5(4)

AUTHORS: Tomashov, N. D., Al'tovskiy, R. M., Arakelov, A. G.

SOV/2o-121-5-33/5o

TITLE: The Anodic Protection of Titanium in Sulfuric Acid (Anodnaya zashchita titana v sernoy kislote)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 121, Nr 5, pp 885 - 888 (USSR)

ABSTRACT: This paper investigates the processes of the formation of oxide films by self-passivation of titanium in solutions of sulfuric acid and the processes on the metal surface which are caused by anodic polarization. The investigations were carried out for titanium of the type VT-1D (O:0,23 - 0,26%, H: 0,022 - 0,023%, N: 0,017%, Fe:0,12%, Si: 0,05%) in solutions of sulfuric acid at room temperature. A diagram shows the behavior of titanium during the dressing (zachistka) of the surface in solutions of sulfuric acid. Titanium restores the passive state after the dressing of the surface in a 5% solution of H_2SO_4. In 10% H_2SO_4, titanium remains

in the active state after dressing. The potential of the active state of titanium in sulfuric acid was equal to ~0,3 V. The oxygen in the air dissolved in the electrolyte, plays the principal rôle in the conservation of the stability of the passive state of titanium in diluted solutions of sulfuric acid. If the titanium surface is treated in a 10% solution of H_2SO_4 in an oxygen atmosphere, the titanium also turns into the passive state. There is a protecting, stable oxide film on the surface of titanium in the passive state. Also the surface of titanium in its active state is partially covered by an oxide film. The second diagram shows the curves of the anodic polarization of titanium in solutions of sulphuric acid of various concentrations. The anodic polarizability in the region of the active dissolution of titanium increases if the concentration of the sulfuric acid decreases. The last diagram shows the results of the corrosion experiments on titanium samples with and without anodic protection. The corrosion losses of the non-protected samples increased

linearly with time. After an anodic protection of titanium in both of the investigated solutions of sulfuric acid practically no corrosion losses were found. There are 4 figures and 12 references, 9 of which are Soviet.

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

PRESENTED: April 11, 1958, by P.A.Rebinder, Academician

SUBMITTED: April 8, 1958

AUTHORS: Tomashov, N. D., Chernova, G. P., Al'tovskiy, R. M., 32-3-17/52
Blinchevskiy, G. K.

TITLE: Development of a Method of Metal Dressing by a Solution for the Purpose of Studying the Effect of Passivity
(Razvitiye metoda zachistki poverkhnosti metallov pod rastvorom dlya issledovaniya yavleniy passivnosti)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 3, pp. 299-303 (USSR)

ABSTRACT: The method mentioned in the title was developed by G. B. Klark and G.V. Akimov [Ref. 1]. The system was improved in that metal-dressing is carried out on the entire part of the surface that is in contact with the electrolyte; the emery stone has an automatically controlled and constant velocity; the test vessel is thermally controlled, and experiments can be carried out in an atmosphere of different gases. A schematical drawing with an exact description is given. The influence of the composition of stainless steel on the velocity of the formation of the protective coating as well as that exercised by the composition of the solution upon the latter in tungsten, zirconium, and titanium was investigated. As

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Development of a Method of Metal Dressing by a Solution for the Purpose of Studying the Effects of Passivity

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may be seen from the results of investigation and from the diagrams given, the influence exercised by the composition of steel is of decisive importance. Among other things it was found that an increase of the concentration of chlorine ions in the solution renders re-establishment of the passivation of zirconium and titanium more difficult, whereas that of tungsten is rendered somewhat more easy. The re-passivation of titanium in a 3n HCl + 0.2n NaJ solution is independent of the influence exercised by the oxygen in the air, as it promotes the formation of the J_3-complex ions. The method described makes it possible to carry out other investigations of this kind as e.g. that of the influence exercised by protective coatings upon the polarization properties of metals. There are 4 figures, and 2 references, 2 of which are Slavic.

ASSOCIATION: Institute of Physical Chemistry AS USSR (Institut fizicheskoy khimii Akademii nauk SSSR)

AVAILABLE: Library of Congress

Card 2/2 1. Metals-Passivity-Effects 2. Metals-Coating-Methods

AL'TOVSKIY R. M.

TOMASHOV, Nikon Danilovich. Prinimali uchastiye: TYUKINA, M.N.; PALEOLOG, Ye.N.; CHERNOVA, G.P.; MIKHAYLOVSKIY, Yu.N.; LUNEV, A.F.; TIMONOVA, M.A.; MODESTOVA, V.N.; MATVEYEVA, T.V.; BYALOBZHESKIY, A.V.; ZHUK, N.P.; SHREYDER, A.V.; TITOV, V.A.; VEDENEYEVA, M.A.; LOKOTILOV, A.A.; BERUKSHTIS, G.K.; DERYAGINA, O.G.; FEDOTOVA, A.Z.; FOKIN, M.N.; MIROLYUBOV, Ye.N.; ISAYEV, N.I.; AL'TOVSKIY, R.M.; SHCHIGOLEV, P.V.. YEGOROV, N.G., red.izd-va; KUZ'MIN, I.F., tekhn.red.

[Theory of the corrosion and the protection of metals] Teoriia korrozii i zashchity metallov. Moskva, Izd-vo Akad.nauk SSSR, 1959. 591 p. (MIRA 13:1)

(Corrosion and anticorrosives)

18(7); 25(1) PHASE I BOOK EXPLOITATION SOV/3133

Korroziya i zashchita staley; sbornik statey (Corrosion and Protection of Steel: Collection of Articles) Moscow, Mashgiz, 1959. 233 p. 7,000 copies printed.

Ed.: N.D. Tomashov, Doctor of Chemical Sciences, Professor; Reviewers: A.A. Zhukhovitskiy, Doctor of Chemical Sciences, Professor, and K.S. Ponomareva, Docent; Ed. of Publishing House: Ya.G. Alaverdov; Tech. Ed.: B.M. Popova; Managing Ed. for Literature on Machine and Instrument Construction: N.V. Pokrovskiy, Engineer.

PURPOSE: This book is intended for scientific and technical personnel concerned with questions of the corrosion and protection of metals.

COVERAGE: The articles in this collection deal with the corrosion of steels in corrosive environments, investigation of the effect of various factors on corrosion, and methods of protecting steels from gas and electrochemical corrosion. Special attention is given to new methods of investigation. A number of the articles give the results of studies made under operating conditions. New data, obtained by the Department of Metal Corrosion, Moskovskiy institut stali (Moscow Institute of Steel), are published here for the first time. Four articles are the result of work conducted jointly at the laboratories of the Moskovskiy metallurgicheskiy zavod "Serp i molot" (Moscow Metallurgical Plant "Serp i molot") and the Khimicheskiy zavod imeni M.I. Kalinina (Chemical Plant imeni M.I. Kalinin). Most of the articles contain practical recommendations on the protection of metals from corrosion. No personalities are mentioned. References follow each article.

