy of particles knocked-out from target 2 by neutral atoms can be explained only in the following ways: The neutral component of the secondary emission contains scattered neutral atoms. The neutral atoms hitting target 2 leave it as positive ions and retain a considerable part of their energy. During the bombardment of target 1 by 100-ev Na^+ ions, secondary ions of 77 ev are emitted. If neutral atoms of E_{max} = 77 ev hit target 2 the end-point energy of the secondary ions from target 2 amounts to 59 ev. The delay curve for bombardment by secondary ions is similar to the delay curve for bombardment. by secondary neutral atoms. The fast neutral atoms are also elastically scattered if target 1 is at other temperatures. The intensity of the neutral component remains almost constant up to

Card 2/3

On a possibility of determining ...

S/048/62/026/011/001/021
B102/B186

were compared for several pairs of ion energy. E.g., for Na^+ ion energies
of 450 and 920 ev two curves are obtained: saturation is reached first
(i.e. at a smaller film thickness) with the lower ion energy. With ion
energies of 1360 and 1840 ev a single curve is obtained, i.e. saturation is
independent of the time t of NaCl deposition. Since t~d, it is
independent of the film thickness. These measurements show that, if the
lower energy E_{min} of the two ion energies is below a critical value E_{crit},
the coefficient of ion-induced electron emission will cease to depend on
the film thickness as soon as a certain thickness d_{sat} is reached. d_{sat}
decreases with decreasing ion energy. For $E_{min} \geqslant E_{crit}$ γ reaches
saturation at equal film thickness, not depending on the ion energy. For
Na^+ ions, E_{cr} is of the order of 1000 ev. The curves $\gamma/\gamma_{sat} = f(t)$ are
compared with the curves $\sigma/\sigma_{sat} = f(t)$, where σ is the coefficient of
electron-induced electron emission. At primary-electron energies
$E_e > 250$ ev, $\sigma(1)$ reaches saturation at equal film thickness independently
of E_e. This thickness corresponds to the depth from which the secondary

Card 2/3

Some properties of the ion ...

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B125/B102

$T \sim 1000°K$. The current increase that attends further temperature rise is due to thermal ions. The secondary neutral emission and the secondary ion component apparently contain the same groups of secondary particles. The scattering mechanism of primary ions from a metallic surface in the form of neutral atoms is essentially similar to that of the scattering of positive ions. There are 5 figures.

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42428

S/048/62/026/011/020/021
B125/B102

26 2312

AUTHORS: Arifov, U. A., Ayukhanov, A. Kh., and Aliyev, A. A.   17

TITLE: Angular distribution of scattered secondary ions when heavy ions bombard light targets

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 11, 1962, 1440-1445

TEXT: Hot molybdenum (1400°K) and nickel (1100°K) targets were bombarded with fast Cs^+ ions (500-1200 ev) and the angular distribution of the scattered ions was measured. Apparatus and measuring methods have been described by Arifov et al. (Izv. AN UzSSR, Ser. fiz.-mat. nauk, 6, 57, (1961)). In order to retain evaporated ions from the collector, a voltage of 1 v was applied between target and collector. The currents of scattered ions were measured with a movable probe. For angles of incidence between 0° (normal) and a certain limiting angle the currents measured were weak and the distribution was cosine-shaped. At angles of incidence Φ larger than the limiting angle (scattering angle) $\beta = sin^{-1}(m_1/m_2)$ the conditions are completely changed, the weak probe

Card 1/3

35534

S/020/62/142/006/006/019
B104/B108

AUTHORS: Arifov, U. A., Academician AS Uzbekskaya SSR, Flyants, N. N.,
             and Ayukhanov, A. Kh.

TITLE: Some properties of secondary ionic-neutral emission

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 6, 1962,
             1265-1267

TEXT: Two Ta targets, each surrounded by a collector and a protective
cylinder, were placed in a T-shaped glass container. Target no. 1
(30 by 7 by 0.015 mm) was bombarded with ions generated by surface
ionization of an alkali halide. All charged particles between the two
targets were deflected by the field of a capacitor so that only the neutral
particles emitted from the surface of target no. 1 could reach target
no. 2. Pressure during measurement was between 1 and $3 \cdot 10^{-6}$ mm Hg.
Prior to each measuring series the targets were heated to 2,500°K for
6-8 hours. The maximum energy of the neutral atoms striking target no. 2
by bombarding target no. 1 can be calculated from the relation

Card 1/2

ACCESSION NO: AP3000223   S/0166/63/000/002/0065/0069

AUTHORS: Shustrov, Y. A.; Poltoratskiy, V. I.; Ayukhanov, A. Ih.

TITLE: On the role of barrier formation in the cathode sputtering process

SOURCE: AN UzSSR. Izv. Seriya fiziko-matem. nauk, no. 2, 1963, 65-69

TOPIC TAGS: continuous sputtering, tungsten target, ion source, surface ionization, negative ion

ABSTRACT: An experiment has been performed to compare qualitatively two processes: continuous sputtering of material and knocking-out target material forming a chemical compound with the adsorbed substances. The experiment was done in a 10^{-7} mm Hg vacuum, using a heated tungsten target and an Na and K ion source of 1 to 10μ a/cm^2 density. The latter was obtained by means of surface ionization over an incandescent tungsten wire. The sputtering product was accumulated on a collector made of 0.5 mm nickel plates. Experiments were done in three steps. First the tungsten target was kept cool and the sodium ion beam was turned on at 1600 ev energies with the collector potential V at zero value. Next V was set at -140 v, followed by raising the target temperature to 1160K. A graph of cathode sputtering

Card 1/2

ACCESSION NO: AP30X0223

.coefficient versus collector potential shows that the greater part of the knocked-out negative ions possesses an energy of 20 ev. For $V \leq -140$ v the collector contains only neutral particles. Under potassium ion bombardment, a noticeable amount of negative tungsten-containing compounds is observed in the sputtering products. Orig. art. has: 4 figures and 2 formulas.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UzSSR (Physical-Technical Institute AN UzSSR)

SUBMITTED: 08Jan63   DATE ACQ: 12Jun63   ENCL: 00

SUB CODE: PH   NO REF SOV: 006   OTHER: 004

Card 2/2

S/109/63/008/002/016/028
D413/D308

AUTHORS: Flyants, N.N., Arifov, U.A. and Ayukhanov, A.Kh.

TITLE: Transient secondary emission processes during bombardment of films on metals by fast neutral atoms of another element

PERIODICAL: Radiotekhnika i elektronika, v. 8, no. 2, 1963, 311-315

TEXT: Although in the study of the interaction of atomic particles and solid surfaces it is of value to investigate bombardment by neutral atoms as well as by ions, this has been neglected because of the difficulties of obtaining suitable fast atom beams and measuring their secondary effects; the experiments that have been done, such as by Chaudry and Khan, have only given information on secondary electron emission. The authors have measured the secondary emission of positive and negative ions from a Ta target both in the clean state and during deposition of a Na film, bombarded with either ions or neutral atoms of Na and K of energies up to

Card 1/2

Transient secondary emission ...

S/109/63/008/002/016/028
D413/D308

1000 ev. The neutral alkali atom beams were obtained by the technique of resonant overcharge of ions in a stream of the alkali metal vapor. A form of the double modulation method was used for making the measurements. All the results go to show that the secondary emission effects from the action of neutral atoms do not differ qualitatively from those produced by positive ions of the same element. There are 5 figures. The most important English-language reference reads as follows: R.M. Chaudry, A.W. Khan, Proc. Phys. Soc., London B., 61, 1948, 526.

