Corrosion and Protection of Steel (Cont.)   SOV/3133

Andreyeva, V.G. [Engineer], P.V. Strekalov [Engineer], and M.Á. Vedeneyeva.
Corrosion Resistance of 1Kh18N9T-steel Welded Joints   228

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TOMASHOV, N D

PHASE I BOOK EXPLOITATION   SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klivovi Tech. Ed.: I.F. Buzina; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and V on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

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Legrand, S.V. Method of Elongation by Forging With the Use of Back Pressure   358

Kuznetsov, V.D. Basic Problems in Mechanical Properties of Heat-Resistant Alloys   361

AVAILABLE: Library of Congress

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VK/jb
5-16-60

PHASE I   BOOK EXPLOITATION   SOV/3587

Tomashov, Nikon Danilovich

Teoriya korrozii i zashchity metallov (Theory of Corrosion and Protection of Metals) Moscow, Izd-vo AN SSSR, 1959. 591 p. Errata slip inserted. 4,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut fizicheskoy khimii.

Eds. of Publishing House: N.G. Yegorov and A.V. Shreyder; Tech. Ed.: I.F. Kuz'min.

PURPOSE: This book is intended for scientific research workers, metallurgists and engineers studying the corrosion of metals and methods of prevention.

COVERAGE: The book is an analytic study of the corrosion of metals. Scientific principles governing the process of corrosion of metals and means of prevention are investigated. The author explains the theory of corrosion and outlines its stages of development, gives an analysis of solid bodies, and describes the crystalline

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structure of metals and the main features of electrolytes. Part I treats chemical corrosion: the mechanism of oxidation, growth of films and the laws governing this phenomenon, and protection of metallic structures by alloying and coating. Part II analyzes problems of electrochemical corrosion: electrode potentials, the operation of corrosive galvanic cells, corrosive currents, polarization and depolarization phenomena, and factors inhibiting and accelerating electrochemical corrosion. Part III outlines the mechanism of corrosion and analyzes factors of atmospheric, soil and marine corrosion. Part IV investigates the corrosion resistance of various metals and alloys, analyzes the composition of different metals, and lists the metals most resistant to corrosion. The conclusion contains a number of suggestions for further study in corrosion prevention. The author thanks M.N. Tyukina, Ye.N. Paleolog, G.P. Chernova, Yu.N. Mikhaylovskiy, A.F. Lunev, M.A. Timonova, V.N. Modestova, T.V. Matveyeva, A.V. Byalobzheskiy, N.P. Zhuk, A.V. Shreyder, V.A. Titov, M.A. Vedeneyeva, A.A. Lokotilov, G.K. Berukshtis, O.G. Deryagina, A.Z. Fëdotova, M.N. Fokin, Ye.N. Mirolyubov, N.I. Isayev, R.M. Al'tovskiy, P.V. Shchiglev, L.S. Kupriyanova, O.N. Markova,

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Theory of Corrosion (Cont.)   SOV/3587

S.A. Baykova, L.A. Leonidova, and Professors S.G. Vedenkin and
A.V. Ryabchenkov. Each chapter is accompanied by references.

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TOMASHOV, N.D.

18(7);6(7)   PHASE I BOOK EXPLOITATION   SOV/2246

Zashchita podzemnykh metallicheskikh sooruzheniy ot korrozii; (Protection of Underground Metal Structures from Corrosion. Manual) Moscow, Izd-vo M-va kommunal'nogo khoz. RSFSR, 1959. 743 p. Errata slip inserted. 6,000 copies printed.

Ed.: M.I. Ryabtsev; Ed. of Publishing House: V.G. Akatova; Tech. Ed.: Ye. S. Petrovskaya.

PURPOSE: This collection of articles is intended as a manual on corrosion protection of underground metal structures.

COVERAGE: The book is divided into four parts. The first part gives information on the characteristics of underground metal structures and sources of stray currents. The second part deals with the theory of soil corrosion. The third part deals with corrosion of metals by stray current, sources of stray current, the problem of combating leakage from corrosion and the fundamentals of planning corrosion prevention. The fourth part examines measures for preventing corrosion of underground metal structures and gives the basic operating principles of equipment involved. No personalities are mentioned. References follow.

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Protection of Underground Metal (Cont.)   SOV/2246

Card 7

TOMASHOV N.D.

5(4)

PHASE I BOOK EXPLOITATION   SOV/2216

Soveshchaniye po elektrokhimii. 4th, Moscow, 1956.

Trudy...: [sbornik] (Transactions of the Fourth Conference on Electrochemistry) Moscow, Izd-vo AN SSSR, 1959. 868 p. Errata slip inserted. 2,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR.

Editorial Board: A.N. Frumkin (Resp. Ed.) Academician, O.A. Yesin, Professor; S.I. Zhdanov (Resp. Secretary), B.N. Kabanov, Professor, Professor; V.V. Stender, Professor; Ya. M. Kolotyrkin, Doctor of Chemical Sciences, V.V. Losev, P.D. Lukovtsev, Professor, Z.A. Solov'yeva; V.V. Stender, Professor; and C.M. Florianovich; Ed.: of Publishing House: N.G. Yegorov; Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists, and researchers interested in various aspects of electrochemistry.

COVERAGE: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry sponsored by the Department of Physical Chemistry of Chemical Sciences, and the Institute of Physical Chemistry of the Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories and galvanic processes in metals electrodeposition and of each division. Abridged discussions are given at the end of each division. The majority of reports are not included here involving polysis. The majority of reports. No personalities are mentioned. Published in periodical literature are given at the end of the articles. References are given at the end of most of the articles.

Burshtejn, R. Kh. (Institute of Electrochemistry, Academy of Sciences, USSR). Investigating the Contact Potential   603
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ivity of Iron in Oxidizing Solutions

Rozdyhansky, G.S. (Kazanskiy filial AN SSR-Kazan' Branch,   617
Academy of Sciences, USSR). Some Regularities of the Anodic Dissolution of Metals Under Conditions of Local Passivation

Sukhotin, A.M. (Gosudarstvennyy institut prikladnoy khimii-   621
State Institute of Applied Chemistry). Passivity of Iron in Acid Solutions

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Tomashov, N.D. and Yu. M. Mikhaylovskiy (Institute of Physical   634
Chemistry, Academy of Sciences, USSR). Electrochemical Kinetics of Corrosion Processes Under Adsorbed Films of Moisture

85546

S/081/60/000/020/008/014
A006/A001

18.8310   1506

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 20, p. 295, # 81439

AUTHORS: Tomashov, N.D., Berukshtis, G.K.

TITLE: A Method of Determining the Rate of Corrosion Processes Under Thin Electrolyte Films

PERIODICAL: Tr. In-ta fiz. khimii, AN SSSR, 1959, No. 7, pp. 5-10

TEXT: The authors describe a new electrochemical method of determining the corrosion rate from the magnitude of current on the model of a micro-corrosion element, assembled from thin dissimilar metal plates having different electrochemical potentials and serving as cathodes and anodes. The anode and cathode plates, alternating in the packet, are insulated from each other by a varnish or mica layer. The operating surface of the model is formed by the well-polished faces of the metal plates and the insulation. The conventional thickness of the metal plates is ~ 0.5 mm, and that of the insulation is $30 - 50 \mu$. Contact panels are arranged on the lower section of the packet, connected with the model anodes by conductors; all the cathodes are parallel switched to one common conductor.

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S/081/60/000/020/008/014
A006/A001

A Method of Determining the Rate of Corrosion Processes Under Thin Electrolyte Films

This method of switching makes possible to switch off any number of electrodes in case of necessity and to change the correlation of the cathode and anode surfaces of the model. It is shown that this method makes possible the study of basic regularities: the effect of temperature, concentration and composition of the electrolyte, and the intensity of mixing the medium, on the corrosion rate in adsorption and visible moisture films and in the electrolyte volume; the method can be used to investigate the corrosion rate under various conditions.

A. Moskvicheva

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

S/081/60/000/020/004/014
A006/A001

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 20, p. 294, # 81433

AUTHORS: Tomashov, N.D., Modestova, V.N., Blinchevskiy, G.K.

TITLE: Methods of Investigating Corrosion and Electrochemical Behavior of Metals Under Stress

PERIODICAL: Tr. In-ta fiz. khimii, AN SSSR, 1959, No. 7, pp. 64-77

TEXT: The design of a machine was developed for corrosion tests under stress with a time-constant load, permitting the operation at higher temperatures and measuring simultaneously the potential of the specimen. The corrosion behavior under stress of MA9 alloy was tested (low-alloy magnesium base alloy) in 0.001 n. NaCl solution and in a solution containing 35 g/l NaCl + 20 g/l K_2CrO_4. It is shown that in 0.001 n. NaCl solution, when stress is absent, the corrosion defects appear in the form of multiple rounded micropittings. In the presence of stress, the micropittings transform into slits or intercrystallite cracks. In a 35 g/l

Card 1/2

S/081/60/000/020/004/014
A006/A001

Methods of Investigating Corrosion and Electrochemical Behavior of Metals Under
Stress

$NaCl$ + 20 g/l K_2CrO_4 solution, coarse spotty corrosion is observed. The stress
does practically not affect the shape of pittings.

From the authors' summary

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

S/137/60/000/008/009/009
A006/A001

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No. 8, p. 316,
18903

AUTHORS: Tomashov, N. D., Isayev, N. I,

TITLE: Using the Ohmic-Capacity Method to Investigate the Behavior of
Protective Films During Corrosion of Metals in Strained State

PERIODICAL: Tr. In-ta fiz. khimiy, AN SSSR, 1959, No. 7, pp. 78-84

TEXT: The authors describe a method consisting in the combined measurement
of a double electric layer on metal surfaces (metal-electrolyte) and of the ohmic
resistance, to study the state of a protective oxide film during corrosion under
tensile stress conditions. There are 7 references.

Yu. L.

Translator's note: This is the full translation of the original Russian abstract.

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65373

S/081/60/000/017/007/016
A006/A001

26.1620

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 17, pp. 74-75,
68756

AUTHORS: Fokin, M.N., Matveyeva, T.V., Tomashov, N.D.