TABLE OF CONTENTS:

AL'TOVSKIY, R.M.

Use of titanium in some industrial branches. Biul.tekh.-ekon.inform. no.5:84-87 '60. (MIRA 14:3)
(Titanium)

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)

84631

18.8310 2808, 1530, 1454

S/076/60/034/010/012/022
B015/B064

AUTHORS: Tomashov, N. D. and Al'tovskiy, R. M.

TITLE: Investigations of the Mechanism of Electrochemical Corrosion of Titanium. VII. Corrosion and Passivity of Titanium in Hydrochloric Acid Solutions in the Presence of Platinum, Copper, and Iron Ions

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 10, pp. 2268-2274

TEXT: The passivating action of Pt^{4+}-, Cu^{2+}-, and Fe^{3+} ions upon other metals, e.g., stainless steel and titanium has previously been studied by various researchers, among them by D. G. Monipenni, B. P. Artamonov, A. I. Shultin, G. P. Maytak, N. I. Gratsianskiy, G. P. Chernova and N. D. Tomashov, D. Shleyn and D. Smatko. The electrode potential shifts, when these ions are added, to more positive values. Uhlig and Geary (Ref. 9) assumed that Cu^{2+} and Fe^{3+} adsorb on the titanium surface, take up electrons and form dipoles whose negative end dips into the solution,

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Investigations of the Mechanism of Electrochemical Corrosion of Titanium. II. Corrosion and Passivity of Titanium in Hydrochloric Acid Solutions in the Presence of Platinum, Copper, and Iron Ions

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so that passivation is due to a saturation of the valence forces of the surface atoms of the metal. The present paper investigates the influence of the Pt^{4+}-, Cu^{2+}-, and Fe^{3+} ions on the electrochemical and corrosion behavior of titanium in a 15% hydrochloric acid solution at 25°C. BT-IA (VT-ID) titanium was used (0.13-0.15% oxygen, 0.015% hydrogen, 0.024% nitrogen, 0.12% iron, 0.03% silicon). The admixtures were added in the form of $H_2PtCl_6 \cdot 6H_2O$, $CuCl_2 \cdot 2H_2O$ or $FeCl_3 \cdot 6H_2O$. The experiments were made in closed vessels, and the rate of corrosion was determined from the weight loss of the sample. Table 1 gives the results obtained, showing that in the case of small amounts of admixtures, corrosion is accelerated, i.e., most by Pt^{4+}, less by Cu^{2+}, and least by Fe^{3+}. An increase in admixture leads to the passivation of titanium with an efficiency decreasing from Pt^{4+} over Cu^{2+} to Fe^{3+}. Anodic polarization (Fig. 1) also leads to a transition from the active to the passive state. From the curves of

Investigations of the Mechanism of Electrochemical Corrosion of Titanium. II. Corrosion and Passivity of Titanium in Hydrochloric Acid Solutions in the Presence of Platinum, Copper, and Iron Ions

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cathodic polarization it may be seen (Fig. 2) that in the presence of the cations added, the polarization curves reach essentially more positive potentials up to the limiting diffusion current than the curves in pure hydrocnloric acid. Measurements of the constant potential after a purification of the titanium surface in the solution showed that only if the Pt^{4+}-ion concentration is increased to $3 \cdot 10^{-6}$ g.ion/l in 15% HCl, titanium remains in passivated state after the purification of the surface. For iron ions, spontaneous passivation is only reached at a concentration of Fe^{3+} $1 \cdot 10^{-3}$ g.ion/l. The results show that the Pt^{4+}-, Cu^{2+}-, and Fe^{3+} ions are anodic inhibitors, which due to the acceleration of the cathodic process (Fig. 2) effect an anodic passivation of the metal surface (Fig. 1). The action of the Pt^{4+}- and Cu^{2+} ions may take place in two directions - on the one hand, as cathodic depolarizers, on the other hand, they form affective cathodic areas thus, accelerating the

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Investigations of the Mechanism of Electrochemical Corrosion of Titanium. II. Corrosion and Passivity of Titanium in Hydrochloric Acid Solutions in the Presence of Platinum, Copper, and Iron Ions

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cathodic process. The Fe^{3+}-ions accelerate the cathodic process only as depolarizers. By a similar mechanism it is possible that other noble metals such as Pt^{4+} and Cu^{2+} bring about the titanium passivation as well as ions with variable valence (e.g. Sn, Pb etc) in a similar way as the Fe^{3+}-ions. V. I. Layner and N. G. Kudryavtseva are mentioned in the text. There are 3 figures, 1 table, and 14 references: 10 Soviet, 1 US, and 1 German.

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

SUBMITTED: January 21, 1959

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Table 1 Таблица 1

Коррозия титана в 15%-ном растворе соляной кислоты в присутствии ионов железа, меди и платины

1 Раствор	2 Добавляемый катион	3 Концентрация добавки, g-ион/л	4 Скорость коррозии, g/m² час
15% HCl	Без добавки	—	0,23
15% HCl	Fe^{3+}	0,00004	0,25
		0,00005	0,29
		0,00008	0,00
15% HCl	Cu^{2+}	0,000005	0,25
		0,00001	0,32
		0,00002	0,39
		0,00003	0,38
		0,00004	0,0
15% HC	Pt^{4+}	0,0000005	0,55
		0,00000075	0,68
		0,000001	0,59
		0,000002	0,00
15%HCl + +0,8% NaF	Без добавки	—	295
	Pt^{4+}	0,0000005	308
		0,000015	323
		0,00005	326

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Legend for Table 1: corrosion if titanium in 15% hydrochloric acid solution in the presence of iron, copper, and platinum ions, 1 = solution, 2 = added cation, 3 = concentration of the state in g.ion/l, 4 = corrosion rate in $g/m^2 \cdot$hour, 5 = without addition.