SUBMITTED: March 19, 1962

Card 2/2

S/109/63/008/002/018/028
D413/D308

AUTHORS: Moroz, L.P. and Ayukhanov, A.Kh.

TITLE: On the ratio between the negative-ion and electron
                  components of the secondary emission from NaCl films
                  bombarded by Na+, Rb+ and Cs+ ions

PERIODICAL: Radiotekhnika i elektronika, v. 8, no. 2, 1963,
                  322-327

TEXT: Several workers have studied the negative secondary
emission from alkali halide films bombarded by ions, but have not
distinguished between the negative-ion and electron components, which
can give misleading results. The authors have measured these compon-
ents in the emission from NaCl films on Mo or Ta under bombardment
by Na+ and Cs+ ions in the energy range 150 - 2100 ev and Rb+ ions
in the range 200 - 1600 ev, during deposition of the NaCl. The char-
acteristic of the negative-ion emission agreed closely with that of
the positive-ion emission, rising sharply to saturation at a thick-
ness corresponding to a non-atomic layer and being substantially in-

Card 1/2

On the ratio between ...

S/109/63/008/002/018/028
D413/D308

dependent of the mass and energy of the primary ions. The secondary electron emission behaved quite differently, rising only slowly with film thickness to saturate at a layer tens of atoms thick, and increasing markedly with increase in energy and decrease in mass of the primary ions. Thus the ratio between the two components of the negative secondary emission may vary widely with the film thickness and the mass and energy of the bombarding ions, and few conclusions can be drawn from the total value of negative emission current. There are 6 figures.

SUBMITTED: March 19, 1962

Card 2/2

AYUKHANOV, A. KH.

MEASURING SECONDARY ION AND ELECTRON EMISSION DURING FILM DEPOSITION ON METALS (USSR)

Arifov, U. A., A. Kh. Ayukhanov, and S. V. Starodubstev. Radiotekhnika
i elektronika, v. 8, no. 4, Apr 1963, 669-674. S/109/63/008/004/017/030

A vacuum-tube instrument is described which permits improved observation
of high-speed deposition of Na or Mg on a Ta substrate. The device can
measure simultaneously the coefficients of secondary emission from the target
surface caused by either bombardment by particles of two energy levels or by
alternate bombardment of electrons and ions. This electrical circuit differs
from the usual double modulation circuit in that the bombarding particles are
energized both with a d-c potential, E'_0, and a square-wave generator, whose
wave form is in turn modulated by a sinusoidal voltage $E_a^i \sin \omega t$. Thus a
current of secondary particles, changing periodically per $I = I(E_0^i + E_a \sin \omega t)$,

Card 1/2

AID Nr. 981-1   3 June

MEASURING SECONDARY ION [Cont'd]   S/109/63/008/004/017/030

appears at the collector. This current is fed to the vertical deflection ampli-
fier of a cathode-ray oscillograph. The modulation of the primary ion (or elec-
tron) current by the modulated rectangular pulses makes it possible to obtain
the zero line automatically and to measure secondary currents caused by the
maximum-energy $(E_0' + E_a')$ and minimum-energy $(E_0' - E_a')$ primary particles.
The results of bombardment with electrons show that the dependence of the
secondary emission of negative particles on film thickness, while differing
quantitatively for different bombarding-ion energies, are identical qualitatively
and that the coefficients of the secondary emission of negative particles due
to both ion and electron bombardment undergo qualitatively similar changes
with an increase in film thickness. It is concluded that the method described
makes it possible to obtain reliable evaluations for a number of basic secondary
emission characteristics.   [DW]

Card 2/2

L 22555-65   EWT(l)/EWT(m)/EPF(c)/EPA(w)-2/ETC(t)/T/EWP(k)/EWP(b)/EWA(m)-2
Pr-4/Pab-IO   I,P(c)   JD/WW/JD
ACCESSION NR: AP5000466   S/0166/64/000/004/0020/0026

AUTHOR: Arifov, U. A.; Aliyev, A. A.; Ayukhanov, A. Kh.   B

TITLE: Angular dependence of the energy spectra of secondary ions during the bombardment of metals by positive ions

SOURCE: AN UzSSR. Izvestiya. Seriya fiziko-matematicheskikh nauk, no. 4, 1964, 20-26

TOPIC TAGS: secondary ion, ion scattering, angular distribution, energy spectrum, metal bombardment, alkali metal ion

ABSTRACT: The authors previously studied (see e.g., Izv. AN SSSR, ser. fiz.-mat. nauk, no. 4, 1963, 86) the angular dependence of the current of secondary ions during the bombardment of metallic targets by alkali metal ions. However, an explanation of the interaction mechanism may be given only after the study of the angular dependence of the energy distribution. Consequently, the secondary ion energy region between 500 and 2000 ev was investigated by means of a Hughes-Rojansky-type electrostatic analyzer (Phys. Rev., 34, 284, 1929) having a 127° opening and an equilibrium trajectory of 55 mm. The results of the Na+ E_0 = 700 ev bombardment of

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L 22555-65
ACCESSION NR: AP5000466

W targets and Rb+ II$_0$ = 900 ev bombardment of T targets are shown in Tables 1 and 2 of the Enclosure, respectively. Both targets were heated to 1800), and q_x was obtained using the formula

$$E = E_0 \frac{(\mu - 1)^2}{(\cos \pm \sqrt{\mu + \cdots \pm \beta})^2} \qquad (1)$$

in which V_s refers to the experimental results for secondary ions, while V_{max} corresponds to the maximum value of primary ions. Orig. art. has 1 formula, 4 figures, and 2 tables.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UzSSR (Institute of Physics and Technology, AN UzSSR)

SUBMITTED: 13May64   ENCL: 02   SUB CODE: NP

NO REF SOV: 005   OTHER: 003

Cord   2/4

L 22555-65
ACCESSION NR: AP5000466   ENCLOSURE: 01

Table 1.   Angular dependence of energy spectrum for Na$^+$ bombardment of W.

Coefficient $\eta = \dfrac{E}{E_i}$	Incident angle, degrees								
	0	10	20	30	40	50	60	70	80
η_r	0,66	0,68	0,71	0,74	0,79	0,82	0,85	0,89	0,90
η_s	0,65	0,67	0,71	0,73	0,79	0,82	0,84	0,88	0,91
η_{max}	0,77	0,60	0,61	0,63	0,88	0,90	0,93	0,96	0,98

Card   3/4

L 22555-6
ACCESSION NR: AP5000466   ENCLOSURE: 0?

Table 2. Angular dependence of energy spectrum for Rb^+ bombardment of Ta.

(a) Coefficient $\eta = \dfrac{E}{E_0}$

(b) Incident angle, degrees

$\eta = \frac{E}{E_0}$	0	10	20	30	40	50	60	70	80
	0,19	0,21	0,25	0,2?	0,36	0,44	0,51	0,?0	0,62
	0,18	0,20	0,25	0,2?	0,35	0,44	0,50	0,?8	0,68
η_{max}	0,35	0,37	0,40	0,??	0,49	0,56	0,63	0,?0	0,79

Card 4/4

L 59707-65   ET(m) Peb DIAAP

ACCESSION NR: AR5017534

UR/0058/65/000/006/G011/G011

25

B

SOURCE: Ref. zh. Fizika, Abs. 6G85

AUTHORS: Shustrov, V. A.; Ayukhanov, A. Kh.