TITLE: Cells for Testing Metal-Solution Systems Under the Effect of Elec-
tronic Radiation With Consideration of Polarization Phenomena

PERIODICAL: Tr. In-ta fiz. khimii AN SSSR, 1959, No. 7, pp. 114-118

TEXT: Designs of a cell are suggested where the metallic electrode is
polarized anodically (cell a) and cathodically (cell b) during electronic irradia-
tion of the metal-solution system. Characteristics of radiation are: electron
energy $\sim$ 1 Mev; density of the electron flux: 3.3×10^{13} electron/cm^2 . sec;
power of a dose in a layer of the solution near the electrode of 1-mm thickness:
6.6×10^{19} ev/cm^3 sec. Thickness of the layer of the circulating solution (3%
NaCl) over the electrode in cell "a": 1 and 10 mm (less and more than the thick-
ness of the layer of full absorption of the electron radiation energy). In cell
"a" at a thickness of the solution layer equal to 1 mm, the corrosion rate of

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85373

S/081/60/000/017/007/016
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Cells for Testing Metal-Solution Systems Under the Effect of Electronic Radiation
With Consideration of Polarization Phenomena

$1 \times 18 H 9 T$ (1Kh18N9T) steel is by 2 orders of magnitude higher than that of a non-
irradiated specimen. The nature of destruction and the corrosion rate in irradia-
tion are different from those with anodic polarization of the specimen from an
external current source. These differences were not observed if the thickness of
the layer was 10 mm. The placing of a protector or cathodic polarization of the
specimen in cell "a" protects it against increased corrosion during irradiation.

D. Kokoulina

Translator's note: This is the full translation of the original Russian ab-
            stract.

Card 2/2

S/081/60/000/017/008/016
A006/A001

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 17, p. 75, # 68757

AUTHORS: Tyukina, M.N., Zalivalov, F.P., Tomashov, N.D.

TITLE: Electron-Microscopical Study of the Microstructure of Anodic Oxide Films on Aluminum

PERIODICAL: Tr. In-ta fiz. khimii, AN SSSR, 1959, No. 7, pp. 165-174

TEXT: The authors studied the effect of electrochemical conditions of obtaining anodic oxide films on Al upon their structure and physico-chemical properties. The Al surface was investigated after removal of the oxide film in hot solution of 35 ml/l H_3PO_4, and 20 g/l CrO_3. The surface of the oxide film and the transverse and longitudinal splits of the oxide film were also studied. A method is described of obtaining carbon imprints from anodic oxide film splits. It is shown that anodic oxide films on Al surfaces consist of close-packed cells in the form of hexagonal prisms, arranged with their base faces parallel to the anode surface. The cellular structure is formed within 3-7 sec after application of the anode current and does not change with a further growth of the oxide film

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S/081/60/000/017/008/016
A006/A001

Electron-Microscopical Study of the Microstructure of Anodic Oxide Films on
Aluminum

thickness. The pore size in the oxide film increase linearly with an increase
of the forming tension. It is shown that the particular properties of anodic
oxide films (hardness, resistance against corrosion and wear) obtained by the
method of hard anodizing, are explained by the increased size of oxide cells,
forming the oxide film, due to the thickening of their walls.

Yu. Polukarov

Translator's note: This is the full translation of the original Russian ab-
stract.

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9 (6)
AUTHORS:

Zalivalov, F. P., Tyukina, M. N.,   SOV/32-25-6-17/53
Tomashov, N. D.

TITLE:

Investigation of the Microstructure of Anodic Oxide Films on
Aluminum by the Aid of the Electron Microscope
(Issledovaniye mikrostruktury anodnykh okisnykh plenok na
alyuminii pri pomoshchi elektronnogo mikroskopa)

PERIODICAL:

Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 696-698 (USSR)

ABSTRACT:

A method was devised, permitting the determination of the cell
structure of anodic oxide films on aluminum (Fig 1). By this
method no impression is taken of the film on the metallic
anode surface (Ref 1); instead, replicas are prepared of such
films. The method is based on the operation of taking off
and subsequently comminuting the oxide film, thus obtaining
microscopic particles which are split along the side-
(longitudinal section) or bottom- (cross section) plane of
the hexagon lattice structure. Reproductions of these planes
of shear may be obtained by the carbon-replica method (Ref 2).
The preparation procedure is described. Observations were made
with the electron microscope EM-3 or UEM-100, and the samples
under investigation were of AV000 aluminum (99.99 % Al), which

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Investigation of the Microstructure of Anodic Oxide   SOV/32-25-6-17/53
Films on Aluminum by the Aid of the Electron Microscope

        were oxidized anodically in a 4 % sulphuric acid solution by
the method of the hard anodization (Refs 3, 4) (Figs 2, 3).
The figures show that the oxide film is a dense packing of
cells in the form of hexagon prisms. Data are supplied of
the dimension and quantity of cells (Table); they agree with
data obtained with an earlier described method (Ref 1).
There are 3 figures, 1 table, and 4 references, 2 of which
are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of
Physical Chemistry of the Academy of Sciences, USSR)

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SOV/32-25-6-19/53

28(5)
AUTHORS: Tomashov, N. D., Isayev, N. I.

TITLE: Method of Investigating Corrosive and Electrochemical Properties
             of Metals in the State of Stress (Metod issledovaniya korro-
             zionnykh i elektrokhimicheskikh svoystv metallov v napryazhennom
             sostoyanii)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 7oo - 7o2 (USSR)

ABSTRACT: Phase oxide films on metal surfaces exhibit a greater electric
             resistance so that a change in electric resistance and capacity
             is observable when submitting a sample to a stress causing the
             destruction of the oxide film. The degree of film destruction
             may be evaluated by the rate and magnitude of such variations.
             A system was devised based on this principle and used for
             the investigation of the surface oxide layer state according
             to the electric resistance-capacity method in sample stressing
             treatments. It may be observed from the scheme of the system
             (Fig 1) and from the description that an electric current supplied
             by an AC generator ZG-10 and having a potential of 1o-15 mv is
             used here. The circuit compensation is done by selecting
             appropriate capacities with the AC current resistor KMS-6. The

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Method of Investigating Corrosive and Electrochemical   SOV/32-25-6-19/53
Properties of Metals in the State of Stress

compensation moment is determined according to the minimum
of the AC current amplitude on the oscillograph. The test takes
place in a special vessel (Fig 2) in which the wire-shaped
sample is stretched (diameter 1-2 mm). The experimental results
obtained (Fig 3 on anodized aluminum, Fig 4 electropolished Al,
Fig 5 stainless 3Kh13 steel) show that in the case of deforma-
tions damaging the oxide film the capacity of the latter is
increased, electric resistance drops and the electrode potential
shifts to more negative values. This holds for the case that
the new-formed oxide films (on the damaged spots) exhibit a
weaker electric resistance than the primary films. To be sure,
also new oxide films may form whose conductivity is lower than
the one of primary films as, for example, is the case with
3Kh13 steel in 12 n HNO_3 (Fig 6). There are 6 figures.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of
Physical Chemistry of the Academy of Sciences of the USSR)

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28 (5)

AUTHORS: Tomashov, N. D., Byalobzheskiy, A. V.,   SOV/32-25-6-31/53
             Val'kov, V. D., Zalivalov, F. P.

TITLE: Device for the Rapid Determination of the Quality of Anodic
             Oxide Films on Aluminum and Its Alloys (Pribor dlya bystrogo
             opredeleniya kachestva anodnykh okisnykh plenok na
             alyuminii i yego splavakh)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 738-739 (USSR)

ABSTRACT: For the detection of defective parts of anodic films the
             device K-1 by G. V. Akimov and Ye. N. Paleolog is
             usually used. The device permits the detection of very small
             defects, does, however, not indicate the general quality of
             the film; another disadvantage is the use of a sodium
             chloride solution which may lead to a corrosion of the film.
             Therefore, a new device was designed, K-2 - very similar to
             K-1; the mode of operation of the new device is based upon
             the fact that the conductivity of the anodic oxide film is
             the greater the more porous it is. The construction of the
             detector of defects (Fig 1) is somewhat modified, stainless
             steel 1 Kh18N9 or zink serve e. g. as electrode as copper
Card 1/2   and aluminum may together form an electric cell. The device

Device for the Rapid Determination of the Quality of   SOV/32-25-6-31/53
Anodic Oxide Films on Aluminum and Its Alloys

(Fig 2, Scheme) has piles as direct-current transmitters
(2-4 v) so that a non corroding electrolyte may be used
(0.1 % solution of potassium- or sodium bichromate). There
are 2 figures.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute
of Physical Chemistry of the Academy of Sciences, USSR)

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18 (7)
AUTHORS: Tomashov, N. D., Andreyev, L. A.,   SOV/32-25-10-16/63
               Isayev, N. I.

TITLE: Comprehensive Investigation of Stress-Corrosion Cracking Processes

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 25, Nr 10, pp 1200 - 1203
               (USSR)

ABSTRACT: A device and a suitable method for simultaneous microscopic and
               electrochemical investigation of stress-corrosion cracking proc-
               esses were developed. The device includes a tensile-testing
               machine with a visual and measuring recording system. Axial
               tensile loads up to 250 kg can be applied; the total electrode
               potential of the metal, and the potentials in the resulting
               cracks, are automatically recorded, and visual observation of
               the propagation kinetics of cracks is possible. The tests are
               carried out in a corroding medium which is constantly renewed.
               The loading (stretching) takes place on the tensile-testing
               machine (Fig 1) by means of a metal spring, and is adjusted by
               a set wheel. Visual observation of the sample (of cracks) is
               done by a microscope of type MIS-11. The tensile-testing ma-
               chine was adjusted by a dynamometer of type DS-1. Immediately
Card 1/3   before the test loading, the corroding liquid was put on the

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Comprehensive Investigation of Stress-Corrosion Cracking   SOV/32-25-10-16/63
Processes

sample by a glass tube. The changes in the electrochemical po-
tential in the cracks were measured by means of appropriate
capillaries, an electron amplifier (Fig 2, Diagram), and a loop
oscillograph of type MPO-2. The corrosion of alloy MA 2 was
tested in a solution of Na_2CrO_4(20 g/l) and NaCl (35 g/l). The
oscillogram (Fig 3) of the potential changes on the sample sur-
face on stretching shows that, by the destruction of the oxide
film, an intense formation of anode segments occurs producing
a maximum in the oscillogram. New microcells (oxide-film pores)
formed at the same time effect a retardation of anodic polariza-
tion on the whole metal surface. The appearance of cracks
causes the formation of a steadily increasing anodic segment.
From a visual point of view, the propagation of cracks can be
divided into 3 periods: (1) The incubation period (from the be-
ginning of loading until the formation of cracks); (2) the
period of uniform propagation of cracks (formation of hydrogen
bubbles), and (3) the period of accelerated crack development
(apparently of purely mechanical character). An increase in
load shortens the first and second periods, and slightly ac-

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Comprehensive Investigation of Stress-Corrosion Cracking   SOV/32-25-10-16/63
Processes

celerates the third one. The results obtained confirm the assumption of a film-electrochemical mechanism of stress corrosion cracking. There are 3 figures and 2 references, 1 of which is Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences, USSR)

Card 3/3

SOV/76-33-3-17/41

5(4), 18(7)
AUTHORS: Tomashov, N. D., Al'tovskiy, R. M.