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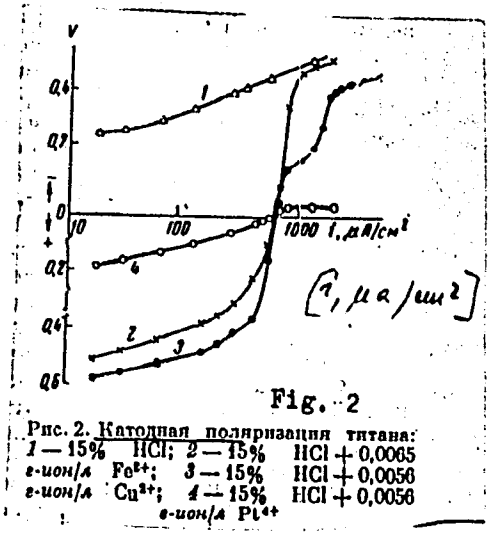

Fig. 2

Рис. 2. Катодная поляризация титана: 1 — 15% HCl; 2 — 15% HCl + 0,0065 г-ион/л Fe^{3+}; 3 — 15% HCl + 0,0056 г-ион/л Cu^{2+}; 4 — 15% HCl + 0,0056 г-ион/л Pt^{4+}

Legend for Fig. 2: cathodic polarization of titanium: 1 - 15% HCl, 2 - 15% HCl + 0.0065 g.ion/l Fe^{3+}, 3 - 15% HCl + 0.0056 g.ion/l Cu^{2+}, 4 - 15% HCl + 0.0056 g.ion/l Pt^{4+}.

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AL'TOVSKIY, R.M.

PHASE I BOOK EXPLOITATION SOV/5544

Tomashov, N. D., Doctor of Chemical Sciences, Professor, ed.

Korroziya i zashchita konstruktsionnykh metallicheskikh materialov; sbornik statey (Corrosion and Protection of Constructional Metals; Collection of Articles) Moscow, Mashgiz, 1961. 258 p. Errata slip inserted. 10,000 copies printed.

Ed. of Publishing House: N.P. Yevstaf'yeva; Tech. Ed.: O.V. Smirnova; Managing Ed. for Literature on Chemical and Textile Machine Building: V.I. Rybakova, Engineer.

PURPOSE: This collection of articles is intended for scientific and technical personnel concerned with the corrosion and protection of metals.

COVERAGE: The collection deals with problems of the corrosion of constructional metals in various environments and conditions. Articles discuss new methods for the investigation and testing of corrosion and give results of recent research conducted on the corrosion and protection of metal constructions. The corrosion of some new alloys is also considered. The collection includes articles generalizing the results of research conducted during the last 2-3 years in the Department for Corrosion of Metals of the Moskovskiy institut stali (Moscow Steel Institute). Some of the articles were written in cooperation with the laboratory staffs of the "Serp i molot" Plant and Khimicheskiy zavod im. M.I. Kalinina (Chemical Plant imeni M.I.Kalinin) and are based on investigations conducted at these plants. No personalities are mentioned. There are 219 references, Soviet and non-Soviet. References accompany each article.

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APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101210006-0"

AVAILABLE: Library of Congress (TA462.T64)

18.8310

31555
S/081/61/000/022/029/076
B110/B138

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. Khimiya, no. 22, 1961, 255, abstract 22I151 (Sb. "Korroziya i zashchita konstrukts. metallich. materialov". M., Mashgiz, 1961, 151-163)

TEXT: It has been found that the corrosion-resistance of Ti in H_2SO_4 is increased if the Ti surface is saturated by oxygen and, especially, by N_2 and H_2. [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 23I255 (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, ВТ1 (VT1) and ВТ5 (VT5), are less resistant than those with an α + β structure, ВТ3 (VT3) and ВТ3-1 (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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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.]

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18 8300

31556
S/081/61/000/022/030/076
B110/B138

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

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

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 22, 1961, 255, abstract 22I152 (Sb. "Korroziya i zashchita konstrukts. metallich. materialov". M., Mashgiz, 1961, 173-186)

TEXT: It is noted that Pd increases the corrosion resistance (CR) of Ti more efficiently than Pt. Alloying with molybdenum increases the resistance of Ti as it has less tendency to anodic dissolution than without this addition. Far from raising its CR, the addition of Cr even reduces it in some cases. Ternary alloys Ti-Pd-Mo and Ti-Pd-Cr have greater resistance than the Ti-Pd alloy. This is because the current required for anodic dissolution of Ti around the potential for complete passivation is less than when it is alloyed with Mo or Cr. [Abstracter's note: Complete translation.]

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AL'TOVSKIY, R. M.

Cand Chem Sci, Diss -- "Investigation of the mechanism of electrochemical corrosion and the protection of titanium in acid media". Moscow, 1961. 15 pp, 20 cm (Acad of Sci USSR. Inst of Electrochem), 200 copies, list of 10 works by the author on pp 14-15 (KL, No 9, 1961, p 176, No 24272). [61-50366]

24021
S/076/61/035/005/004/008
B101/B218

18 8300

AUTHORS: Tomashov, N. D., Chernova, G. P., and Al'tovskiy, R. M. (Moscow)

TITLE: Study of the mechanism of electrochemical corrosion of titanium. III. Corrosion and electrochemical behavior of titanium and titanium alloys with platinum and palladium in solutions of sulfuric and hydrochloric acid

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 5, 1961, 1068-1077

TEXT: The corrosion resistance of titanium to high acid concentrations and temperatures above room temperature was improved by alloying with Pt or Pd. The following alloys were made of titanium of the type BT-1 (VT-1), alloyed in a vacuum high-frequency furnace: no. 1: Ti + 1 % Pt; no. 2: Ti + 2 % Pt; no. 3: Ti + 1 % Pd; no. 4: Ti + 2 % Pd; and no. 5: pure Ti (remolten VT-1) The electrochemical characteristics of these samples were studied by recording the potentiostatic polarization curves with an electronic potentiostat. Fig. 1 shows the results obtained from 40 % H_2SO_4 for Ti and Ti + 1 % Pt with the characteristic points $E_{ст}$ = steady potential; $E_п$ = passivation potential corresponding to the passivation current $I_п$;

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$E_{пп}$ = potential of complete passivation, corresponding to the current $I_{пс}$ of the passive state; E_a = activation potential; I_k is the cathodic, and I_a the anodic current; E_H = potential of the hydrogen electrode. The other alloys showed similar results. Fig. 2 presents those obtained from 40, 60, and 70 % H_2SO_4. As may be seen from Fig. 4, there are two corrosion maxima with Ti, but only one with the alloys. Anodic polarization in HCl showed the same behavior as in H_2SO_4. With Ti in 20 % HCl (Fig. 6), however, a cathodic passivity occurred due to the formation of a protective layer of titanium hydride. The results are as follows: 1) Titanium alloys containing Pt and Pd are much more resistant to corrosion than pure Ti. 2) Increased temperature and acid concentration complicates the passivation of Ti because the potential is shifted in the direction of positive values. 3) In alloys of Ti containing Pt and Pd, the steady potential becomes more positive due to a reduction of the hydrogen overvoltage by 350-400 mv and, thus, lies within the range where Ti is completely or almost completely passivated. This fact leads to an increase in the corrosion resistance of these alloys. There are 7 figures, 2 tables, and 11 references: 5 Soviet-bloc and 6 non-Soviet-bloc. The 2 most important references to English-

language publications read as follows: J. B. Cotton, Chemistry and Industry, no. 3, 68, 1958; L. B. Golden, I. R. Lane, W. L. Acherman, Industr. and Engng. Chem., 44, 1930, 1952.