TITLE: Cathode sputtering of tungsten

CITED SOURCE: Dokl. An UzSSR, no. 10, 1964 22-26

TOPIC TAGS: tungsten sputtering, ion bombardment, cathode sputtering

TRANSLATION: The radioactive isotope method was used to investigate cathode sputtering of a polycrystalline tungsten target, the temperature of which was ~ 1800 K. It is assumed that sputtering of a clean surface takes place at such a temperature. In order to prevent evaporation of the target, an instrument was constructed, which made it possible to measure simultaneously the amount m_1 of the material evaporated from one side of the target, and the amount m_2 of the material evaporated and sputtered during the same time from the opposite side. The amount of sputtered material was $m = m_2 - m_1$. The energy dependences of the coefficient W of sputtering of tungsten by ions Cs^+, Rb^+, K^+, and Li^+ is obtained. In the energy region 300—2500 eV, these dependences are represented by straight lines. A correlation is established between the value of the coefficient of cathode sputtering and the energy received by the target from the incoming ion in two successive

Card 1/2

L 5?207-65

ACCESSION NR: AR5017534

collisions with the lattice atoms.   V. Shustrov.

SUB CODE: MP, OP   ENCL: 00

Card 2/2

ACCESSION NR: AP4022711   S/0020/64/155/002/0306/0308

AUTHOR: Arifov, U. A. (Academician); Ayukhanov, A. Kh.; Sustrov, V. A.;
Khasanov, R. M.; Poltoratskiy, V. I.

TITLE: Cathode sputtering of tungsten by potassium ions

SOURCE: AN SSSR. Doklady*, v. 155, no. 2, 1964, 306-308

TOPIC TAGS: cathode sputtering, tungsten sputtering, tungsten surface purifica-
tion, tungsten, potassium ion, $_{74}W^{184}$, potassium

ABSTRACT: The authors investigated the sputtering of tungsten in a form of
chemical compounds and also studied the conditions for obtaining a pure tungsten
surface. Radioactive tracers were used for determination of the amount of
sputtered material. Polycrystalline tungsten targets with induced activity.
($_{74}W^{184}$) were bombarded with potassium ions. The sensitivity of detection was
10^{-9} gm. The experimental details were given in author's paper (Iz. AN UzSSR,
No. 2, 1963). It was found, by using retarding or accelerating potentials, that

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ACCESSION NR: AP4022711

the spattered particles were negative ions to a considerable extent. This is attributed to the adsorption of residual gases by tungsten atoms. Heating the target reduces the number of negative ions.' At $T > 1600K$, the spattering is temperature independent, which indicates that the tungsten compounds are practically absent, and that the spattering is characteristic of a pure surface. Orig. art. has: 4 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk UzSSR (Physics-Engineering Institute, AN/UzSSR)

SUBMITTED: 21Sep63   DATE ACQ: 08Apr64   ENCL: 00

SUB CODE: PH   NO REF SOV: 003   OTHER: 002

Card 2/2

L 6802-65   EWT(l)/EWT(m)/EPA(w)-2/EEC(t)/T/EEC(b)-2/EWP(q)/EWP(b)   Peb-24   9/
IJP(c)/ASD(d)/ASD(d)-5/ASD(m)-3/AFWL/ESD(dp)/ESD(gs)/ESD(t)/RAEM(t)

ACCESSION NR: AP4042681   S/0048/64/028/008/1395/1399

AUTHOR: Moroz, L. P.; Ayukhanov, A.Kh.

TITLE: Comparative study of the depth of penetration of different ions into dielectric films by a secondary ion-electron emission method /Report, Third All-Union Conference on Semiconductor Compounds held in Kishinev 16-21 Sep 1963/

SOURCE: AN SSSR. Izv. Seriya fizicheskaya, v.28, no.8, 1964, 1395-1399

TOPIC TAGS: ion deceleration, ion interaction, thin film, secondary electron, sodium chloride, rubidium compound, chlorine compound, sodium ion, cesium ion, potassium, rubidium, ion

ABSTRACT: A method for determining the relative depth of penetration of different ions into the same dielectric film was devised and applied to the investigation of the penetration of Na^+ and Rb^+ ions into RbCl films and K^+ and Cs^+ ions into NaCl films. In this method the penetration of the ions into the film is followed by observing the secondary electrons that are emitted, and the maximum depth from which secondary electrons originate is regarded as the penetration depth. To determine this depth, the thickness of the film is continuously increased during the measure-

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L 6802-65

ACCESSION NR: AP4044681

O

ments; the yield of secondary electrons accordingly rises until the thickness of
the film reaches the critical value, after which the yield remains constant. In the
experiments reported, the salt films were produced by evaporation onto a 1.5 x 40
mm^2 molybdenum substrate. Ions from two separate sources were directed onto this
substrate at equal small angles of incidence, and the secondary electron current
was monitored with an oscilloscope. The two ion beams were modulated by square
waves of different frequencies, so that one could observe on the oscilloscope the
electron currents produced by each of the two ion beams separately, and by both of
them together. The less penetrating beam was the one for which saturation of the
secondary current set in first. The actual thickness of the film was not measured,
so that only which of the two beams was the more penetrating could be determined.
The advantage of the method is that the two kinds of ion are observed in the same
film, thus obviating the problem of reproducibly forming and manipulating uniform
thin films. The experiments with Na^+ and Rb^+ ions on RbCl films and K^+ and Cs^+ ions
on NaCl films were conducted at ion energies from several hundred to several thou-
sand electron-volts. It was found that the two ions penetrated to the same depth
when their initial velocities were equal. From this and the fact that the ions dif-
fered greatly in mass it is concluded that the secondary electrons originating at
the greatest depths were ejected directly by the ions themselves rather than by

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L 6802-65
ACCESSION NR: AP4014681

atoms of the film to which the ions might have transferred their momentum as in a
relay race. It is inferred that the conclusion of L.P.Morus and A.Kh.Ayakhanov
(Izv.AN SSSR.Ser.fiz.26,1322,1962) that secondary electrons produced by ions and
those produced by electrons originate at the same effective depth is erroneous, and
that when the two phenomena are observed in the same growing film it is found that
the effective depth for electron-electron emission exceeds that for ion-electron
emission by a factor 1.3. Orig.art.has: 5 figures.

ASSOCIATION: none

SUBMITTED: 00   ENCL: 00

SUB CODE: NP,GP   NR REF SOV: 005   OTHER: 000

3/3

L 36217-65   EWT(1)/EPF(n)-2/EWG(m)/EPA(w)-2/T/E/EWP(t)/EWP(b)   Pab-10/Pu-4   IJP(c)
          RWH/JI/JG

ACCESSION NR: AP5007100   S/0109/65/010/003/0541/0547

AUTHOR: Shustrov, V. A.; Khasanov, R. M.; Ayukhanov, A. Kh.   36
                                                                       13

TITLE: Disintegration of Ta and W cathodes at various temperatures

SOURCE: Radiotekhnika i elektronika, v, 10, no. 3, 1965, 541-547

TOPIC TAGS: cathode disintegration, tantalum cathode, tungsten cathode

ABSTRACT: Ta and W foils tagged with $_{73}Ta^{82}$ and $_{74}W^{85}$ were disintegrated at 300-1500K
and 10^{-6}torr in a specially designed device (see Enclosure 1). Nickel cylinder 1 served
as a receiver of the disintegrated material; the cylinder consisted of 12 equal
"collectors" 50mm long and 15.7 mm (arc) wide. A 5-mm hole 3 in the center of each
collector was intended as an entrance for the ion beam. Target 9 was located axially.
Diaphragm 2 had two cuts 4. Between the last electrode of electron lens 5 and cylinder
1, a guard plate 6 with a a 2-mm hole prevented the ions from hitting the collector
directly. Plots of the coefficient of cathode disintegration vs. temperature and
energy (200-1200ev) are presented; the disintegration was effected by K, Li, and Na
ions. It was found that: (1) The disintegration of a clean metal surface is