TITLE: Investigation of the Mechanism of Electrochemical Corrosion of Titanium (Issledovaniye mekhanizma elektrokhimicheskoy korrozii titana). I. Effect of the Halogen Ions Upon the Corrosion and Electrochemical Behavior of Titanium in Sulfuric Acid (I. Vliyaniye galoidnykh ionov na korrozionnoye i elektrokhimicheskoye povedeniye titana v sernoy kislote)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 3, pp 610 - 616 (USSR)

ABSTRACT: Recently several investigations have been carried out dealing with the corrosion properties of titanium, for titanium has properties well suited for construction material. The present paper deals with the effect of the Cl^--, Br^-- and J^-- ions upon the behavior of Ti in sulfuric acid solutions. Cold-rolled titanium tin VT-1D (0.12% Fe, 0.022 - 0.023% H, 0.23 - 0.26% O, 0.05% Si and 0.017% N) was investigated. The experiments were carried out in the air and in hydrogen atmosphere. The rate of corrosion was

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SOV/76-33-5-17/41

Investigation of the Mechanism of Electrochemical Corrosion of Titanium. I. Effect of the Halogen Ions Upon the Corrosion and Electrochemical Behavior of Titanium in Sulfuric Acid

determined according to the loss in weight and the halogen ions were added in form of their Na-salts. The experimental results obtained confirm the assumption that the corrosion behavior of Ti is determined by a coating of an oxide film on the metal. Thus, it is possible to explain observations as to a Ti-activation in diluted sulfuric acid in the presence of oxygen and a considerable potential shift towards more negative values in connection with a purification of the titanium surface. The addition of J^--ions produced in several cases an increased corrosion resistance of titanium which is due to a passivation by the formation of a complex ion J_3^-. Cl^-- and Br^-- ions have a double effect; in diluted acid solutions where titanium is passivated they cause an activation; and in concentrated acid solutions with activated titanium they cause a passivation. The nature of the effect of Cl^-- and Br^-- ions depends on the state of the Ti-surface and the formation of an adsorption- or phase protective film respectively. There are 5 figures and 13 references, 6 of

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SOV/76-33-3-17/41

Investigation of the Mechanism of Electrochemical
Corrosion of Titanium. I. Effect of the Halogen Ions Upon the Corrosion
and Electrochemical Behavior of Titanium in Sulfuric Acid

which are Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut fizicheskoy khimii, Moskva
(Academy of Sciences, USSR, Institute of Physical Chemistry,
Moscow)

SUBMITTED: July 18, 1957

Card 3/3

5(2,4)
AUTHOR: Tomashov, N. D., Mikhaylovskiy, Yu. N.

TITLE: Mechanism of Anodic Dissolution of Metals in Soils (Mekha-
            nizm anodnogo rastvoreniya metallov v pochvakh)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 6,
            pp 1285 - 1288 (USSR)

ABSTRACT: For the dissolution mentioned in the title as well as for
            electrolytes the general equation holds:
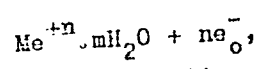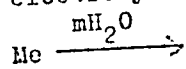
$$Me \xrightarrow{\ mH_2O\ } Me^{+n} \cdot mH_2O + ne_o^-,$$ in which the primary stage
            of the process is a migration of the metal ion into the soil
            electrolyte. As far as the anodic process is accompanied
            by a hydration of the forming metal ions the presence of
            a certain amount of moisture in the soil is an indispensable
            condition (Ref 1). Greater variations in the moisture of
            natural soils may have a considerable influence upon the
            rate of anodic metal dissolution. In this connection the
            authors mention the investigation results of the aforesaid
            process in the case of "Armko" iron in soils of different

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Mechanism of Anodic Dissolution of Metals in Soils   SOV/20-124-6-29/55

moisture. Figure 1 gives anodic polarization curves obtained in the case of iron electrodes in sand with 1-20% moisture in which case the moisture was added in form of NaCl solution. From the results it can be seen that the stable potential of iron is shifted into the positive range in the case of decreasing soil moisture; the inhibitions of the anodic reaction increase. A similar dependence exists in loam soils. From the results obtained it can be seen that the density of the self-dissolution currents increases with decreasing soil moisture, i.e. in connection with making less complicate the cathodic process (Ref 1) whereas, the stable potential of iron is shifted on the general curve 1 into the positive range (Fig). Thus, the corrosion rate increases as calculated for the active (just moistened) anodic surface with decreasing soil moisture. If the this rate is calculated for the visible surface the former will increase only as long as the making less complicated at the cathodic process proceeds more rapidly than the shrinking of the active surface. In the case of a further decrease in moisture the entire rate of metal corrosion will decrease in consequence of the passivation of the basic surface of

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Mechanism of Anodic Dissolution of Metals in Soils   SOV/20-124-6-29/55

the metal. There are 3 figures, 1 table and 6 Soviet references.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: November 6, 1958, by V. I. Spitsyn, Academician

SUBMITTED: November 3, 1958

Card 3/3

5 (4)

AUTHORS: Mirolyubov, Ye. N., Kurtepov, M. M.,   SOV/20-125-6-32/61
Tomashov, N. D.

TITLE: On Some Particular Features of the Cathode Process on
Stainless Steel in Solutions of Nitric Acid (O nekotorykh
osobennostyakh katodnogo protsessa na nerzhaveyushchikh
stalyakh v rastvorakh azotnoy kisloty)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 6,
pp 1288-1291 (USSR)

ABSTRACT: The processes mentioned in the title were investigated by
plotting cathode-polarization curves (Fig 1). Investigations
were carried out for chromium- and chromenickel steels
containing niobium, and, for comparison, a platinum electrode.
The dependence of corrosion on the potential is shown by
figure 2. The following was found: The maximum current
depends on the composition of the electrode; overvoltage in
the cathode process is lower in the case of steel than in
that of platinum. These phenomena are explained by a
disturbance of passivation as a result of cathodic polarization
followed by the formation of nitrous acid (as autocatalyst)
by the reducing effect exercised by the substances removed

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On Some Particular Features of the Cathode Process on   SOV/20-125-6-32/61
Stainless Steel in Solutions of Nitric Acid

from the steel upon the nitric acid. There are 2 figures and
11 references, 5 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute
for Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: January 24, 1959, by A. M. Frumkin, Academician

SUBMITTED: January 24, 1959

Card 2/2

5(4)

AUTHORS: Tomashov, N. D., Isayev, N. I.   SOV/20-126-3-45/69

TITLE: The Stability of the Passive State of Mechanical Stresses in Metals (Ustoychivost' passivnogo sostoyaniya mekhanicheski napryazhennogo metalla)

ABSTRACT: It is said in the introduction to the present paper that the influence of mechanical stresses upon the electrode potential has hitherto been hardly investigated and that it may be seen from such publications as are available that mechanical stresses shift the electrode potential in the negative direction. It is looked upon as obvious that the variation of the cathode potential is caused by a variation of the internal energy of the metal; a corresponding equation is given with formula (1). For the case in which the thermal effect of deformation is low compared to the mechanical work of deformation, formula (2) is given for the variation of the cathode potential. The variations of the cathode potential are described as being very small on the basis of these formulas, even in the case of strong deformation, and they never exceed 3 - 5 mv. As experimental measuring values are higher, the destruction of the oxide film is considered to be a

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The Stability of the Passive State of Mechanical Stresses
in Metals   SOV/20-126-3-45/69

further cause of the variation of the cathode potential in the
case of further stresses. It is then said that the state of the
oxide film determines the active or passive state of the metal,
and that it is thus possible to investigate the influence
exercised by mechanical stresses upon the passive state of the
metal. The experiments were carried out on wire samples, and the
alloys and their mechanical properties are given. As a corroding
medium, a solution of $NaNO_3$ and $K_2Cr_2O_7$ is given. The results
obtained are shown by diagrams. The first diagram (Fig 1) shows
the variation with respect to time of the potential and of
capacity in the primary passivation of carbon steel, and the
second diagram (Fig 2) shows the same for stainless steel. It was
found that, in the case of the carbon steel investigated, the
potential goes over into the active state if the short-time stress
causes a plastic deformation of the metal. In the case of the
stainless steel investigated, only very slight activation is
caused even in the case of mechanical stress being very high.
Finally, it is shown that at the moment at which the stress is
applied two factors become active in the metal. The one is

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The Stability of the Passive State of Mechanical Stresses   SOV/20-126-3-45/69
in Metals

mechanical stress, which has an activating effect, the other is
the oxidizing agent, which counteracts activation. After the
decrease of the deformation of the oxide film, passivation by the
solution predominates. There are 3 figures and 10 references,
6 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of
                Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: February 11, 1959 by P. A. Rebinder, Academician

SUBMITTED: January 29, 1959

Card 3/3

TOMASHOV, N. D.

"The corrosion and passivity of titanium."

report to be submitted at Gordon Research Conferences - New London, New Hampton, and Meriden, N.H., 13 June-2 Sep 60.

Institute of Physical Chemistry.

Tomashov, N. D.

PHASE I BOOK EXPLOITATION   SOV/4782

Moscow. Institut stali

Proizvodstvo i obrabotka stali i splavov (Production and Treatment
of Steel and Alloys). Moscow, Metallurgizdat, 1960. 462 p.
(Series: Its: Sbornik, 39) 2,100 copies printed.

Ed.: Ye. A. Borko; Ed. of Publishing House; S. L. Zinger; Tech.
Ed.: M. R. Kleyman; Editorial Council of the Institute: M. A.
Glinkov, Professor, Doctor of Technical Sciences; R. N. Grigorash,
Docent, Candidate of Technical Sciences; A. P. Lyutin, Professor,
Doctor of Technical Sciences; V. P. Zhukhovitskiy, Professor,
Doctor of Chemical Sciences; I. M. Kidin, Professor, Doctor of
Technical Sciences; B. O. Livanis, Professor, Doctor of Tech-
nical Sciences; A. P. Lyubimov, Professor, Doctor of Technical
Sciences; I. M. Pavlov, Corresponding Member, Academy of Sciences
USSR; and A. M. Pokhvisnev, Professor, Doctor of Technical Sciences.

PURPOSE: This book is intended for technical personnel in industry,
scientific institutions and schools of higher education, dealing
with open-hearth and electric-furnace steelmaking, metal rolling,
physical metallurgy, metallography, and heat-treatment. It may

Card 1/10

also be used by students specializing in these fields.

COVERAGE: The book contains results of theoretical and experiment-
al investigations of metallurgical and heat-engineering processes
in open-hearth and electric furnaces. Data are included on the
following: desulfurizing of pig iron outside the blast furnace,
interaction of oxides of the carbide-forming metals with solid
carbon, the change of content of gases in the bath of the open-
hearth furnace in various periods of melting, intensification of
the electric melting of steel, etc. Other articles deal with the
the nonuniformity of deformation in rolling, the study of the
continuous rolling process, the dependence of the friction —
slippage coefficient in rolling on a number of factors, and
other problems in the pressworking of metals. Articles on
physical metallurgy and the theoretical principles and techniques
of the heat treatment of steel are also included. No personali-
ties are mentioned. References accompany most of the articles.
There are 207 references, both Soviet and non-Soviet.