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

SUBMITTED: August 3, 1959

Fig. 1: Potentiostatic curves of anodic polarization of Ti and Ti + 1 % Pt in 40 % H_2SO_4 at 25 and 50°C. Legend: a) schematic anodic potentiostatic curve (explanation in the text); 6) cathodic curves: 1) Ti in 40 % H_2SO_4 at 25°C and with increasing I; 2) idem with decreasing I; 3) Ti at 50°C; 4) Ti + 1 % Pt at 25°C; 5) idem at 50°C; anodic curves: 6) Ti at 25°C and with increasing I; 7) idem with decreasing I; 8) Ti at 50°C; 9) Ti + 1 % Pt at 25°C; 10) idem at 50°C.

S/020/61/141/004/014/019
B101/B110

AUTHORS: Tomashov, N. D., Al'tovskiy, R. M., and Kushnerev, M. Ya.

TITLE: Examination of structure of passive oxide films on the surface of titanium

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 4, 1961, 913 - 916

TEXT: The authors studied composition and structure of passivating films forming in auto-passivation of Ti in various solutions and in anodic passivation. Reference is made to a previous paper (Zav. lab., no. 3 (1960)). Here, the oxide film forming on oxidizing in air on titanium and its alloys BT-5 (VT-5), BT3 (VTZ), and BT3-1 (VTZ-1) was found to consist of TiO. In this case, the oxide film was loosened from the metal base by means of a 5% Br solution in anhydrous methanol, and electronographically analyzed by "transmission". In the present study, the same method was used. Composition and structure of films forming on Ti were examined: (1) in auto-passivation in 5% HCl, 5% H_2SO_4, 6% HNO_3, 1 N NaCl, 1 N NaOH at room temperature; (2) in anodic oxidation in 40% H_2SO_4 at the

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Examination of structure of...

potentials -0.05, +1, and +8 v; (3) in oxidation in boiling 65% HNO_3. It was found: (A) Orientation of the metal layer due to polishing of the surface causes an orientation of the crystals of the oxide film; (B) All diffraction patterns of the oxide films obtained by the solutions mentioned under (1) and (2) for -0.05 and +1 v agreed best with the diffraction pattern of titanium oxide having the composition $Ti_2O_3 \cdot (3-4)TiO_2$; (C) In the case of (2) at +8 v, and in the case of (3), the oxide film consists of TiO_2 having an anatase structure which contains a small quantity of rutile. Electron diffraction patterns obtained by reflection agreed with the transmission electron diffraction patterns. This confirms that removing the film from the titanium surface did not cause a structural change. Conclusion: TiO_2 forms under rigorous oxidation conditions. Under milder conditions (auto-passivation at room temperature, anodic oxidation at a positive potential not being too high), the lower oxide, $Ti_2O_3 \cdot (3-4)TiO_2$, forms. Under conditions being still milder, the formation of even lower titanium oxides is possible. There are 2 figures,

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Examination of structure of...

2 tables, and 15 references: 10 Soviet-bloc and 5 non-Soviet-bloc. The two references to English-language publications read as follows: P. H. Morton, W. M. Baldwin, Trans. Am. Soc. Metals, 44, 1004 (1953); S. Ogawa, D. Watanabe, Sci. Rep. Res. Inst. Tohoku Univ., no. 2, 184 (1955).

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

PRESENTED: July 5, 1961, by V. I. Spitsyn, Academician

SUBMITTED: July 4, 1961

Card 3/3

TOMASHOV, N.D., doktor khim. nauk, prof., otv. red.; GOLUBEV, A.I., doktor tekhn. nauk, otv. red.; PALEOLOG, Ye.N., kand. khim. nauk, red.; AL'TOVSKIY, R.M., kand. khim. nauk, red.; MIROLYUBOV, Ye.N., kand. khim. nauk, red.; ARKHANGEL'SKAYA, M.S., red.; ISLENT'YEVA, P.G., tekhn. red.

[Corrosion of metals and alloys] Korroziia metallov i splavov; sbornik. Moskva, Metallurgizdat, 1963. 382 p. (MIRA 16:5)
(Corrosion and anticorrosives)

ACC NR: AM5026681 Monograph UR/

Tomashov, N. D.; Al'tovskiy, R. M.

Corrosion and the protection of titanium (Korrosiya i zashchita titana) Moscow, Mashgiz, 63. 0167 p. illus., biblio., tables. Errata slip inserted. 4,500 copies printed.

TOPIC TAGS: titanium, titanium alloy, titanium compound, corrosion, corrosion resistance, corrosion resistant alloy, corrosion resistant metal, electrochemical analysis, corrosion protection, metal coating, protective coating, metal stress, electrolyte

PURPOSE AND COVERAGE: The book is based on data published throughout the world for the past decade. It also includes experimental research conducted by the authors on the corrosion and electrochemical properties of titanium and the search for new titanium alloys with greater corrosion resistance. It presents data on the electrochemical properties, passivity and corrosion resistance of titanium and its alloys. It examines the fields in which titanium and its alloys can be applied in modern technology. The book is intended for scientific and engineering-technical workers of research institutes and plant laboratories, and also all people interested in the problems of the corrosion and the protection of metals and in the development and application of corrosion-resistant titanium alloys or the arrangement of further scientific research in this field. The book may also be useful for students of metallurgical, chemical and technological higher educational institutions.

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L 8493-65 (n)/EWP(h) EIP(c)/ASD(f)/ASD(m)-3 JD/WB/MLK

ACCESSION NR: AT4043071 S/0000/64/000/000/0167/0174

AUTHOR: Al'tovskiy, R. M.; Tomashov, N. D.