Card 1/2

L 36217-65
ACCESSION NR: AM007100
is possible at temperatures exceeding a certain value definite for a given ion-metal
pair; (2) The coefficient of disintegration of a clean surface does not depend on the
target temperature up tp 2000K. Orig. art. has: 6 figures

ASSOCIATION: none

SUBMITTED: 03Feb61   ENCL: 01   SUB CODE: EC

NO REF SOV: 004   OTHER: 002

Card 2/3

L 41698-65   EWT(l)/EPA(sp)-2/EPF(c)/EPA(w)-2/EEC(t)/EWA(m)-2   P1-4/Pr-4/Pz-6/
Pab-10/Pcb   IJP(c)   AT/WW
ACCESSION NR: AR5008426   UR/0058/65/000/001/H060/H060

SOURCE: Ref. zh. Fizika, Abs. 1Zh379

AUTHORS: Moroz, L. P.; Ayukhanov, A. Kh.

TITLE: On the possibility of determining the depth of penetration of ions in a
solid by means of secondary ion-electron emission

CITED SOURCE: Dokl. AN UzSSR, no. 6, 1964, 15-18

TOPIC TAGS: electron emission, ion bombardment, secondary emission, thin film,
penetration depth

TRANSLATION: Two possible mechanisms are considered for the knocking out of
secondary electrons from the target substance: the direct action of the bom-
barding ions themselves, and the production of electrons by the recoil atoms
(i.e., by the target atoms situated in this region) in cascaded transport of
large batches of energy. To explain the role of each of these mechanisms, ex-
periments were carried out that yielded the dependences of the coefficient of

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L 41698-65

ACCESSION NR: AP5008426

ion-electron emission on the thickness of NaCl and RbCl films evaporated in vacuum on a molybdenum substrate, the films being bombarded with K^+, Cs^+, and Na^+ and Rb^+ ions, respectively. It is established that secondary electrons are emitted from a layer of equal thickness in the case when the bombarding ions have equal velocities. Starting from this experimental fact, it is asserted that the electron emission from deep layers of the target is due to the primary ion beam itself. On the basis of such a conclusion, the authors believe that the secondary ion-electron emission can be used to study the depth of penetration of the ions in a solid. V. Shustrov.

SUB CODE: AP   ENCL: 00

Card 2/2

ARIFOV, U.A.; ALIYEV, A.A.; AYUKHANOV, A.KI.

Angular dependence of the energy spectra of secondary ions
following the bombardment of metals with positive ions. Izv.
AN Uz.SSR.Ser.fiz.-mat.nauk 8 no.4:20-26 '64.

(MIRA 18:3)

1. Fiziko-tekhnicheskiy institut AN UzSSR.

L. 59017-65   EWT(1)/EPF(c)/EPA(w)-2/T/EWA(n)-2   r-h   IJP(c)

ACCESSION NR: AR5016007   UR/0158/65/000/005/H082/H083

SOURCE: Ref. zh. Fizika, Abs. 5Zh550

AUTHORS: Arifov, U. A.; Aliyev, A. A.; Ayukhanov, A. Kh.

TITLE: Angular dependence of the energy spectra of secondary ions in the bombard-
ment of light targets by heavy positive ions

CITED SOURCE: Dokl. AN UzSSR, no. 9, 1964, 22-26

TOPIC TAGS: ion emission, secondary emission, molybdenum, nickel, ion bombardment,
energy spectrum, secondary ion spectrum

TRANSLATION: Using an electrostatic analyzer and a method described by the author
earlier (abstract 57h549), the authors investigated the energy spectra of secondary
ions produced when Ni and Mo are bombarded with Ib$^+$ and Cs$^+$ ions at different an-
gles of incidence. The ions analyzed were those emitted at at angle of 50° to the
normal to the surface. Upon bombardment of a heated target, starting with angles
of incidence 30°, the observed secondary ions were faster than the evaporated and
the sputtered ones. With further increase in the angle of incidence, the spectrum
of this group of ions broadened and their number increased. With increasing
primary-ion energy, the maximum of the distribution curve shifted towards larger

Card 1/2

L 59017-6

ACCESSION NR: AR6016007

values of the energy. The observed scattering of the ions is attributed to pair collisions -- single and multiple. V. Shustrov.

SUB CODE: NP   ENCL: 00

Card 2/2

L 09093-67   EWT(1)/EWP(m)   AT

ACC NR: AP7002336   SOURCE CODE: UR/0166/66/000/003/0041/0048

AUTHOR: Arifov, U. A.; Aliyov, A. A. Ayukhanov, A. Kh.   40

ORG: Physicotechnical Institute, Academy of Sciences Uzbek SSR (Fiziko-tekhnicheskiy Institut AN UZSSR)

TITLE: Angular dependence of the energy spectra of secondary ions at various angles of emission

SOURCE: AN UZSSR. Izvestiya, Seriya fiziko-matematicheskikh nauk, no. 3, 1966, 41-48

TOPIC TAGS: ion bombardment, particle spectrum

ABSTRACT: Earlier articles by the authors described the use by them of an electrostatic analyzer to study the angular dependence of the energy spectra of secondary ions during the bombardment of metals by positive ions. On the basis of the resulting data the authors concluded that during the bombardment of metals by ions in an energy range of 1-3 kev scattering is explained by paired collisions - single and multiple. The earlier articles described the results of the energy analysis of the secondary ions emitted at a certain angle (= 50°) in relation to an angle of incidence of 10°-80°. As a result of the design of the instrument it was possible, by changing the target position vis-à-vis the analyzer, to study the dependence of the energy spectra of the secondary ions on

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L 09093-67

ACC NR: AP7002336   D

the angle of incidence at various emission angle values. The present article
gives the results of these investigations, in particular, oscillograms showing
the energy distribution and the angular dependence of the energy spectra at
various angles of emission for secondary ions when a Mo target heated to 1800° K
is bombarded by positive potassium or cesium ions with energy $E_o = 1000$ ev. The
authors discuss some of the results and conclude that they can be explained from
the viewpoint of paired collisions of the bombarding ions with a system of free
atoms. Orig. art. has: 3 formulas and 4 figures. [JPRS: 38,168]

SUB CODE: 20 / SUBM DATE: none / ORIG REF: 010 / OTH REF: 001

Card 2/2   aat

L 237𝑁6-66   E𝑊T(1)/E𝑊T(m)/T   AT

ACC NR: AP6C08549   SOURCE CODE: UR/0166/66/000/001/0057/0061

AUTHOR: Arifov, U. A. ; Khadzhimukhamedov, Kh. Kh. ; Ayukhanov, A. Kh.   5/

ORG: Physics Technical Institute, AN UzSSR (Fiziko-tekhnicheskiy institut AN UzSSR)

2/
TITLE: The coefficient of surface ionization of fast secondary particles
/9

SOURCE: AN UzSSR. Izvestiya. Seriya fiziko-matematicheskikh nauk, no. 1, 1966, 57-61.