Card 2/10

Golovkin, S. S., Docent, Candidate of Technical Sciences, V. M.
Ignatenko, Engineer, and Ye. V. Shchedrin, Engineer [Department
of the Physics of Metals and X-Ray Analysis]. Effect of Strain
Distortions and Aging on the Diffusion Rate in Nickel-Based
Alloys   381

Polukhin, P. I., and O. S. Popov, Engineer [Department of
Rolling]. Investigation of the Deformation of Metal in Diagon-
al Beam Passes   400

Polukhin, P. I., Candidate of Technical Sciences [Department of
Electrotechnics]. Magnetic Viscosity of High-Coercivity Alloys   422

Smyalov, M. D., Doctor of Chemical Sciences, and M. P. Zhuk, and
Ye. N. Mirolyubov, Candidates of Chemical Sciences [Department
of Corrosion of Metals]. Behavior of Iron and Steel in Oxidiz-
ing Solutions   438

Dymov, A. M., Doctor of Chemical Sciences, and L. Z. Kozel,
Candidate of Chemical Sciences [Department of Analytical

Card 9/10

Tomashov N.D.

PAGE I BOOK EXPLOITATION   807/1533

Vesosyuznyy sovet nauchno-tekhnicheskikh obshchestv

Mezhkristallitnaya korroziya i korroziya metallov s napryazheniem sostoyanii (Intercrystalline and Stress Corrosion of Metals) Moscow, Mashgiz, 1960. 358 p. 3,000 copies printed.

Ed.: I.A. Levin, Candidate of Technical Sciences; Ed. of Publishing House: L.I. Lracharko, Engineer; Tech. Ed.: V.D. Elkind; Managing Ed. for Literature on Metallurgy and Instrument Making (Mashgiz): V.I. Baberthasky, Engineer; Editorial Board: I.A. Levin, Candidate of Technical Sciences (Chairman), V.P. Barannoy, Candidate of Technical Sciences, Y.M. Mikiforova, Candidate of Technical Sciences, and A.V. Turkovskya, Candidate of Technical Sciences.

PURPOSE: This collection of articles is intended for technical personnel concerned with problems of corrosion of metals.

COVERAGE: The collection contains discussions of intercrystalline corrosion of stainless steels and stress corrosion of carbon steels, low-alloy and stainless steels, and light-weight and nonferrous alloys. The tendency of steels of various composition and system to corrode under certain conditions is discussed and the nature of corrosion and corrosion cracking is analyzed. No personalities are mentioned. Most of the articles are accompanied by bibliographic references, the majority of which are Soviet.

II. INTERCRYSTALLINE CORROSION OF STAINLESS STEELS

Chemlen, Ch. I., Candidate of Technical Sciences, S.I. Volfson, and Nu. S. Hurtov, Engineer. Effect of Slow Heating on the Tendency of Intensely Nickel Steel Intercrystalline Corrosion   27

Rimskiy, I.I., Candidate of Technical Sciences, and I.V. Ivanino, Senior Scientific Worker. Study of the Tendency of the Cr18Ni9 10X18H9 and 1X18T Types of Chromium-Nickel Steels Toward Intercrystalline Corrosion   45

Malvov, B.I., B.A. Bugor, and N.M. Kurganov, Candidates of Technical Sciences. Intercrystalline Corrosion Concentrated Along the Fusion Line of Welded Joints of the 18-8 Type Stabilized Steels ("Knife-Type Corrosion")   59

Levtin, I.P., and I.Y. Mimmer. Effect of the Electric Heating of the 10X59T Steel on the Processes Determining Its Resistance to Intercrystalline Corrosion   71

Devlichenko, Ye. A., Candidate of Technical Sciences, L.P. Kaeali, Engineer, and D.I. Kurdyaba, Candidate of Technical Sciences. Effect of the Heat Treatment of Some Stainless Steels on Their Tendency Toward Intercrystalline Corrosion   79

Zotov, Ye. V., Engineer. Tendency of Chromium-Nickel-Molybdenum-Copper Steels Toward Intercrystalline Corrosion   126

Rozalev, A.A., Candidate of Technical Sciences. Development of Two-Phase structure Effective Means of Increasing Stainless Steel Resistance to Intercrystalline Corrosion   145

Levin, I.A., Candidate of Technical Sciences. More on the Problem of the Causes of Stainless Steel Intercrystalline Corrosion   148

Voldesseyeva, N.A., Engineer, and M.P. Semashko. Doctor of Chemical Sciences, Professor. Determining Intercrystalline Corrosion and Corrosion of Chromium-Nickel Austenitic Steels by Measuring the Internal Friction   152

Tomashov, N.D., Doctor of Chemical Sciences, Professor, and V.N. Modestova, Candidate of Chemical Sciences. Effect of Stress on the Corrosion and Potentials of the Magnesium-Manganese Alloy System   275

27215
S/081/61/000/014/013/030
B103/B217

18.8380

AUTHORS: Tomashov, N. D., Mikhaylovskiy, Yu. N.

TITLE: Electrochemical theory of underground corrosion of metals

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 14, 1961, 332, abstract
             14H182. (Tr. In-ta fiz. khimii. AN SSSR, 1960, vyp. 8,
             190 - 216)

TEXT: The authors examined data on the effect of soil structure and
properties (humidity, permeability) on cathodic and anodic processes in
underground corrosion. It was found that the rate of uniform total
corrosion I_{corr} of a metal in the soil can be calculated from the equation

$I_{corr} = KI_K I_a / (I_K + I_a)$, where K is a constant, I_K is the density of the
cathodic limiting current at an iron electrode in the soil concerned
(oxygen permeability of soil), I_a is the density of the anodic current at a
given potential. The rate of local corrosion (δ) can be estimated from
the oxygen permeability of soil I_K and from its resistance (ρ): AI_K/ρ ,

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Electrochemical theory of...

27215
S/081/61/000/014/013/030
B103/B217

where A is a constant. The possibility of formation of large macrofields is determined by the equation $I = B\Delta I_K/\Delta l f^{-1}$, where B is a constant, $I_K/\Delta l$ is the change of oxygen permeability in a soil section of length Δl. On the basis of these assumptions a device for estimating the corrosive activity of soils was designed and constructed. [Abstracter's note: Complete translation.]

Card 2/2

TOMASHOV, N.D.; MIKHAYLOVSKIY, Yu.N.; LEONOV, V.V.

. Investigating the work of differential aeration couples in soils.
Trudy Inst.fiz.khim. 8:217-225 '60.   (MIRA 14:4)

(Soil corrosion)

TOMASHOV, N.D.; KRASNOYARSKIY, V.V.; MIKHAYLOVSKIY, Yu.N.

Field testing of the corrosion of steels in soils. Trudy Inst.fiz. khim. 8:226-234 '60.   (MIRA 14:4)

(Steel—Corrosion)   (Soil corrosion)

TOMASHOV, N.D.; LUNEV, A.F.; IGNATOVA, Z.I.

Studying the protective properties of coatings by the capacitance-
-resistance method. Trudy Inst.fiz.khim. 8:254-263 '60.

(MIRA 14:4)

(Protective coatings—Testing)   (Electric testing)

TOMASHOV, N.D.· LUNEV, A.F.; GEDGOVD, K.N.

Investigaⴤion of ion penetration and the porosity of protective
coatings by means of tagged atoms. Trudy Inst.fiz.khim. 8:264-
275 '60.   (MIRA 14:4)

(Protective coatings—Testing) (Ions—Migration and velocity)
                    (Radioactive tracers)

TOMASHOV, N.D.; MIKHAYLOVSKIY, Yu.N.; LOPOVOK, G.G.

Testing of insulation coatings for cracking during flexure. Trudy
Inst.fiz.khim. 8:276-280 '60.   (MIRA 14:4)

(Protective coatings—Testing)

KRASNOYARSKIY, V.V.; LUNEV, A.F.;. TOMASHOV, N.D.

Field testing of protective coatings on underground pipelines.
Trudy Inst.fiz.khim. 8:281-290 '60. (MIRA 14:4)

(Pipelines—Corrosion) (Protective coatings—Testing)

TOMASHOV, N.D.; MIKHAYLOVSKIY, Yu.N.; LEONOV, V.V.

Kinetics of the deterioration of portective coatings on metals in
electrolytes. Trudy Inst.fiz.khim. 8:291-296 '60.   (MIRA 14:4)

(Protective coatings)   (Electrolytic corrosion)

TOMASHOV, N.D.; MIKHAYLOVSKIY, Yu.N.; LEONOV, V.V.

Kinetics of cathodic processes in the corrosion of metals under
protective coatings. Trudy Inst.fiz.khim. 8:297-304 '60.
(MIRA 14:4)

(Protective coatings)   (Electrolytic corrosion)

TOMASHOV, N.D., doktor khimicheskikh nauk; ZHUK, N.P., kand.khimicheskikh nauk; MIROLYUBOV, Ye.N., kand.khimicheskikh nauk

Behavior of iron and steel in oxidizing solutions. Sbor. Inst.stali no.39:438-449 '60.   (MIRA 13:7)

1. Kafedra korrozii metallov Moskovskogo ordena Trudovogo Krasnogo Znameni instituta stali im. I.V.Stalina.
          (Iron--Corrosion) (Steel--Corrosion)
                    (Oxidizing agents)

TOMASHOV, N.D.; AL'TOVSKIY, R.M.; KUSHNEREV, M.Ya.

Method for removing thin oxide films from titanium surfaces and study
of their structures. Zav.lab. 26 no.3:298-301 '60.   (MIRA 13:6)

1. Institut fizicheskoy khimii Akademii nauk SSSR.
        (Titanium oxides)

18.8310

27514
S/080/60/033/006/019/041/XX
D217/D302

AUTHORS: Tomashov, N.D., Chernova, G.P., and Markova, O.N.

TITLE: Influence of anodic polarization on the intercrystal-
              line corrosion of stainless chromium-nickel steels

PERIODICAL: Zhurnal prikladnoy khimii, v. 33, no. 6, 1960,
              1324 - 1334

TEXT: The possibility of protecting steels against general and
intercrystalline corrosion by means of anodic polarization in sul-
phuric acid solutions and in solutions used for testing the ten-
dency to intercrystalline corrosion, was investigated. The mate-
rial tested was 2X18H9 steel (2Kh18N9) (free from titanium), con-
taining 0.15 - 0.25 % C. This steel, as quenched from 1050^0 and
subsequently tempered at 650^0 for 2 hours, is known to be liable
to fail by intercrystalline corrosion. Untempered, however, it
does not tend to fail by this mechanism. This steel was therefore
tested in both conditions. The tendency to failure was determined
after boiling in a solution of the following composition: 160 g

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S/080/60/033/006/019/041/XX
D217/D302

Influence of anodic polarization ...