B

TITLE: Anodic protection of titanium in acids

SOURCE: Mezhvuzovskaya konferentsiya po anodnoy zashchite metallov ot korrozii. 1st, Kazan, 1961. Anodnaya zashchita metallov (Anodic protection of metals); doklady* konferentsii. Moscow, Izd-vo Mashinostroyeniye, 1964, 167-174

TOPIC TAGS: titanium, titanium corrosion, anodic protection, titanium passivation, corrosion resistant titanium alloy

ABSTRACT: The feasibility of increasing the corrosion resistance of titanium by anodic polarization has been investigated by subjecting titanium to corrosion tests in 40 and 78% sulfuric acids and in 15 and 25% hydrochloric acids, with the potential of the specimens maintained between +0.5 and +1.0 v. It was found that, if the specimen is immersed in a solution with the anodic current on, the current density can be taken equal to just the minimum density required for anodic passivation of titanium in a given acid solution since, in this case,

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titanium is rapidly passivated. Immersing the specimen in a solution with the current off makes possible in the initial period the transition of the specimen into the active condition. To accomplish anodic protection in this case, it is necessary to apply an anodic current of a density 5—10% higher than the above minimum density at the beginning of the process. The maximum density of the protective current is determined from the anodic potentiostatic curves. For 40 and 70% sulfuric acid it is 0.3 and 1.5 ma/cm^2, and for 15 and 25% hydrochloric acid it is 0.1 and 0.3 ma/cm^2, respectively. To maintain the potential of titanium within the values of +0.5 to +1.0 v in 40 and 78% sulfuric acid, a current density of only 0.1—0.2 and 0.5 to 1.0 mka/cm^2, respectively, is required. For 15 and 25% hydrochloric acids, the corresponding figures are 0.5—1.0 and 1.0—2.0 mka/cm^2, respectively. Anodic protection under such conditions practically eliminated the corrosion losses of titanium in all investigated solutions. However, the anodic protection of titanium is not always effective and, in such cases, a Ti-Cr alloy which is more stable under conditions of anodic protection should be used. This alloy has a considerably lower density of anodic-dissolution current in the passivated condition, compared to that of titanium. Orig. art. has: 7 figures.

L 8413-65
ACCESSION NR: AT4043071

ASSOCIATION: none

SUBMITTED: 13Mar64	ATD PRESS: 3104	ENCL: 00
SUB CODE: MM, IE	NO REF SOV: 007	OTHER: 005

Card 3/3

ACCESSION NR: AP4010485 S/0080/64/037/001/0126/0131

AUTHOR: Al'tovskiy, R. M.; Tomashova, N. N.

TITLE: The corrosive and electrochemical behavior of titanium and chromium alloys in sulfuric acid

SOURCE: Zhurnal prikladnoy khimii, v. 37, no. 1, 1964, 126-131

TOPIC TAGS: titanium alloys, chromium alloys, non-oxidizing acids, sulfuric acid, anode polarization, inertness, anodic protection, aggressive media, titanium potential, corrosion resistance, over-passivation

ABSTRACT: A detailed study of the corrosive and electrochemical behavior of titanium alloys with chromium in 40% and 70% sulfuric acid revealed that they have a lower stability than unalloyed titanium, and that anodic protection reduces the speed of titanium corrosion hundreds of times, particularly titanium alloyed with chromium. In titanium-chromium alloys anodic release of oxygen is considerably less inhibited than in titanium. The results obtained in these tests

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ACCESSION NR: AP4010485

show that titanium-chromium alloys eventually may prove to be suitable for insoluble anodes in the electrolytic processes of sulfuric acid solutions. When diluted in an active state, corrosion resistance of titanium-chromium alloys are not superior to unalloyed titanium. Titanium-chromium alloys have a smaller region of potential stable passivation than titanium, necessitating more careful control over the potential for anodic protection. It has been established that titanium-chromium alloys are subject to overpassivation as well as secondary passivation in sulfuric acid solutions at high temperatures. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 24May62 DATE ACQ: 14Feb64 ENCL: 00

SUB CODE: ML, CH NO REF SOV: 005 OTHER: 001

Card 2/2

AL'TOVSKIY, R.M.; FEDOTOVA, A.G.; KOROLEV, S.I.

Studying the corrosion properties of yttrium. Part 1: Effect of pH on the corrosion and electrochemical behavior of yttrium. Zashch. met. 2 no.1:52-56 Ja-F '66. (MIRA 19:1)

1. Submitted April 19, 1965.

L 01300-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG/WB

ACC NR: AP6003320 (N) SOURCE CODE: UR/0365/66/002/001/0052/0056

48
46
B

AUTHOR: Al'tovskiy, R. M.; Fedotova, A. G.; Korolev, S. I.

ORG: none

TITLE: Investigation of the corrosion properties of yttrium. I. Effect of the pH on the corrosion and electrochemical behavior of yttrium

SOURCE: Zashchita metallov, v. 2, no. 1, 1966, 52-56

TOPIC TAGS: yttrium, corrosion resistance, electrochemistry, corrosion resistant metal

ABSTRACT: The effect of the pH on the corrosion resistance and stationary electrode potential of yttrium containing 0.1% O, 0.3% Si, and 0.3% Cu was studied in solutions of NaX + HX and NaX + NaOH types (X was the anion of Cl^- or NO_3^-). The corrosion of yttrium in nitrate and at a pH >3 in chloride solutions occurred with a decrease in corrosion rate with time. This indicated the formation of a protective film (probably hydroxide) on the surface of the yttrium. The dissolving of yttrium practically ceased to exist after 50-75 hours of the experiment. The rate of corrosion of yttrium decreased with increased pH, especially in the acid region (pH 2 - 4). The corrosion rate was somewhat lower in nitrate than in chloride solution. The metal was in the passive state at a lower pH (10.5) in the nitrate solution than in the presence of Cl^- (pH 13). Yttrium practically did not dissolve in bidistilled H_2O with and without addition of

Card 1/3 UDC: 669.794 : 620.193

alkalies. Therefore, the presence in solution of NO_3^- and especially of Cl^- has no effect on the resistance of yttrium to corrosion. Thermodynamically, yttrium should be a very active metal electrochemically. The standard potential of reaction $Y = Y^{3+} + 3e$ is - 2.37 v. But even the most negative potentials of yttrium in the solutions studied were 1 v more positive. This suggested the presence of a protective film on the yttrium surface even in the active state of yttrium. The curve of stationary potential - pH for yttrium in chloride solution consisted of three parts. The stationary potentials at a potential below 3 and above 10 decreased with decrease or increase of the pH, respectively. The potential slightly increased with a decreased pH in the interval of pH 10-3. According to G. V. Akimov and I. L. Rozenfeld (Issledovaniya v oblasti elektrokhimicheskogo i korrozionnogo povedeniya metalov i splavov, Oborongiz, M., 1950), this can be explained most satisfactorily by the presence of potentials of the film-pore type on the metal surface. A complete passivation of yttrium in chloride solution occurred at pH 13. The inflection on the curve at pH 3 indicated a change in surface conditions. Probably, at pH <3 the hydroxide film was converted into yttrium chloride and the film lost its protective properties. The stationary potential-pH curve of yttrium in the nitrate solution was similar to that in the chloride solution except for the absence of a decrease in potential in the acid region (pH <3) and for the fact that the stationary potential in nitrate solutions at a pH of 3-10 was 0.25 v more positive than in chloride solutions. This was caused by the presence of NO_3^- which increased the potentials of the cathode sections. At a pH of 2-10 the corrosion of yttrium occurred with both hydrogen and oxygen depolarizations and at a pH >10 only

L 01300-67

ACC NR: AP6003320

with oxygen depolarization. The cathode polarization curves of yttrium in alkaline solutions indicated that the relationship between overvoltage of H (i) and current density (η) at a pH of 13 has the form of: $\eta = 1.38 + 0.22 \log i$. The dependence of the overvoltage of hydrogen on the pH in the region of pH 6.2-13 has the form of: $\eta = 1.22 - 0.038$ pH. Orig. art. has: 6 fig.