TOPIC TAGS: fast particle, secondary emission, ion bombardment, ion emission, surface ionization

ABSTRACT: After a brief review of the literature, the authors note that there is no clarity in the question on the charge state of fast particles emitted from a surface and on the application of the law of surface ionization to these particles. The present authors together with S. V. Starodubtsev showed earlier (DAN SSSR, 124, 1959, 60) that there are slow (evaporated and diffused) as well as fast (scattered) ions in the secondary ion emission. Experimental work on the charge state of emitted fast particles had been conducted without separating the secondary ions into the individual components. There-fore, the purpose of the present work is the experimental study of the charge state of
Card 1/2

L 23756-66

ACC NR: AP6008549

surface-emitted fast particles depending on the ionization energy and potential of bombarding ions. On the basis of the experimental data obtained in the present work and that of other authors (Flyants, N.N., Arifov, U.A., Ayukhanov, A. Kh. "Radiotekhnika i elektronika," 1963, no. 8, 34; Zandberg, E. Ya. ZhTF, 25, 1955, 1386; Arifov, U.A., Khadzhimukhamedov, Kh. Kh. "Izv. AN SSSR," seria fizich., 24, 1960, 705) it is concluded that the scattering in the form of positive ions depends not on the charge state of the primary particle, but on the ionization potential of the bombarding particle. This process, however, only qualitatively agrees with the mechanisms of surface ionization. This should have been expected, since secondary scattered ions have an entire energy spectrum, from thermal to limiting, determined by single and multiple elastic collisions of the bombarding particle with the atoms of the metal. A better agreement of the results with the surface ionization mechanism may be obtained, apparently, only for the group of slow ions with energies below 10 ev. Orig. art. has: 1 figure and 3 formulas.

SUB CODE: 20 / SUBM DATE: 10Mar65 / ORIG REF: 015 / OTH REF: 001

Card 2/2

AYUKOV, A.

Effect of chemical composition and physical condition of ... upon the softening temperature ... I. Z. Kozorich and A. S. Ayukov. Trudy Leningrad. Politekh. Inst. 1955, No. 71 ... No. ... ... Zhur. ... 1956, ... ores, concentrates, ... The softening temp. was detd. for several ... ... agglomerates of these ores. Twenty g. of the sample ... placed in a graphite crucible 28 mm. in diam. in a Tam- ... furnace, and on top of the sample was placed a hollow ... ... and contg. a Pt/PtRd thermocouple. A porce- ... covered total wt. of the rod was 2 ... The rod was con- ... ... a needle which moved on a scale according ... of softening was detd. by a noticeable im ... the begin- ... ... to ore; the end by the immersion to the bottom ... ... crucible. The size of grains had no effect upon the ... of ore softening. The agglomerate starts to soften ... ... that the ore. At 980-1100° for the ores the depth ... ... immersion of the rod was 18% of total height for the ... minerals ... was 54%. The end of softening fo agglom- ... ... was 170°, for ores 1210°.   Alexis N. Pesroff

AYUKOV, A.S

AUTHOR: Sapozhnikov, N.P.   133-58-3-5/29
TITLE: Remarks on the Paper of A.S. Ayukov "Charge Distributor of
             a New Design" (Otklik na stat'yu A.S. Ayukova "Raspredelitel'
             shikhty novoy konstruktsii")
PERIODICAL: Stal', 1958, Nr 3, p 208 (USSR)
ABSTRACT: The author agrees with the views expressed in the paper
             published in Stal', 1956, Nr 11.
ASSOCIATION: Cherepovetskiy metallurgicheskiy zavod
             (Cherepovets Metallurgical Works)
AVAILABLE: Library of Congress
Card 1/1

AYUKOV, A.S.

New Design of Charge Distributor. A. S. Ayukov. (Sta' ..., (11), 975-976). [In Russian]. The design of bell-type tops used in the U.S.S.R. is criticized and a top of new design is proposed. Model experiments with the proposed design showed good results and it is claimed that it would be easier to make gas-tight at high top pressures than existing tops. A. K.

BLAST FURNACE 18

ZAYTSEV, K.T.; AYUKOV, A.S.; DOIMATOV, V.A.

Blast furnace trial operation with raw Atasu ore. Stal' 21
no.12:1059-1062 D '61.   (MIRA 14:12)

1. Karagandinskiy metallurgicheskiy zavod.
            (Blast furnaces)
            (Atasu region--Iron ores)

AYUKOV, A.S.

Local burning of blast furnace tuyers. Metallurg 8 no.1:10-11
Ja '63.   (MIRA 16:1)

1. Karagandinskiy metallurgicheskiy zavod.
        (Blast furnaces--Design and construction)

STARSHINOV, E.N.; OSTROUKHOV, M.Ya.; KOCHINEV, Ye.V.; Prinimali uchastiye:
TARASOV, D.A.; SOROKA, P.F.; KARACHENTSEV, M.D.; OS'KIN, V.T.;
KORNEV, V.K.; POPOV, Yu.A.; DOLMATOV, V.A.; AYUKOV, A.S.

Blowing-in of large blast furnaces. Sbor.trud. UNIIM
no.11:27-32 '65.
                                                    (MIRA 18:11)

STARSHINOV, B.N.; SINITSKIY, V.D.; SEN'KO, G.Ye.; GULYGA, D.V.; BABIY, A.A.; KHORUZHIY, A.G.; Prinimali uchastiye: OSTROUKHOV, M.Ya.; SAVELOV, N.I.; PLISKANOVSKIY, S.T.; MOISEYEV, Yu.G.; LAVRENT'YEV, M.L.; TARASOV, F.P.; ZAGREBA, A.V.; KAMENEV, R.D.; TKACHENKO, A.A.; FREYDIN, L.M.; LUKIN, P.G.; POPOV, Yu.A.; MISHIN, P.P.; KARACHENTSEV, M.D.; DOLMATOV, V.A.; AYUKOV, A.S.; PALAGUTA, V.P.; VYAZOVSKIY, Yu.V.; SOLODKIY, Yu.A.; KONAREVA, N.V.; SAPRONOV, Yu.V.; SINITSKAYA, S.K.; SAPRONOV, B.V.; LEKAREV, V.L.; STOLYAR, V.V.; PROKHORENKO, Z.A.; BANDINA, Ye.Ye.

Results of the first year of operation of large capacity blast furnaces. Sbor. trud. UNIIM no.11:34-46 '65.

(MIRA 18:11)

AYUNTS, Zh.A.

Significance of Amorpha fruticosa L. in the Erivan greenbelt [in
Armenian with summary in Russian]. Izv.AN Arm.SSR.Biol.i sel'khoz.
nauki 8 no.5:87-88 My '55.   (MLRA 9:8)
                    (Erivan--Amorpha)

AYUPOV, Arif; AVAZOV, Rakhmatulla; KODIROVA, R., red.

[Large crops in dry farming] Lalmikorlikda mul khosil;
Sirdare oblasti, Zhizzakh ishlab chikarish boshkarmasi-
dagi "Udarnik" sovkhozi gallakorlarining tazhribalaridan.
Toshkent, Uzdavnashr, 1964. 27 p.   (MIRA 17:12)

AYUPOV, A.A., inzh. distantsii (stantsiya Cholkar)

Shop equipment has become obsolete. Put' i put. khoz. no. 8:44
Ag '58.
(MIRA 11:8)
(Railroads--Equipment and supplies)

AYUPOV, F.M., kapitan

We are reducing the time needed to train first- and second-class
operators. Vest.protivovozd.obor. no.2:54-57 F '61. (MIRA 14:2)
(Radar, Military)

AYUPOV, Kh.