$CuSO_4 \cdot 5H_2O + 100 \ cm^3 H_2SO_4$ (s.g. = 1.84) + 1000 ml H_2O with addi-
tion of copper filings. The behavior of the stainless steel 2Khl8-
N9 was investigated in the above range of potentials (from - 0.13
- +1.3 V) in order to study its corrosion behavior and develop
methods of protecting it against intercrystalline corrosion. The
study of the influence of anodic polarization on intercrystalline
corrosion was carried out by plotting polarization curves by po-
tentiostatic methods and by corrosion tests at given potentials.
It was found that the range of the stable, passive condition of
quenched and tempered 2Khl8N9 steels in sulphuric acid solutions
lies between + 0.51 and + 0.83 V. In the tempered condition, this
range reduces to 0 to + 0.4 V. In the stable, passive state, this
steel, whether tempered or quenched, resists failure by intercry-
stalline corrosion in sulphuric acid solutions, the general corro-
sion is extremely slight and anodic protection in this case is
possible. With an increase in aggressiveness of the medium, the
stable, passive range of the tempered steel is reduced to a grea-
ter extent than that of quenched steel, and in a strongly aggres-

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S/080/60/033/006/019/041/XX
Influence of anodic polarization ...   D217/D302

sive medium may be entirely absent. In the transpassivity region, the tempered steel is liable to fail be intercrystalline corrosion, whereas the quenched steel is not. Protecti████against intercrystalline corrosion in the passive potential range by means of anodic polarization is possible both in the copper sulphate-base testing solution and in solutions containing 10 % HNO_3 + 1 or 2 %

NaF. There are ██figures, 4 tables and 10 references: 8 Soviet-bloc and 2 non-Soviet-bloc. The reference to the English-language publication reads as follows: R. Edelenau, Nature, 17, 739, 1954.

SUBMITTED: November 24, 1959

Card 3/3

80232
S/076/60/034/04/22/042
B010/B009

5.4600

AUTHORS: Tomashov, N. D., Paleolog, Ye. N., Fedotova, A. Z. (Moscow)

TITLE: Electrochemical and Corrosion Behavior of Semiconductors in
            Electrolyte Solutions. I. Electrode Processes on Germanium in
            Sulfuric Acid Solutions in the Presence of Hydrogen Peroxide

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 4, pp. 833 - 840

TEXT: Since germanium is the electron semiconductor now most frequently used
the kinetics of the electrode processes of germanium monocrystals of the n- and
p-types in sulfuric acid solutions with different hydrogen peroxide contents was
investigated in the present paper. The samples were polished or etched in an
SR-4 solution (15 cm^3 CH$_3$COOH, 25 cm^3 HNO$_3$, 15 cm^3 HF, and 0.06 cm^3 Br$_2$). The
curves of cathodic polarization (Fig. 1) of n-type germanium show that this ma-
terial behaves, in principle, like a metal electrode. With regard to the discharge
of hydrogen ions n-germanium is not an effective cathode and exhibits a high hy-
drogen supertension. Table 1 shows the change in the hydrogen peroxide concentra-
tion of a sulfuric acid solution (pH = 1) + 0.11 M H$_2$O$_2$ in the cathodic

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S/076/60/034/04/22/042
B010/B009

Electrochemical and Corrosion Behavior of Semiconductors
in Electrolyte Solutions. I. Electrode Processes on
Germanium in Sulfuric Acid Solutions in the Presence of
Hydrogen Peroxide

polarization of n-germanium in the presence of air at 25°C. The process continues until H_2O_2 is reduced, and the cathodic polarization of germanium is greatly decreased. The cathodic polarization of p-germanium is more inhibited than that of n-germanium, i.e., the H_2O_2 reduction as well as the hydrogen ion discharge. This may be due to an additional potential drop on account of the reduction of the number of holes in p-germanium, so that the principal role in the reduction reaction on p-germanium is played by the electrons in the zone of valency. The anodic behavior of p-germanium differs from that of n-germanium. The anodic dissolution on p-germanium is similar to that on normal metal. With current densities up to LH 30 ma/cm^2 p-germanium remains active in all solutions and dissolves into Ge^{4+}. The velocity of delivery of the holes to the surface of n-germanium may be regarded as determining the anodic dissolution process of n-germanium. This results in a marked ability of the electrode to be polarized and in the occurrence of an anodic saturation current whose magnitude is independent of the composition of the solution and increases when the electrode is exposed to light. There are

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80232

Electrochemical and Corrosion Behavior of Semiconductors   S/076/60/034/04/22/042
in Electrolyte Solutions. I. Electrode Processes on   B010/B009
Germanium in Sulfuric Acid Solutions in the Presence of
Hydrogen Peroxide

5 figures, 2 tables, and 7 references, 1 of which is Soviet.

ASSOCIATION: Akademiya nauk SSSR Institut fizicheskoy khimii (Academy of
                Sciences USSR Institute of Physical Chemistry)

SUBMITTED: July 4, 1958

Card 3/3

S/076/60/034/05/14/038
B010/B002

5.4600

AUTHORS: Paleolog, Ye. N., Tomashov, N. D., Fedotova, A. Z.

TITLE: Electrochemical and Corrosion Behavior of Semiconductors in Electrolyte Solutions. II. The Rate of Solution of Germanium in Sulfuric Acid in the Presence of Hydrogen Peroxide

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 5, pp. 1027-1031

TEXT: The dissolution of germanium in electrolyte solutions has not yet been investigated systematically though this problem is of special importance for the production of semiconductors, i.e., for the etching of the surface of germanium. In the present paper, the authors studied the dissolution of n-type and p-type germanium in H_2SO_4 (pH=1), H_2SO_4 (pH=1) + + 0.12 M H_2O_2 and 8.8 M H_2O_2. The solution was carefully mixed, and the rate of dissolution was determined at 25°C by a colorimetric determination of the germanium content of the solution in certain intervals. The analyses were carried out by L. S. Kupriyanova. The results obtained (Table) show that the rate of dissolution is independent of the type of germanium (n-type or p-type) and rises in the presence of H_2O_2. Furthermore, it changes little in time. A cathodic or anodic polarization of the germanium electrode

Card 1/2

Electrochemical and Corrosion Behavior of   S/076/60/034/05/14/038
Semiconductors in Electrolyte Solutions.   B010/B002
II. The Rate of Solution of Germanium in
Sulfuric Acid in the Presence of Hydrogen
Peroxide

leads to a decrease in the rate of dissolution. On the strength of the
results obtained the authors establish that under the present experimental
conditions the dissolution of germanium has an electrochemical nature. As
the dissolution of n-type germanium by means of H_2O_2 is raised with the
same intensity as in the case of p-type germanium, it is assumed that on
the surface of n-type germanium the concentration of holes is higher, and
that the cathodic process is facilitated by the reduction of hydrogen
peroxide. There are 2 figures, 1 table, and 4 references: 1 Soviet,
2 German, and 1 American.

ASSOCIATION: Akademiya nauk SSSR Institut fizicheskoy khimii
              (Academy of Sciences of the USSR, Institute of Physical
              Chemistry)

SUBMITTED: August 4, 1958

Card 2/2

84248

1018
1145
5.4600   1153

S/076/60/034/009/008/022
B015/B056

AUTHORS: Deryagina, O. G., Paleolog, Ye. N, and Tomashov, N. D.

TITLE: Electrochemical and Corrosion Behavior of Semiconductors
               in Electrolytic Solutions. III. Dissolution of Germanium
               in Contact With Other Metals

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 9,
               pp. 1952-1959

TEXT: In the fusion of n-type germanium with indium, a narrow band of a
p - n junction may be obtained. If electric contacts (Cu wires) are solder-
ed onto the germanium and indium with tin, and if the whole is insulated
against air/with the exception of the free Cu wire ends (e.g., with an
epoxy resin shell), a plate cathode Ge - In - Sn - Cu is obtained (Fig. 1).
As the surface of this diode is edged before being embedded into the
resin shell, the electrochemical behavior of Ge in the many-electrode
system Ge - In - Sn - Cu was investigated, and the mechanism of its dis-
solution was explained. The experiments were carried out in 1 N NaOH solu-
tions of different H_2O_2 contents (0.3 N H_2O_2 and 1.0 N H_2O_2), or in pure

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84248
S/076/60/034/009/008/022
B015/B056

Electrochemical and Corrosion Behavior of
Semiconductors in Electrolytic Solutions.
III. Dissolution of Germanium in Contact With
Other Metals

17.5 N H_2O_2 solutions. Samples of n-type Ge (of the type ДМ(DM) or БМ(BM)),
In, Cu, and Sn embedded in polystyrene, as well as pairs of n-type Ge-Cu
and n-type Ge-In, and ready diodes (of the type ДГц-22 (DGTs-22)) were
used. The area of the electrodes in the diodes investigated are given
in Table 1. The corrosion current of Ge, as well as the quantity of the
dissolved Ge were determined by a colorimetric method (Ref. 7); the sur-
face profile of Ge was measured by means of a microscope, or the current
density and dissolution rate of Ge (in the pair Ge-Cu) was calculated
from the polarization diagram. A comparison between the experimental
data and the calculated values (Table 2) shows that a self-dissolution
of Ge takes place, and that the latter increases with the H_2O_2 content.

In the many-electrode system investigated, Ge is the anode and Cu is the
most effective cathode, whereas Sn and In are highly polarized and, accord-
ing to conditions, act as a cathode or anode. The total loss of n-type
Ge (Table 3, Ge-Cu loss) in contact with Cu, In, and Sn is determined by
the rate of anodic dissolution or self-dissolution, the ratio between

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84248

Electrochemical and Corrosion Behavior of
Semiconductors in Electrolytic Solutions.
III. Dissolution of Germanium in Contact With
Other Metals

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B015/B056

the two rates depending on the H_2O_2 content (Table 4), i.e., self-dis-
solution predominates in pure H_2O_2 solutions. The behavior of n-type Ge
during etching in the afore-mentioned solutions corresponds to the
activity of the Ge electrode in the system Ge - In - Sn - Cu, and is
subject to electrochemical rules. There are 6 figures, 4 tables, and
8 references: 7 Soviet and 1 US.

ASSOCIATION: Akademiya nauk SSSR, Institut fizicheskoy khimii, Moskva
                (Academy of Sciences USSR, Institute of Physical Chemistry,
                Moscow)

SUBMITTED: December 13, 1958

Card 3/3

81732

S/020/60/133/01/47/070
B004/B007

5.4600

AUTHORS: Paleolog, Ye. N., Korotkova, K. S., Tomashov, N. D.