SUB CODE: 11,07/ SUBM DATE: 19Apr65/ ORIG REF: 006/ OTH REF: 002

Card 3/3 fdh

L 04774-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG/WB

ACC NR: AP6025718 SOURCE CODE: UR/0365/66/002/004/0436/0438

AUTHOR: Al'tovskiy, R. M. ; Fedotova, A. G.; Korolev, S. I.

62
B

ORG: none

TITLE: Investigation of the corrosion properties of yttrium, II. Corrosion of yttrium in hydrofluoric acid

14 27

SOURCE: Zashchita metallov, v. 2, no. 4, 1966, 436-438

TOPIC TAGS: corrosion, corrosion rate, electrochemistry, yttrium, chemical kinetics, hydrofluoric acid

ABSTRACT: The corrosion kinetics and the electrochemical properties of yttrium in 2% and 18% HF were studied at 25° and 90°. Reduction in corrosion rate with time was proved to be due to the formation of a protective film of YF_3. Under the test conditions -- 250 hours at 25° and 24-50 hours at 90° -- the film remained intact, but on prolonged contact in HF the film breaks down and chips off. Deep pits and film crumbling were noted in 25 hours in vapor phase tests. Removal of oxygen from the system had no effect on the corrosion rate. The stationary potential of yttrium in HF solutions shifts to the positive side with time, indicating passivation. Anodic polarization is the

Card 1/2 UDC: 620.193.41:669.794

AL'TOVSKII, V. I.

Klimatologicheskaia kharakteristika vozdushnoi linii Moskva-Irkutsk. /Climatological characteristics of the Moscow-Irkutsk air route/. Moskva, 1931. 192 p., maps, tables. (NII VVS RKKA).

SO: Soviet Transportation and Communications, A Bibliography, Library of Congress, Reference Department, Washington, 1952, Unclassified.

ROGINSKIY, S.Z.; AL'TSCHULER, O.V.; VINOGRADOVA, O.M.; YANOVSKIY, M.I.; KRIVORUCHKO, O.P.

New variants of chromatographic preparation of high-purity gases and vapors. Izv. AN SSSR Ser. khim. no.2:214-221 '65.
(MIRA 18:2)

1. Institut khimicheskoy fiziki AN SSSR.

ABRAMYAN, S.L.; AKSEL'ROD, S.M.; ALEKSEYEV, F.A.; AL'TSHEL', S.A. [deceased], BESPALOV, D.F.; GADZHI-KASIMOV, A.S.; ZHILIN, K.A.; LISTENGARTEN, B.M.; ODINOKOV, V.P.; PUTKARADZE, L.A.; SHIMELEVICH, Yu.S.

Neutron-neutron pulse method for investigating wells and results of its use in the Balakhan'-Sabunchi-Ramany field. Azerb. neft. khoz. 39 no.11:9-13 N '60. (MIRA 13:12)
(Apsheron Peninsula—Oil well logging, Radiation)

ABRAMYAN, S.L.; AL'TSHEL', S.A.[deceased]; TER-GRIGORYAN, Yu.N.

Effect of gun perforating on the stability of casings. Neft. khoz. 40 no.11:47-52 N '62. (MIRA 16:7)

(Oil well casing)

USSR/Microbiology - Microbes Pathogenic for Man and Animals. F
Bacteria. Bacteria of the Intestinal Group.

Abs Jour : Ref Zhur Biol., No 22, 1958, 99414

Author : Chernokhvostova, Ye.V., Al'tshteyn, A.D., Shirman, G.A.
Inst : -
Title : On the Problem of the Mechanism of the Disintoxicating Effect of Synthomycin and Levomycetin.

Orig Pub : Antibiotiki, 1957, 2, No 6, 45-49

Abstract : Synthomycin (S) in vitro failed to neutralize the toxicity of bacteria of paratyphoid B and Flexner dysentery of mice after the bacteria were killed by heating. The effect of S and Levomycetin (L) upon the experimental intoxication of white mice caused by intraperitoneal injection of endotoxin pf paratyphoid B and dysentery bacilli of Flexner was investigated. A single oral administration of S or L in semifluid agar proved ineffective. It was thus demonstrated that these antibiotics do not

Card 1/3

ALTSHTEYN, A.D.

ALTSTEIN, A.D.

Interference between teck-borne encephalitis and poliomyelitis viruses in tissue culture. II. Mechanism of cell resistance to poliovirus in tissue cultures infected with tick-borne encephalitis virus. Acta virol. 6:481-486 '62.

1. Institute of Poliomyelitis and Viral Encephalitides, U.S.S.R. Academy of Medical Sciences, Moscow.
(ENCEPHALITIS VIRUSES) (POLIOVIRUS)
(VIRUS CULTIVATION)

GINSBURG, N.N.; KASYMOV, K.T.; AL'TSHTEYN, A.D.

Comparative study of various methods of titrating virus-neutralizing antibodies to the poliomyelitis virus in tissue culture. Vop. virus. 5 no. 1:20-25 Ja-F '60. (MIRA 14:4)

1. Institut po izucheniyu poliomiyelita AMN SSSR, Moskva.
(POLIOMYELITIS) (ANTIGENS AND ANTIBODIES)

AVAKYAN, A.A.; AL'TSHTEYN, A.D.; KIRILLOVA, F.M.; BYKOVSKIY, A.F.

Means for the improvement of laboratory smallpox diagnosis. Vop. virus. 6 no.2:196-203 Mr-Ap '61. (MIRA 14:6)

1. Laboratoriya morfologii virusov i elektronnoy mikroskopii Instituta po izucheniyu poliomyelita AMN SSSR, Moskva.
(SMALLPOX)

AL'TSHTEYN, A.D.