Role of the budget in the development of the economy and
culture of the Tatar A.S.S.R. Fin.SSSR 21 no.7:15-18
Jl '60.   (MIRA 13:7)

1. Ministr finansov Tatarskoy ASSR.
        (Tatar A.S.S.R.--Budget)
        (Tatar A.S.S.R.--Economic conditions)

AYUPOV, Kh.J4.

Results achieved by the Samarkand station for visual optical observation of articicial satellites. Trudy Uz(hi no.117: 99-132 '62.

(MIRA 16:7)

(Samarkand—Artificial satellites—Optical observations)

AYUPOV, Kh. and ATEMASOV, A.

"The Technique of the Veterinary Processing of Animals," Ufa, Bashgosizdat, 1951. 72 pages. In Bashkir language. A booklet for veterinary assistants.

Veterinariya, Julr 1952. Translation #155, L. Lulich

AYUPOV, Kh.

"Helminthiasis of Ruminants and the Control Measures"

Ufa, Bashkir Publishing House, 1953

AYUPOV, Kh.V.

"Helminthoses of Agricultural Animals in the Bashkir ASSR and an Attempt at Ridding the Ruminants of One Rayon of the Principal Helminthoses." Cand Vet Sci, All-Union Inst of Helminthology, Moscow, 1954. (RZhBiol, No 3, Apr 55)

SO: Sum. No. 704, 2 Nov 55 – Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (16).

USSR/Diseases of Farm Animals - Diseases Caused By Helminths.   R.

Abs Jour   : Ref Zhur - Biol., No 6, 1958, 26319

Author   : Ayupov, Kh.V.

Inst   : Kazan' Scientific Research Institute.

Title   : Therapeitic Value of Hexachlorethane (HChE) in Sheep
               Fascioliasis (Report of the Author).

Orig Pub   : Byul. nauchno-techn. inform. Kazansk. n.-i. in-ta,
               1957, No 1, 30-31

Abstract   : It was shown that the most stable suspension of HChE
               is obtained when one part of HChE is mixed with two
               parts of fat (sunflowerseed oil or cod-liver oil)
               and with two parts of a one-percent solution of sodium
               oleate or a five-percent solution of corn sourdough.
               Experiments with 804 sheep which were sick with fascioli-
               asis, have shown that a suspension of HChE in dosages

Card 1/2

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USSR/Diseases of Farm Animals - Diseases Caused by Helminths.   R.

Abs Jour   : Ref Zhur - Bioli, No 6, 1958, 26330

Author   : Ayupov, Kh. V.
Inst   :
Title   : Apparatus for Administering Liquid Anthelmintics to
              Sheep and Goats.

Orig Pub   : Veterinariya, 1957, No 6, 36-37

Abstract   : No abstract.

Card 1/1

AYUPOV, Kh.V., kand. veter. nauk; IVANOVSKIY, S.A., kand. veter. nauk;
SAFIULLIN, G.K.; VALIULLIN, S.M., veterinarnyy vrach;
UPORNIKOV, M.V., veterinarnyy vrach; FROLOV, V.P., zootekhnik

Veterinary helminthological evaluation of the year-round
pen system of keeping sheep. Veterinariia 40 no.6:49-52
Je '63.   (MIRA 17:1)

1. Bashkirskaya nauchno-proizvodstvennaya veterinarnaya
laboratoriya (for Frolov). 2. Direktor Miyakinskogo sovkhoza
Bashkirskoy ASSR (for Safiullin).

AKCHURIN, B.S., kand. vet. nauk, otv, red.; AYUPOV, Kh.V., zam.
otv. red.; ALFAROV, D.A., kand. idol. nauk, red.;
BOLDYREV, V.M., naushn. sotr., red.; SATTAROV, A.S.,
nauchn. sotr., red.; BUTIKOVA, S.N., nauchn. sotr., red.;
TRASHNOVA, Ye.T., tekhn. red.

[Papers of the Bashkir Scientific Research Institute of Agri-
culture] Uchenye zapiski Bashkirskogo nauchno-issledovatel'-
skogo instituta sel'skogo khoziaistva. Ufa, 1963. 312 p.
                                          (MIRA 16:10)
1. Bashkirskiy nauchno-issledovatel'skiy institut sel'skogo
khozyaystva. 2. Zaveduyushchiy otdelom infektsionnykh bo-
lezney Bashkirskogo nauchno-issledovatel'skogo instituta sel'-
skogo khozyaystva (for Sattarov).
            (Bashkiria--Veterinary medicine)

AYUPOV, Khamit Valiyevich; DEMIDOV, Nikolay Vasil'yevich; BAYANOV,M.G.
dots.
[Liver helminthiases of farm animals] Pochenochnye gel'-
mintozy sel'skokhoziaistvennykh zhivotnykh. Ufa, Bash-
kirskoe knizhnoe izd-vo, 1963. 49 p.   (MIRA 18:7)

1. Bashkirskiy gosudarstvennyy universitet (for Bayanov).

AYUPOV, M.A.

Experience adjusting the automatic protective device of a high
pressure PV-150 economizer; exchange of experience. Energ.biul.
no.4:1-4 Ap '57.   (MIRA 10:5)

(Boilers)

AIUPOV, Mirza

[Trade unions of Uzbekistan in the struggle to build communism]
Profsoiuzy Uzbekistana v bor'be za postroenie kommunizma.
Tashkent, Gosizdat UzSSR, 1959.   117 p.   (MIRA 14:3)
        (Uzbekistan--Trade unions)

GOLOVIKOV, N.F.; ANTIPOV, N.N.; KAGAN, ...; SHKELYICH, C.C.

Technology of manufacturing molding pipes from aluminum alloys by pressure molding. Trudy VNITI no.12:59-61 '61.   (MIRA 18:4)

GOLOVINOV, M.F.; AYUPOV, R.N.; KAGAN, L.S.; LESHKEVICH, G.G.; KURBATOV, V.I.;
         KALUGIN, A.A.

    Extrusion of pipe of varying cross sections. TSvet. met. 36
    no.8:72-75 Ag '63.
                 (Extrusion (Metals)) (Pipe, Aluminum)   (MIRA 16:9)

L 40579-65   EWT(d)/EWT(m)/EWA(d)/EWP(v)/EPR/EWP(t)/EWP(k)/EWP(h)/EWP(z
EWP(b)/EWP(1)/EWA(c)   Pf-4/Ps-4   IJP(c)   HJW/JD/HW
ACCESSION NR: AT5004708   S/3130/64/000/012/0057/0061

AUTHORS: Golovinov, M. F.; Ayupov, R. N.; Kagan, L. S.; Leshkevich, O. O.