TITLE: The Kinetics of the Electrode Processes on a Silicon
             Electrode in Acid and Alkaline Solutions

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 1,
             pp. 170 - 173

TEXT: The authors investigated the discharge rate of hydrogen ions on
silicon and the anodic dissolution rate of silicon in 0.2 N H_2SO_4,
1.0 N HF, and 5.0 N KOH at 25°C. n- and p-type single crystals of silicon
with different resistivity (0.2, 10.0, and 23.0 ohm.cm) and a diffusion
length of 0.5 mm were used for the investigation. The samples had the same
crystal orientation. The surface was mechanically ground by means of
boron carbide or etched at 80°C with a KOH-solution. Contact was
established by means of rhodium electrolytically deposited on the sample
and a soldered-on copper wire. Fig. 1 shows the curve of the cathodic
polarization of n-type Si. In H_2SO_4 a considerable inhibition of the

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81732

The Kinetics of the Electrode Processes on a   S/020/60/133/01/47/070
Silicon Electrode in Acid and Alkaline Solutions   B004/B007

H-ion discharge was observed also on Si with a ground surface. The pre-
sence of a semiconductive oxide layer is assumed, which proved that by
means of a partial reduction of the layer with current reversal, and
further by etching the KOH, polarization is considerably reduced. In
5.0 N KOH the oxide layer is soluble, the discharge rate of the H-ions
depends only little on the resistivity of the Si-electrode, and the
n-type Si behaves like a metal electrode. Fig. 2 shows the curve of the
cathodic polarization of p-type silicon. Polarization is stronger than
in n-type Si, the nature of the solution exerts little influence upon the
kinetics of H-ion discharge. The anodic polarization is shown in Fig. 3.
In H_2SO_4, the oxide layer is not soluble and has a high degree of ohmic
resistivity. Si is highly polarized, and oxygen is separated. The pre-
sence of the oxide layer is proved by grinding-off the silicon electrode
during the experiment. In this case, the slope of the polarization curve
was considerably flattened up to a current density of 15 ma/cm^2. In the
case of higher current densities, the oxide layer could not be com-
pletely removed. In 1.0 N HF, a different behavior of n- and p-type Si
was observed. p-type Si was not passivated up to a current density of

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81732

The Kinetics of the Electrode Processes on a   S/020/60/133/01/47/070
Silicon Electrode in Acid and Alkaline Solutions   B004/B007

30 ma/cm^2. In the case of n-type Si, a hindrance of the anodic process occurred already at 1.0 ma/cm^2, which is explained by the hole limiting current being attained. The electrochemical behavior of silicon thus in electrolytes is in principle similar to that of germanium, and is determined by the type of conductivity. Silicon, however, differs from germanium by the formation of the chemically inactive SiO_2-layer with high ohmic resistivity which hinders the cathodic and anodic reactions. There are 3 figures and 6 references: 2 Soviet, 3 British, and 1 German.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute
             of Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: March 3, 1960 by A. N. Frumkin, Academician

SUBMITTED: March 3, 1960

Card 3/3

81865

AUTHORS: Deryagina, O. G., Paleolog, Ye. N., Tomashov, N. D.

TITLE: Anodic Dissolution of Germanium With a p-n Transition

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 2,
             pp. 388 - 391

TEXT: The objective of the present paper was to determine the conditions
for a selective etching of the p-n transitions of germanium taking into
account the electrochemical processes of the diode components at the
boundary of the solution. The authors investigated the distribution of
the potential, the current density, and the dissolving speed in the com-
ponents of a germanium diode at various anodic polarizations. Indium-
germanium diodes were used for the test in which germanium of the ДМ
(DM) type, as well as a germanium single crystal with p-n transition
were applied. The samples were embedded in epoxy resin and ground at a
right angle to the In-Ge contact plane. They were then polished and
after etching in H_2O_2 they were anodically polarized in 0.1 N NaOH or

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Anodic Dissolution of Germanium With a
p-n Transition

S/020/60/133/02/39/068
B004/B064

0.1 N H_2SO_4 at room temperature and in dispersed daylight. The posi-
tive pole of the circuit was connected to the indium. The potential
distribution was measured with a capillary detector, the depth of the
solution (the profile of the surface) with a Linnik double microscope.
The width of the zone of p-type germanium was determined by the pre-
cipitation of copper with cathodic polarization of the p-n transition
in pyrophosphate solution. Fig. 1 shows the curve of the anodic polari-
zation of indium, p- and n-type germanium in 0.1 N NaOH. A strong
polarization occurs in In and n-Ge. In contrast to In the high degree
of polarization of n-type germanium is not due to passivity but to the
low degree of hole concentration. Fig. 2 shows the potential distribu-
tion on the surface of the diode at an anode current of 0.05 - 4.00 ma,
Fig. 2b shows the surface profiles after 60 min. and Fig. 2v gives the
amperages obtained. The current density of n-Ge is greater than that
of the anode current on the boundary of the solution. In the authors'
opinion this is due to the injection of holes in n-Ge above the p-n
transition. This is confirmed by Fig. 3 which shows that the anodic
polarization of the n-Ge surface decreases as the distance from the

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Anodic Dissolution of Germanium With a   S/020/60/133/02/39/068
p-n Transition   B004/B064

p-n transition increases. This is due to a decreased concentration of
the injected holes. If the germanium diode is anodically polarized from
indium a high degree of anodic polarization of indium occurs and it is
above all the p-Ge and the adjacent zones of n-Ge which dissolve. With
a cathodic polarization from n-Ge its dissolution can be stopped and
concentrated to the narrow zone of p-Ge. Indium is not polarized in
H_2SO_4 and mainly indium and the adjacent zone of p-type germanium are
dissolved. Similar results were obtained with the germanium single
crystal. Because of the different anodic polarizability of n-Ge, p-Ge,
and In and because of the existing p-n transition a selective etching
of a germanium diode or triode is possible. There are 3 figures and
9 references: 4 Soviet, 1 American, 3 British, and 1 German.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute
              of Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: February 3, 1960, by A. N. Frumkin, Academician

SUBMITTED: March 2, 1960

Card 3/3

TOMASHOV, Nikon Danilovich; ZHUK, Nikolay Platonovich; TITOV, Vasiliy
        Alekseyevich; VEDENEYEVA, Mariya Aleksandrovana; EL'KIND, L.M.,
        red. izd-va; ISLENT'YEVA, P.G., tekhn. red.

        [Laboratory work on the protection of metals from corrosion] Labo-
        ratornye raboty po korrozii i zashchite metallov. Moskva, Gos.
        nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii,
        1961.   239 p.   (MIRA 14:7)
                        (Metals—Corrosion)

32624
S/137/61/000/011/102/123
A060/A101

18.8300

AUTHORS: Vedeneyeva, M.A., Tomashov, N.D.

TITLE: Effect of deformation upon the intercrystalline failure of nichrome steel

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no.11, 1961, 48-49, abstract 11I323 (V sb. "Korroziya i zashchita konstrukts. metallich. materialov", Moscow, Mashgiz, 1961, 116 - 126)

TEXT: The authors studied the effect of deformation caused by cold rolling and dressing of the surface by emery paper upon the intercrystalline failure of Cr-Ni steel. The steels OX18H9, 1X18H9, and X23H23M3Д3 (OKh18N9, 1Kh18N9, and Kh23N23M3D3) were tested. The cold deformation (rolling) with degrees of reduction 20-60% was carried out both before and after tempering at 650°C for 2 hours. As result of the treatment the tendency of these steels to intercrystalline failure is reduced. This is related to the fact that in the process of deforming along the cleavage planes carbides and the α-phase separate out. The carbide phase which is precipitated in the course of tempering and deformation, separates out on a great area and its concentration is reduced. As result of this,

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Effect of deformation ...

the corrosion resistance of the boundaries increases. The deformation of steel
before tempering (in the zone of dangerous temperatures) lowers the tendency to
intercrystalline corrosion in a greater degree than does deformation after
tempering. Cold deformation before tempering at 650^0 entirely eliminates the
tendency of steel Kh23N23M3D3 to intercrystalline cracking under reductions of
21 - 60%, and that of steels OKh18N9 and 1Kh18N9 - under reductions of 49 and 58%
respectively. The rate of intercrystalline etching of specimens of steel 1Kh18N9
with etched surface notably exceeds the corrosion rate of the specimens dressed
with emery paper. There are 10 references.

Ye. Layner

[Abstracter's note: Complete translation]

Card 2/2

32623
S/137/61/000/011/101/123
A060/A101

18·8300

AUTHORS: Tomashov, N.D., Andreyev, L.A.

TITLE: Oxidation of titanium at high temperatures

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 11, 1961, 46, abstract
              11I308 (V sb. "Korroziya i zashchita konstrukts. metallich. materi-
              alov", Moscow, Mashgiz, 1961, 127 - 132)

TEXT: A study was performed of the oxidation kinetics of Ti mark BT -1Д
(VT-1D) in the interval 800-1,150°C· in gaseous mixtures of O_2+N_2 in various pro-
portions. Under soakings longer than one hour the oxidation follows a linear
law in the entire temperature range under investigation. For 1,000°C a functional
dependence was obtained of the oxidation-rate constant, characterizing the linear
portion of the kinetic curve, on the partial pressure of O in the gaseous mixture.
The kinetics of O dissolution in the metallic base was studied for the tempera-
ture of 1,000°C. It is assumed that the oxidation process is controlled by the O
diffusion into the metallic base of the specimen. There are 8 references.

                                                        Ye. Layner
[Abstracter's note: Complete translation]

Card 1/1

S/081/61/000/022/032/076
B110/B101

AUTHORS: Tomashov, N. D., Mil'vidskiy, M. G.

TITLE: Etching of titanium in acid solutions and alkali melts

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 22, 1961, 259, abstract
              22I182 (Sb. "Korroziya i zashchita konstrukts. metallich.
              materialov". M., Mashgiz, 1961, 133 - 150)

TEXT: A study of the possibilities of etching Ti in H_2SO_4, HCl (acid),
and HNO_3 with fluoride additions showed the etching efficiency of
industrial Ti scale to depend on the oxidation temperature. Scale forming
at 800 - 850°C was chemically stable to acids, but was sufficiently easy
to remove at >1000°C. The anodic and cathodic behavior of Ti in the
acids mentioned, and in HF containing admixtures, was studied. For
etching Ti in alkali melts (NaOH melt), a 10 - 20 min treatment at 400-430°C
and subsequent washing in hot 15% H_2SO_4 are recommended. [Abstracter's
note: Complete translation.]
Card 1/1

33843
S/137/62/000/001/186/237
A006/A101

AUTHORS: Tomashov, N.D., Al'tovskiy, R.M., Prosvirin, A.V., Shamgunova, R.D.