Titration of the tick-borne encephalitis virus and virus-neutralizing antibodies in a culture of human embryonal fibroblasts by the poliomyelitis virus interference phenomenon. Vop.virus 7 no.5:529-534 S-O '62. (MIRA 15:11)

1. Institut poliomiyelita i virusnykh entsefalitov AMN SSSR, Moskva.
(ENCEPHALITIS VIRUSES) (POLIOMYELITIS VIRUSES)
(ANTIGENS AND ANTIBODIES)

AL'TSHTEYN, A.D.

Study of acute and chronic infection caused by ti k-borne encephalitis virus in tissue culture. Report No.1: Early stages of interaction of the virus of tick-borne encephalitis with the cell. Vop. virus no.6:707-712 N-D '63.

(MIRA 17:6)

1. Institut poliomielita i virusnykh entsefalitov AMN SSSR, Moskva.

AVAKYAN, A.A.; AL'TSHTEYN, A.D.; YAN ZHU SI [Yang Ju-hsi]

Study of acute and chronic infection caused by tick-borne encephalitis virus in tissue culture. Report No.2: Dynamics of accumulation and mechanism of spread of the virus of tick-borne encephalitis in tissue culture. Vop. virus. no.6: 713-719 N-D '63. (MIRA 17:6)

1. Institut poliomielita i virusnykh entsefalitov AMN SSSR, Moskva.

KRAV[illegible], A.P., [illegible], A.N.

Problems of oncological safety of live viral vaccines. Vop. virus. 9 no.5:527-533 S-O '64. (MIRA 18:6)

1. Kontrol'nyy institut meditsinskikh biologicheskikh preparatov imeni Tarnavicha, Moskva.

AVAKYAN, [illegible]

Study of acute and chronic infection caused by the virus of tick-borne encephalitis in tissue culture. Report No. 3. On the possible mechanism of chronic infection. Vop. virus. 9 no.6:575-580 N-D '64. (MIRA 18:6)

1. Institut poliomiyelita i virusnykh entsefalitov AMN SSSR, Moskva.

AL'TSHUL', A. (Chernovtsy)

Activity of news photographer cells. Sov.foto. 19 no.1:17-18 Ja '59. (MIRA 12:3)
(Photography, Journalistic)

AL'TSHUL', A.

Wall newspaper of the highway transport workers of Bukovina. Avt.-transp. 40 no.2:9-10 F '62. (MIRA 15:2)

1. Zamestitel' otvetstvennogo sekretarya redaktsii gazety "Radyans'ka Bukovina."
(Bukovina--Highway transport workers)
(Bukovina--Wall newspapers)

AL'TSHUL', A. D.

FA 32/49T41

USSR/Engineering
Hydraulics
Pressure Drop

Nov/Dec 48

"Making Use of Zhukovskiy's Problem to Determine Local Losses of Pressure in Pipes," A. D. Al'tshul', Cand Tech Sci, Mem, Soc of Water Supply and Sanitation Engineering, 3 pp

"Vest Inzhener i Tekhnik" No 6

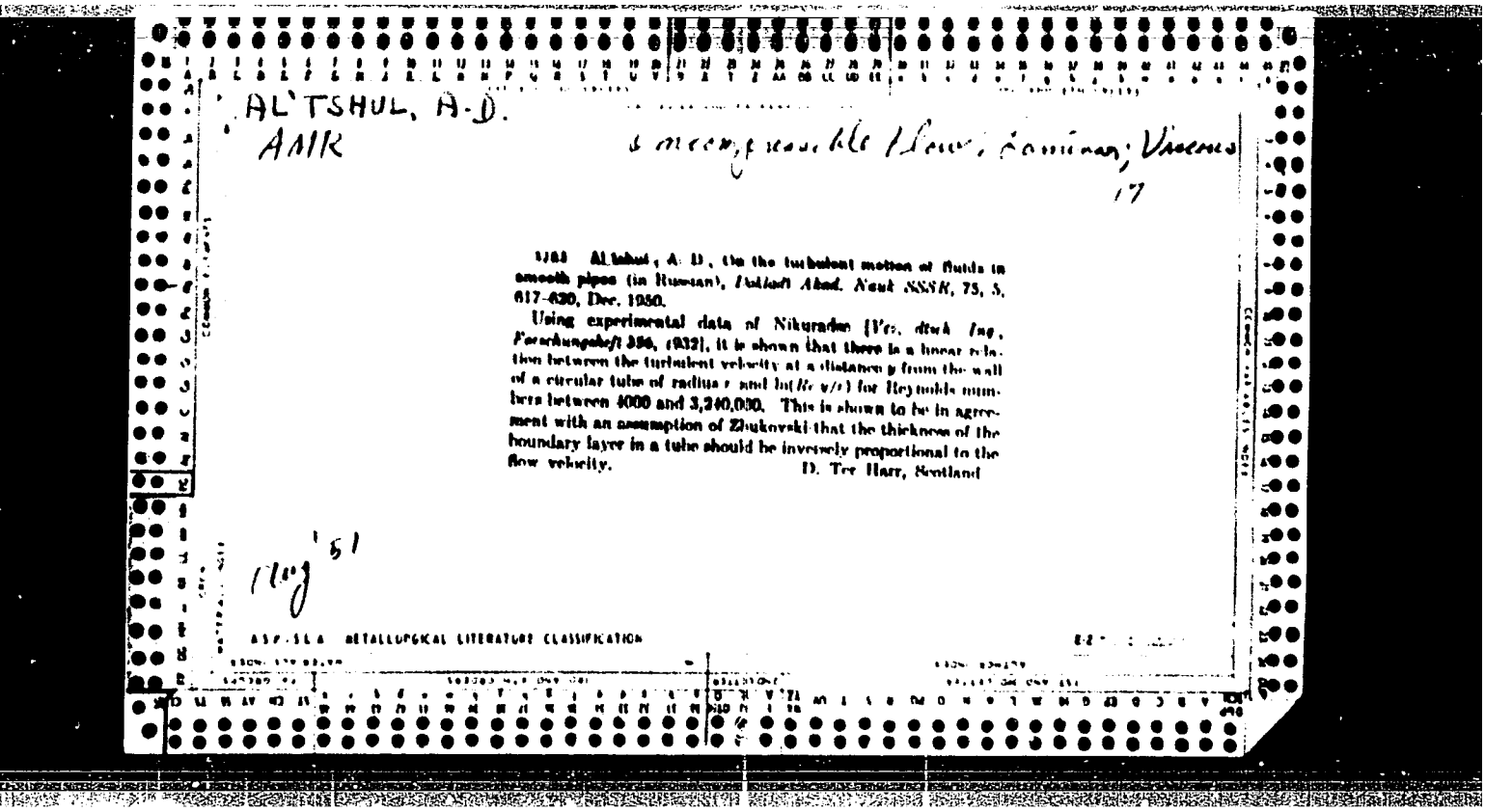
Explains method and applies it to calculation of loss of head due to diaphragms, sudden contractions, valves, etc.