TITLE: Technology of drill pipe pressing from aluminum alloys

SOURCE: Vsesoyuznyy nauchno-issledovatel'skiy institut burovoy tekhniki. Trudy,
no. 12, 1964. Buril'nyye truby iz legkikh splavov (Drill pipes made of light
alloys), 57-61

TOPIC TAGS: alloy, aluminum, aluminum alloy, drill, pressing, metallurgical
process, metal pressing, metal hardening, metal stamping / D16 aluminum, AVT1
aluminum

ABSTRACT: Light drill pipes (thickened at both ends) were made of aluminum
alloys D16 and AVT1. Their production by pressing required special equipment and
technique; Fig. 1 on the Enclosure shows schematically a device for the pressing
of pipes with internal thickenings. The device is equipped with a pin of varied
cross sections which corresponds to the internal pipe diameter and the thickened
parts; the tip has a special shape designed for pressing of thickened parts. A
press designed for the pipes with external thickenings and the main stages of the
process are illustrated in Figs. 2, 3, and 4 on the Enclosure. Several internal

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L 40539-65
ACCESSION NR: AT5004708

and external thickenings along the pipe were made with a pin of a more compli-
cated profile. Finished pipes were hardened in vertical air ovens; the alloy D16
was heated to 500 and the AV alloys to 5200. After a 15-20 minute delay they were
cooled in water and straightened in a special tension device. Finished pipes had
a fibrous structure, and their strength was increased in the longitudinal direc-
tion. Best quality was obtained with homogenized ingots; the lubrication of pins
and containers increased the productivity rate. Orig. art. has: 6 figures, 1
table, and 1 formula.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut burovoy tekhniki
(All-Union Scientific Research Institute of Drilling Technology)

SUBMITTED: 21Aug63   ENCL: 03   SUB CODE: MM

NO REF SOV: 002   OTHER: 000
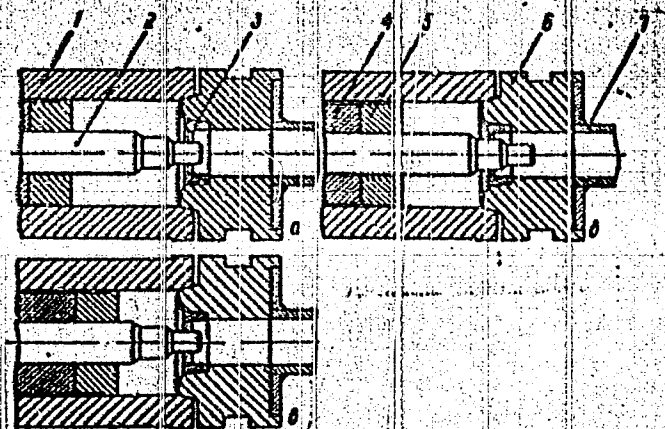
Card 2/5

L 40559-65
ACCESSION NR: AT5004708   ENCLOSURE: 01

Fig. 1. Device for pressing drill pipes with two internal thickenings.
a— pressing of front end; б— pressing of basic pipe; b— pressing of
back end; 1— bush; 2— pin; 3— matrix; 4— press-plunger; 5— press-
collar; 6— matrix-holder; 7— guiding bush

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L-40539-65
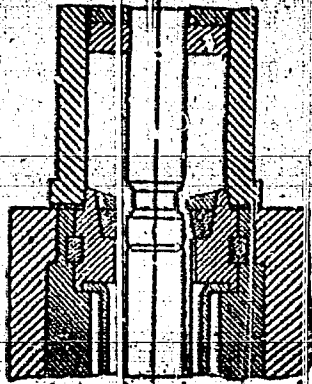ACCESSION NR: AT5004708

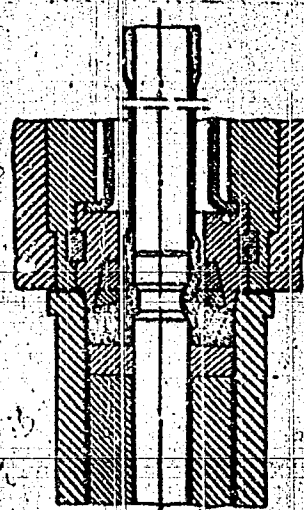ENCLOSURE: 02

Fig. 2.
Pressing of front thickening
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Fig. 3.
Pressing of back thickening
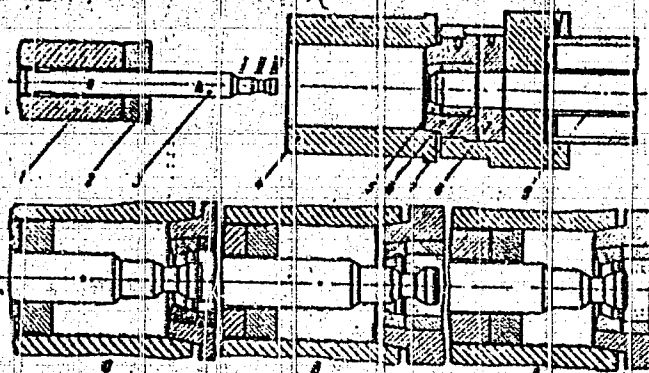
L 40539-65
ACCESSION NR: AT5004708

ENCLOSURE: 03

Fig. 4. Device for pressing drill pipes with two external thickenings;
a- pressing of front thickening; 6- pressing of basic pipe;
b- pressing of back thickening; 1- press-plunger; 2- press-collar;
3- pin; 4- bush; 5- matrix; 6- matrix holder; 7- intermediate ring;
8- supporting ring; 9- guiding bush

Card 5/5

AYUFOV, R.S.; VODYAKOV, I.T.; CHUDAKOV, N.S.

Drying of artificial insole leather at high temperatures. Kozh.-
obuv. prom. 7 no.8:19-22 Ag '65.   (MIRA 18:9)

NOVOPLYANSKAYA, R.; BRIK, A.O., metodist; AYUPOVA, K.V., prepodavatel';
        SOKOLOV, B.M., uchitel' geografii; SYCHEV, V.G., uchitel'
        geografii; MAGOMED, M., khalimanov, uchitel' geografii;
        AZIMOV, D.B.

        Editor's mail. Geog. v shkole 26 no.6:51-54 N-D. '63.
                                                    (MIRA 17:1)
        1. Melitopol'skiy pedagogicheskiy institut (for Novoplyanskaya).
        2. Lipetskiy institut usovershenstvovaniya uchiteley (for Brik).
        3. Pedagogicheskoye uchilishche g. Kansk, Krasnoyarskiy kray (for
        Ayupova). 4. 29-ya srednyaya shkola Novosibirska (for Sokolov).
        5. Lyublinskaya shkola-internat No.2 Khar'kovskoy oblasti (for
        Sychev). 6. Kudalinskaya shkola Gunibskogo rayona Dagestanskoy
        ASSR (for Khalimanov). 7. Mikrokskaya odinnadtsatiletnyaya shkola
        Akhtynskogo rayona Dagestanskoy ASSR (for Azimov).

AYUPOVA, R.I.; DUBIVKO, S.A.

Morphology of the pulp of milk teeth at the stage of root resorption and during anomalies in secondary dentition. Nauch. trudy Kaz. gos. med. inst. 14:351-352 '64.   (MIRA 18:9)

1. Kafedra ortopedicheskoy stomatologii (zav. - prof. I.M.Oksman) Kazanskogo meditsinskogo instituta.

ZHUKOV, V.D.; YAKOVLEV, V.I.; POTAPOVA, V.I.; AYUPOVA, Ye.O.;
FRIDLYANDER, I.N., rukovoditel' raboty

Technology of production and the properties of semifinished
products from the highly resistant B92 alloy. Alium. splavy
no.3:92-104 '64.   (MIRA 17:6)

AYURZAN,T.

Economic role of the Mongolian camel. Trudy Mong. kom. nq.66:
72-84 '54.
(Mongolia--Camels)   (MIRA 8:6)

40261

S/200/62/000/006/001/003
D214/D307

/8.1151

AUTHORS: ·Vlasov, A.Ya., and Ayurzana,n, B.A.