TITLE: Corrosion of titanium and its alloys in sulfuric acid

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 1, 1962, 82 - 83, abstract 11583 (V sb. "Korroziya i zashchita konstrukts. metallich. materia-lov", Moscow, Mashgiz, 1961, 151 - 163)

TEXT: The general aspect of BT 1 (VT1) Ti corrosion rate as a function of H_2SO_4 concentration under air atmosphere is also preserved in tests under O_2, H_2 and N_2 atmospheres and also during tests of some Ti alloys (VT5, VT3, VT3-1) under air atmosphere. The corrosion rate of Ti VT1 in H_2SO_4 under atmospheres of O_2, H_2 and N_2 (with the exception of diluted H_2SO_4 solutions) is somewhat less than under air atmosphere. Alloys Ti VT5, VT3 and VT3-1, are in general somewhat less stable than technically pure VT1 Ti in H_2SO_4 solutions. Saturation of the Ti sur-face with oxygen, and in particular N_2 and H_2, raises considerably the corrosion resistance of Ti in H_2SO_4. Preliminary hydrogenization of the Ti surface by cathodic polarization during self-diffusion in H_2SO_4, inhibits the corrosion process of Ti dissolving in H_2SO_4, in particular of 50 - 65% concentration. A

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33843
S/137/62/000/001/186/237
A006/A101

Corrosion of titanium ...

decrease of the Ti corrosion rate in H_2SO_4 of $>$ 80% concentration is explained by the oxidation of the metal surfaces by concentrated acid and the formation of a protective film consisting of Ti_3O_5.

The authors' summary

[Abstracter's note: Complete translation]

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S/081/61/000/023/028/061
B138/B101

AUTHORS: Tomashov, N. D., Al'tovskiy, R. M., Vladimirov, V. B.

TITLE: Investigation of the corrosion of titanium and its alloys
             in solutions of bromine and methyl alcohol

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 23, 1961, 288,
             abstract 231255 (Sb. "Korroziya i zashchita konstrukts.
             metallich. materialov". M., Mashgiz, 1961, 164 - 172)

TEXT: An investigation of the corrosion resistance of Ti and Ti alloys in
solutions of Br in CH_3OH has shown that alloys with an α-structure, BT1
(VT1) and BT5 (VT5), are less resistant than those with an $\alpha + \beta$ structure,
BT3 (VT3) and BT3-1 (VT3-1). It is noted that in all the Ti alloys the
rate of corrosion increased with the Br_2 concentration of the solution,

and that Ti iodide is more stable than technically pure Ti. An addition
of water to the $CH_3OH + Br_2$ was found to reduce the rate of corrosion, due

to the formation of a protective oxide film. Ti is also subject to

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Investigation of the corrosion...

S/081/61/000/023/028/061
B138/B101

intercrystalline corrosion, which increases with a reduction of the Br_2 concentration in CH_3OH from 5 to 1 %. If the water content of the solution is more than 30 %, however, both intercrystalline and general surface corrosion cease. The corrosion of Ti in Br_2 + CH_3OH solutions is found to be of an electrochemical nature. In anhydrous solutions Ti can be protected by cathode polarization. For total protection in a 2% solution of Br_2 the potential must be maintained at around -0.350 v.

[Abstracter's note: Complete translation.]

Card 2/2

33844
S/137/62/000/001/187/237
A006/A101

18.8300

AUTHORS: Tomashov, N. D., Al'tovskiy, R. M., Chernova, G. P., Arteyev, A. D.

TITLE: Corrosion resistance of titanium alloyed with molybdenum, chromium and palladium

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1962, 83, abstract 1I584
(V sb. "Korroziya i zashchita konstrukts. metallich. materialov",
Moscow, Mashgiz, 1961, 173 - 186)

TEXT: Alloying of Ti with palladium raises considerably its corrosion resistance in H_2SO_4 and HCl. Considerable reduction of the Ti corrosion rate is already observed when it is alloyed with a small Pd amount (0.1%). An increase of the Pd content in the alloy > 2% is not recommended. Electrochemical investigations have shown that an increase in the Ti corrosion resistance when it is alloyed with Pd, results from the shift of the stationary potential of the alloy to a range of values where Ti is partially or fully passive, due to the reduced overvoltage of the cathodic reaction. Alloying of Ti with molybdenum increases Ti resistance due to the considerably reduced ability of the alloy to anodic dissolving as compared with non-alloyed Ti. Alloying of Ti with chromium does not

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S/137/62/000/001/187/237
A006/A101

Corrosion resistance of titanium alloyed with...

raise its corrosion resistance, and even reduces same in some cases, since Cr is less prone to passivity than Ti in H_2SO_4 and HCl, at a potential corresponding to a stationary potential of Ti. Ternary Ti-Pd-Mo alloys and Ti-Pd-Cr alloys are more resistant than the binary Ti-Pd alloy. This is due to a decrease in the current of anodic Ti dissolving near the potential of full passivation, when it is alloyed with Mo or Cr. There are 17 references.

Author's summary

[Abstracter's note: Complete translation]

Card 2/2

33842
S/137/62/000/001/185/237
A006/A101

11.1380

AUTHORS: Titov, V.A., Agapov, O.I., Tomashov, N.D.

TITLE: Corrosion of tantalum, niobium and their alloys in sulfuric acid at
              high temperatures

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 1, 1962, 82, abstract 11581
              ("Korroziya i zashchita konstrukts. metallich. materialov", Moscow,
              Mashgiz, 1961, 187 - 195)

TEXT: The authors studied the behavior of Ta, Nb and their alloys, contain-
ing 21.6; 34.0; 49.4; 67.3 at. % Ta, in H_2SO_4 at high temperature. In 90%
H_2SO_4, at 250°C, during the transition from an alloy containing 34.0 at. % Ta to
an alloy containing 49.4 at. % Ta, an over 30-fold decrease of the corrosion rate
was observed (from 15.1 to 0.5 g/m^2.hour) and also an abrupt change of the poten-
tial toward the positive side (from 0.25 to 0.77 v, i.e. more than by 0.5 v).
The abrupt changes in the anti-corrosion properties of the alloy correspond to the
first threshold of stability in the Ta and Nb correlation, equal to 4/8 atomic
fraction. Extended tests (120 hours) of Ta-Nb alloys under experimental condi-
tions, do not shift the threshold of stability towards the rate of other Ta-Nb

Card 1/2

Corrosion of tantalum ....

33842
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A006/A101

correlations in the alloy. In 10% H_2SO_4 at boiling temperature of the solution (102°C), the internal stresses (cold hardness) shift the electrode potential of the alloys to the negative side, by 0.05 v on the average, but both cold hardness and stress applied do not reduce the corrosion resistance nor cause corrosion cracking of the alloys. Tests with the Ta-Nb alloy containing 96.2 at.% Ta in various H_2SO_4 solutions at 250°C, have shown that 70% H_2SO_4 is the most aggressive medium as compared with its solutions of other concentrations. There are 11 references.

The author's summary

[Abstracter's note: Complete translation]

Card 2/2

18.8300

33838
S/137/62/000/001/180/237
A006/A101

AUTHORS: Tomashov, N. D., Strekalov, P. V.

TITLE: Investigating the corrosion rate of ferro-carbon alloys in acids
             at elevated temperatures

TEXT: Increased temperature of acid causes a sharp increase of the cor-
rosion rate of Fe-C alloys; the corrosion rate increases also at a higher C
content in the alloy in non-oxidizing acids, and in oxidizing acids it decreases
due to the partial inhibition of the anodic process. The effect of temperature
on the diffusion rate of carbon steels in HCl, HNO_3 and H_2SO_4, can be described
by the exponential equation $K = A\exp(- E/RT)$. The authors determined the ac-
tivation energy of processes of carbon-steel diffusion in HNO_3, H_2SO_4 and HCl.
For HNO_3 the activation energy is equal to 10.5 kcal, for H_2SO_4 and HCl it is
13.5 and 17.35 kcal, respectively.
[Abstracter's note: Complete translation]   Author's summary

Card 1/1

S/081/61/000/023/031/061
31966
B138/B101

18.8310

AUTHORS: Titov, V. A., Balandin, I. M., Tomashov, N. D.

TITLE: Investigation of the efficiency of different methods of
             protecting metals in solutions of sulfuric and phosphoric
             acids at elevated temperatures

TEXT: The effect of cathodic (As and Bi ions) and anodic (Cu, Ag, and Au
ions) corrosion inhibitors has been investigated, as also electrolytic
protection by anodic polarization using Cu, Ag, and Au depositions and
Ag and Au contact, on the rate of corrosion of stainless steels 1X18H9T
(1Kh18N9T) and X23H28M3Д3T (Kh23N28M3D3T) and the alloy ЭИ461(EI461)
in 10% solutions of H_2SO_4 and H_3PO_4 at a temperature of $250^\circ C$. The
cathodic corrosion inhibitor, Bi, has been found to have the greatest
inhibiting effect for stainless steels in H_2SO_4. Corrosion of the Ni

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Investigation of the efficiency...

31966
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B138/B101

alloy is more effectively reduced if it has a Cu coating. In H_3PO_4 an addition of Ag ions to the acid solution is the most efficient way of reducing corrosion of the stainless steels and the Ni alloy. [Abstracter's note: Complete translation.]

Card 2/2

AUTHORS: Titov, V. A., Tomashov, N. D.

TITLE: A study of the endurance of card wire

TEXT: Steel brands 55, 50Г (50G), 50ГC (50GS), 50Ti and 60 were studied.
Steel 55 has the best fatigue and corrosion-fatigue indices. For wire made of
this steel τ_w = 25 kg/mm^2 was obtained in air. When high stresses are applied,
wire made of steel 55 has a fatigue resistance over 50 to 90 times higher than
wire of steel 50Ti and 60 respectively. At comparatively low stresses, the
fatigue-resistance indices of wire made of steels 55, 50Ti and 60 become close
to each other. The endurance of wire made of the test brands of steel in tap
water decreases to such a degree that even for the best wire made of steel 55,
at the lowest stress tested by us (25 kg/mm^2), the conditional ultimate corrosion
fatigue was not reached. Wire made of steels 55 and 60 has the highest indices
of corrosion-fatigue resistance in tap water, and wire of steels 50G, 50GS and

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A study of the endurance of card wire

S/137/62/000/001/201/237
A154/A101

50Ti have the lowest indices. The emulsions used in fiber-combing are less aggressive media than tap water. A conditional ultimate corrosion fatigue of 55 kg/mm^2 was established for wire of steels 55 and 50G in emulsion of the Krasnokholmskaya fabrika (Krasnyy Kholm factory), while for wire of steels 60, 50GS and 50Ti this limit was reached at a stress of 35 kg/mm^2 in these conditions. The emulsion of the Kupavinskaya fabrika (Kupava factory) is less agressive than the emulsion of the Krasnyy Kholm factory. In the former emulsion a conditional corrosion-fatigue limit of 55 kg/mm^2 was established even for wire of the worst steel - 50 Ti. Card wire of steel 55 made of polished wire rod has higher endurance indices in tap water than wire of the same steel, but made of unpolished wire rod. Preliminary grinding of the wire rod before the latter is drawn into wire may be considered as one of the methods for prolonging the service life of card clothing.

Authors' summary

[Abstracter's note: Complete translation]

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AUTHOR: Tomashov, N. D.

TITLE: Control factor and corrosion protection of metals

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh
             nauk, no. 2, 1961, 236-245

TEXT: The author classified the various methods of corrosion protection
not with respect to their application or technology, but on the basis
of the theory of electrochemical corrosion and the mechanism of each
method. For this purpose, it was necessary to determine the control
factor of each individual protection method, i.e., the degree of
inhibition of the corrosion process with application of the respective
protection method. It is known from publications that the dependence
of the corrosion current characterizing the corrosion rate on the
factors of electrochemical corrosion is represented by the following

equation: $I = \dfrac{V_k^o - V_a^o}{P_k + P_a + R}$, where $V_k^o - V_a^o$ denotes the difference of

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Control factor and corrosion ...

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the initial equilibrium potentials of the cathodic depolarizing process (V_k^0) and the anodic reaction of metal dissolution (V_a^0) or, in other words, the degree of thermodynamic instability of the respective system; the denominator characterizes the general inhibition of the system; P_k the mean cathodic, P_a the mean anodic polarizability, R the total ohmic resistance of the system. Proceeding from this method, the author establishes a scientific classification of various protection methods on the basis of their effect upon: I) Reduction of the degree of instability of the system, II) inhibition of the cathodic process, III) reduction of the anodic process, IV) increase of the ohmic resistance of the system. The most important data of the table are as follows: I, II, III, and IV are compiled as A: change of the promoting or inhibiting factors of the corrosion process.

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B	C
General characteristics of the protective measure	Concrete methods of corrosion protection
Change of internal factors (of metal)	1) Alloying increasing the thermo-dynamic stability of the alloy; 2) admixtures to the alloy increasing the continuity of the resulting corrosion products
Change of surface factors of the product	1) Coating with a continuous layer of a nobler metal; 2) insulation- and varnish coatings; 3) lubricants; 4) lining and coating with non-metallic substances; 5) oxide-, phosphate-, and other films; 6) enameling; 7) metal coatings forming corrosion layers of higher protection

I {

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II {	Change of external factors (of external conditions or of the corrosive medium)	1) Change of the external medium forming a layer with higher protection; 2) change of the corrosion conditions causing a layer of higher protection; 3) change of the corrosion conditions in such a way that the corroding agent is kept apart from the metal surface
	Change of internal factors (of the metal)	1) Reduction of the surface of cathodic spots in the metal; 2) introduction of admixtures to the alloy increasing the overvoltage of cathodic depolarization
	Change of surface factors of the product	1) Metal coatings with a high overvoltage of cathodic depolarization; 2) non-metallic coatings with the same effect as above, or an inhibiting effect toward the diffusion of cathodic products in the film

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Change of external factors (of external conditions or of the corrosive medium)	1) Introduction of cathodic inhibitors into the solution; 2) reduction of concentration of the cathodic depolarizers on the cathode; 3) cathodic electrochemical protection
Change of internal factors (of the metal)	1) Alloying increasing the anodic passivation capacity of the alloy; 2) introduction of active cathodes into the alloy
Change of surface factors of the product	1) Surface treatment of the metal increasing the passivation capacity (polishing); 2) coating of the product with a layer of stronger passivating metal; 3) varnish coatings or lubricants with a passivating dye
Change of external factors	1) Introduction of anodic inhibitors or production of a stronger passivating external medium; 2) anodic

III⟨

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		electrochemical protection (inhibition of anodic processes due to the occurrence of passivity)
IV	Change of internal factors (of the metal) or the surface factors	No clear examples
	Change of external factors	Increase of the ohmic resistance, e.g.: drying of the bottom or dehydration of liquid fuels

In general, those protection methods are most efficient which act upon the chief control factor of corrosion. If several protection methods with the same control protection factors are applied at the same time, efficiency increases; if control protection factors are not the same, it may decrease. The protection methods reducing the degree of thermodynamic instability, always entail a corrosion reduction, the effect of these methods is, however, smaller if the total inhibition in the system is very high.

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There are 1 table and 14 references: 8 Soviet-bloc and 6 non-Soviet-bloc.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR
                (Institute of Physical Chemistry of the Academy of
                Sciences USSR)

SUBMITTED: August 3, 1959

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S/184/61/000/003/002/004
D041/D113

18·8310   also 1138, 1573

AUTHOR: Tomashov, N.D., Doctor of Chemical Sciences, Professor,
           Chernova, G.P., Candidate of Chemical Sciences

TITLE: New method of electrochemical protection of metals against
           corrosion-anode polarization.

PERIODICAL: Khimicheskoye mashinostroyeniye, no. 3, 1961, 30-33

TEXT: The authors state that there are many electric-protection methods
which are applied in industry in order to prevent metals from corroding as
described by N.D. Tomashov (Ref. 1: Teoriya korrozii i zashchity metallov
[Theory of corrosion and metal protection], Izd. AN SSSR, 1959), (Ref.2:
Zashchita metallicheskikh konstruktsiy ot korrozii protektorami [Protection
of metal structures from corrosion by means of protectors], Oborongiz, 1940),
and by V.A. Pritula (Ref. 3: Katodnaya zashchita zavodskoy apparatury
[Cathode protection of industrial equipment], Goskhimizdat, 1954). None of
these methods use anode polarization. Nevertheless, anode polarization
can be used as corrosion protection, if a metal in a given medium tends to
passivation; the passivity of the metal considerably reduces the anodic dis-
solving. The resistance to corrosion of some metals and alloys (iron, stain-
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less steel, titanium, zirconium, tantalum, etc.) is based on the passivity
phenomena.   The passivity of these metals can be established by increasing
the oxidation effect of the medium, or by anode polarization of the metal.
A constant passivity potential of the metal can be maintained by an electronic
automatic-regulation device, i.e. a potentiostat.   The displacement of the
metal-potential in the electrolyte solution necessary for obtaining the pas-
sive state can be generated by the following methods: by changing the oxida-
tion-deoxidation potential of the medium as described by J.D.Berwick and U.R.
Evans (Ref.4: "Journal of Applied Chemistry", v. 2, no. 10, 1952), by anode
polarization from an external electric source as described by C. Edeleanu
(Ref. 6: "Nature", v. 173, no. 4407, 1954), through contact with an electri-
cally positive metal having a large enough surface as described by the au-
thors (Ref. 7 Tomashov, N.D., Chernova, G.P., Issledovaniya po nerzhaveyu-
shchim stalyam [Stainless-steel investigations], izd. AN SSSR, 1956), by
B.W. Buck Sloope and H. Leidheiser (Ref. 8: "Corrosion", v. 15, no. 11, 1959)
and by M. Stern and H. Wissenberg (Ref. 9: "Journal of the Electrochem. Soc.",
v. 106, no. 9, 1959), by introducing ions of precious metals into the solution,
and by introducing a cathode hardener into the alloy. In order to determine
the potential range within which the metal has the smallest dissolving speed,
potentiostatical curves must be plotted. Fig.2 shows such curves for 2X18H9
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(2Kh18N9) steel. Since inter-crystalline corrosion is one of the disadvant-
ages of stainless steel, the authors together with O.N. Markova (Ref. 16:
"Zhurnal prikladnoy khimii", v. 33, no. 6, 1960) investigated the effects
of anode polarization on the above-mentioned phenomena using 2Kh18N9 steel
which tends considerably to inter-crystalline corrosion after tempering at
650° for 2 hours. The results are compiled in table 2. Table 3 shows the
limits of the stable passive-state range of 2Kh18N9 steel hardened at 1050°
(15 minutes) and tempered at 650° (2 hours) in H_2SO_4 solutions. Fig.4
shows the anode polarization curves for titanium. The authors state that
anode electrochemical protection can be used when the aggressive fluid has
a good conductivity. The potential range in which the metal is sufficient-
ly passive is large enough for the reliable operation of an industrial auto-
matic potentiostat, this value must not be smaller than 50 millivolts as
described by J.D. Sudbury, O.L. Riggs and D.A. Schock (Ref. 17: "Corrosion",
v. 16, no. 2, 1960). At present, the anode protection method is being in-
troduced into industry. It has been proposed for titanium under the effect
of HCl and H_2SO_4 as described by A.H. Barber (Ref. 19: "Corrosion, preven-
tion and control", v. 6, no. 11, 1959). Anodic protection of devices during
sulfurization is already being used as treated by D.A. Schock, O.L.Riggs,

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and J.D. Sudbury (Ref. 21: "Corrosion", v. 16, no. 2, 1960) and by O.L.Riggs, M. Hutchison, N.L. Conger (Ref. 22: "Corrosion", v. 16, no. 2, 1960). The passivity of the metal can be kept constant not only through anode polarization from an external current source, but also through electric contact of the protected part with the metallic protector of an electric furnace. M. Prazak (Czechoslovakian patents, 86080, 150157) has proposed such a protection method for chrome-nickel steels in hot H_2SO_4 solutions; he recommends metal oxides, i.e. Fe_3O_4 or MnO_2 as protector materials. The experimental results obtained and the above-mentioned literature show that wide-scale industrial application of the anodic method for protecting carbon steel, stainless steel, titanium and other metals (which have a passivation tendency) from corrosion, is possible. There are 5 figures, 4 tables, and 22 references, 14 Soviet-bloc and 8 non-Soviet bloc. The four most recent English-language publications read as follows: J.D. Sudbury, O.L. Riggs, D.A. Schock, "Corrosion", v. 16, no. 2, 1960; A.H. Barber, "Corrosion, prevention and control", v. 6, no. 11, 1959; D.A. Schock, O.L. Riggs, J.D. Sudbury "Corrosion", v. 16, no. 2, 1960; O.L. Riggs, M. Hutchison, N.L. Conger, "Corrosion", v. 16, no. 2, 1960.

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S/081/62/000/013/024/054
B177/B101

AUTHORS: Matveyeva, T. V., Tyukina, M. P., Pavlova, V. A.,
Tomashov, N. D.

TITLE: Research on the anodizing of titanium in sulfuric acid
solutions

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 13, 1962, 410, abstract
13K166 (Sb. "Titan i yego splavy". no. 6. M., AN SSSR,
1961, 211-220)

TEXT: Research into a process of anodizing Ti is described. The
composition (in %) tested was Fe 0.13; Ni 0.15; Si 0.17; C 0.05;
N_2 0.098, CuO.34; with Ti forming the remainder in solutions of H_2SO_4.
The authors studied the growth and properties of the films in relation
to the time of anodizing (up to 8 hours); D_a (1-10 a/dm^2); temperature
(20-100°C) and concentration of H_2SO_4 (0-80 %). Anodizing of Ti in H_2SO_4
at about 20°C occurs at a high terminal voltage (up to 100 v) and results

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