TITLE: The dependence of magnetostriction and the coefficient
of linear expansion of Elinvar alloy on temperature

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Sibirskoye otdeleniye,
no. 6, 1962, 99 - 102

TEXT: The aim of this work is to explain the volumetric and elas-
tic properties of Elinvar alloys in terms of ferro-magnetism. The
relationship between magnetrostriction (λ) and temperature was stu-
died. All work was done on annealed specimens of one Elinvar alloy
(37 % Ni, 7.56 % Cr, 54.44 % Fe) in the temperature range from -196
to $350^\circ C$. Magnetostriction curves constructed for various tempera-
tures showed that in strong magnetic fields (H) the relationship
between λ and the field strength in linear and the gradient increa-
ses at temperatures approaching the Curie point. This gradient de-
creases and the curves deviate from linearity when the Curie tempe-
rature is exceeded. Extrapolation of these straight portions to
$H = 0$ show that λ, of technical saturation, is linearly related to
Card 1/2

The dependence of magnetrostriction ...   S/200/62/000/006/001/003
                                           D214/D307

the temperature up to the Curie range, at various field strengths.
The coefficient of linear expansion (α) was constant between -196
and 100°C. Above this temperature α rapidly increased linearly with
temperature. A theoretical equation relating α to λ has been worked
out and experimental results closely agree with the theoretical.
This confirms that the anomalies of the thermal expansion of Elin-
var are connected with the ferromagnetism of the alloy. There are
4 figures.

ASSOCIATION: Institut fiziki sibirskogo otdeleniya AN SSSR, Krasno-
             yarsk (Institute of Physics, Siberian Branch of the
             AS USSR, Krasnoyarsk)

SUBMITTED: June 24, 1961

Card 2/2

24.2700 (1147, 1164, 1482)

AUTHORS: Vlasov, A. Ya., Laptey, D. A., Ayurzanaya, B. A. and Smolin, R. P.

TITLE: Temperature dependence of the magnetic properties of Elinvar

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26 no. 2, 1962, 287-290

TEXT: This paper was presented at a Conference on magnetism and antiferro-magnetism. The authors studied the temperature dependence of magneto-striction, magnetic hysteresis, and coercive force. The studies were carried out on two test arrangements at the same time. Magnetization and coercive force were measured continuously with a vertical astatic magnetometer (Ref. 7: Drokin, A. I., Il'yushenko, V. A., Zh. eksperim. i teor. fiz., 29, no. 8, 339 (1955)). Magnetostriction was measured by transmitting strain gauges in the temperature range from -195° to +350°C and in magnetic fields of up to 3800 oe. Magnetic hysteresis was studied in the A-cycle (20-300-20°C and 20-400-20°C) in external magnetic fields (0 - 30 oe). Annealed (vacuum 10^{-4} mm Hg, 100°C, 2 hr) and unannealed

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Temperature dependence of the...

34175
S/048/62/026/002/024/032
B117/B138

specimens of the following composition were used: 37 % Ni, 7.57 % Cr,
0.52 % Mn, 0.29 % Si, 0.03 % C, 0.011 % P, remainder: Fe. Volume
magnetostriction in pure form was observed in fields above 900 oe. The
temperature dependence of magnetostriction shows the "saddle" characteristic
of invar alloys, with a peak at 155°C. Due to volume magnetostriction,
at technical saturation λ_s this dependence is nonlinear. Paraprocess
magnetostriction λ_p is stable and not dependent on the previous treatment
of the specimen. Unlike most ferromagnetics there are a number of
peculiarities in the temperature dependence of magnetization and coercive
force around Curie point. In unannealed specimens no "anomalies" are
observed. The same holds for the temperature dependence of magnetic
hysteresis, which is peculiar in annealed specimens. The absolute value of
magnetic hysteresis is highest in unannealed specimens, and the temperature
dependence of coercive force has a minimum at 150°C. The anomalies observed
in the course of $I(T)$ and $H_c(T)$ can be attributed to the fact that Elinvar
has groups of magnetic phases with different Curie points. There are
5 figures and 13 Soviet references.

ASSOCIATION: Institut fiziki Sibirskogo otdeleniya Akademii nauk SSSR
             (Institute of Physics of the Siberian Department of the
Card 2/2   Academy of Sciences USSR)

AYURZANAYN, B.A.

Law of approach to magnetostriction saturation of elinvar alloys
and the determination of magnetostriction constants. Izv. AN SSSR.
Ser. fiz. 28 no.1:202-205 Ja '64.

Magnetization and magnetostriction saturation in elinvar alloys
subjected to plastic deformation.   Ibid.:206-210   (MIRA 17:1)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR.

VLASOV, A.Ye. ; AYURZANAYN, B.A.

Temperature relationship of magnetostriction and the coef-
ficient of linear expansion of elinvar. Izv. Sib. otd. AN
SSSR. no.6:99-102 '62
                                             (MIRA 17:7)

1. Institut fiziki Sibirskogo otdeleniya AN SSSR, Krasnoyarsk.

ACC NR: AP700513()

SOURCE CODE: UR/0126/66/022/004/0551/0555

AUTHOR: Khromov, B. P.; Ayurzanayn, B. A.

ORG: Krasnoyarsk Polytechnic Institute (Krasnoyarskiy politekhnicheskiy institut)

TITLE: Susceptibility of the para-process in elinvar alloys

SOURCE: Fizika metallov i metallovedeniye, v. 22, no. 4, 1966, 551-555

TOPIC TAGS: magnetization, elinvar alloy, iron nickel alloy, chromium, magnetic susceptibility, magnetic anisotropy

ABSTRACT: Elinvar alloys display a number of anomalies: considerable magnetostriction of the para-process; a relatively low coefficient of thermal expansion, and a complex temperature dependence of these properties. The nature of these anomalies is associated with ferromagnetism, and hence their elucidation should be furthered by investigating the magnetic properties of these alloys. In this connection, polycrystalline cylindrical specimens of Ni-Cr-Fe elinvar alloys (32% Ni, 6-12% Cr, with Fe as the remainder) were subjected to measurements of differential susceptibility in various magnetic fields of up to 3000 oe with the aid of a previously described experimental setup (Khromov, B. P. Izv. vuzov, Fizika, 1960, no. 1, 171).

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UDC: 538.214:538.221

ACC NR: AP7005130

Findings: for these elinvar alloys magnetization in fields of more than 300 oe occurs owing to the para-process. The dependence of para-process susceptibility on field intensity is in good agreement with the theoretical conclusions of Holstein and Primakoff (Phys. Rev., 1940, 58, 1098). In laboratory fields -- several thousand oersteds -- the para-process susceptibility of elinvar alloys exceeds by one or two orders of magnitude the susceptibility of nickel and iron. The dependence of para-process susceptibility on field intensity is stronger for the alloys with the higher contents of Cr. It is to be expected that the magnetic anisotropy constant of elinvar alloys should be much lower than for nickel and iron. For the elinvar alloy containing 12% Cr at room temperature, positive susceptibility can be expected to diminish to zero and, in fields of several tens of thousands of oersteds, acquire negative values; it would be interesting to experimentally verify this assumption, for which no theoretical explanation is yet available. Orig. art. has: 3 figures, 1 table, 1 formula.

SUB CODE: 12/ 20/ SUBM DATE: 27Dec65/   ORIG REF: 005/ OTH REF: 006

Card 2/2