32/49T41

AL'TSHVL', A.D.

22433. AL'TSHVL', A. D. Uvelichenie vepotpVleniya trubopevodov v potsesse ikh eksploatatsii. Gidrotekhn stroit-vo, 1949, No. 7, S, 6-9.

SO: LETOPIS' No. 30, 1949



AL'TSHUL, A.D.
AMR

incompressible flows, Dominion; Viscous
17

1783 Al'tshul', A. D., On the turbulent motion of fluids in smooth pipes (in Russian), *Izvest. Akad. Nauk SSSR*, 75, 5, 617-620, Dec. 1950.

Using experimental data of Nikuradse [*Ver. dtsch. Ing., Forschungsheft* 356, 1932], it is shown that there is a linear relation between the turbulent velocity at a distance y from the wall of a circular tube of radius r and $\ln(ky/\nu)$ for Reynolds numbers between 4000 and 3,240,000. This is shown to be in agreement with an assumption of Zhukovski that the thickness of the boundary layer in a tube should be inversely proportional to the flow velocity.
D. Ter Haar, Scotland

May '51

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

AL'TSHUL', A. D.

USSR/Engineering - Hydrodynamics Jan 51

"On Distribution of Velocities During Turbulent Flow of Liquid In Pipes," A. D. Al'tshul', Cand Tech Sci

"Gidrotekh Stroi" No 1, pp 33-35

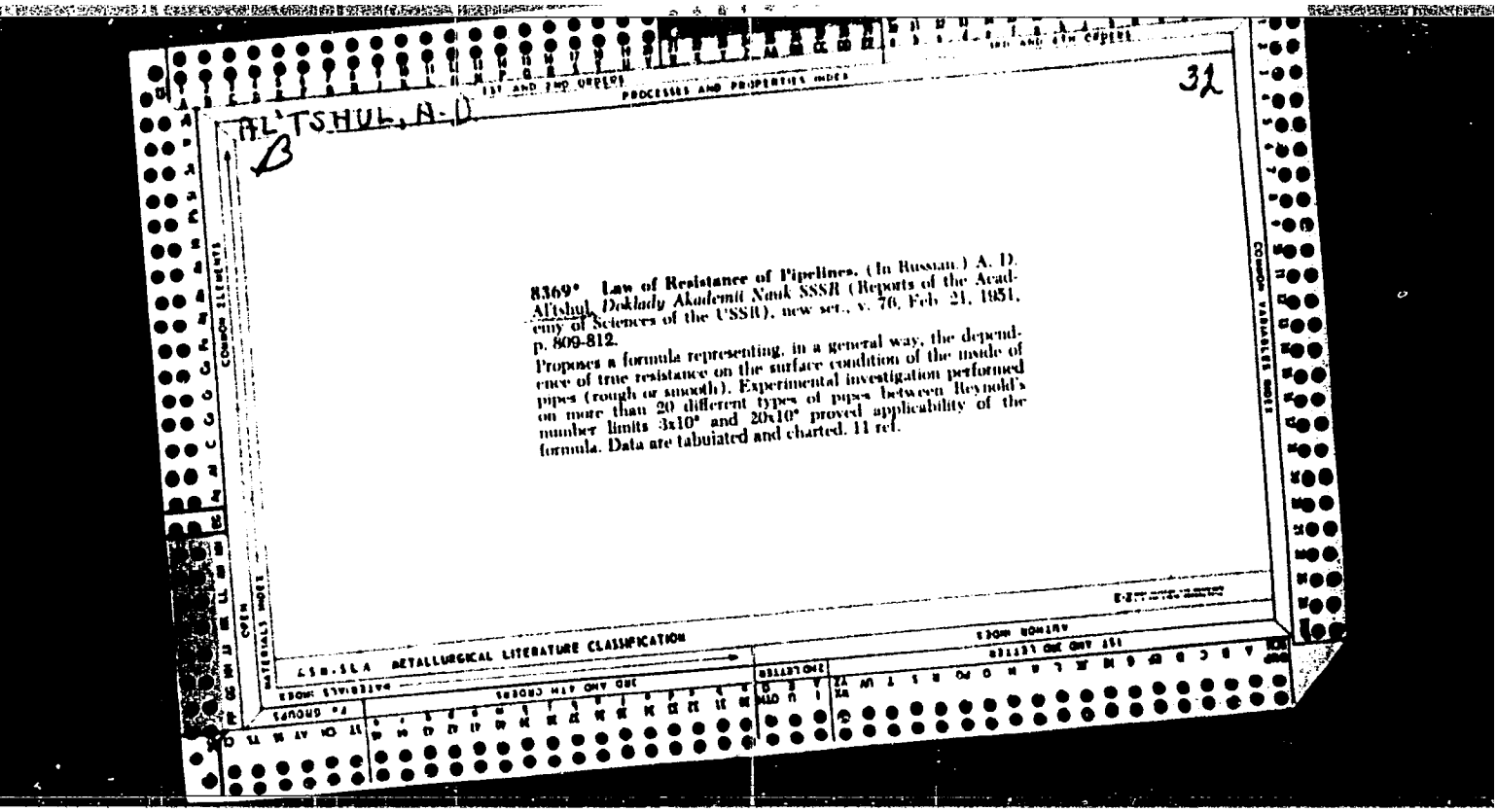
Criticizes Prandlt-Carman theory of turbulent motion as unsubstantiated, based on assumptions which contradict exptl data. Suggests new hypothesis on proportionality of length of stirring path to velocity under conditions of laminar motion. Deduces, from this hypothesis, a formula

199T39

USSR/Engineering - Hydrodynamics (Contd) Jan 51

for distribution of velocities of turbulent motion in round pipes, considering the formulas of Prandtl and Carman as individual cases justified only near pipe walls.

199T39



ALTSHUL, A.D.
B

31

8369* **Law of Resistance of Pipelines.** (In Russian.) A. D. Al'tshul. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Feb. 21, 1951, p. 809-812.

Proposes a formula representing, in a general way, the dependence of true resistance on the surface condition of the inside of pipes (rough or smooth). Experimental investigation performed on more than 20 different types of pipes between Reynold's number limits 3×10^3 and 20×10^6 proved applicability of the formula. Data are tabulated and charted. 11 ref.

/3563* **Relations Between Average and Maximum Rates During Turbulent Flow in Tubes.** (In Russian.) A. D. Al'tshul. *Doklady Akademii Nauk SSSR*, new ser., v. 79, July 21, 1951, p. 405-406.

A brief theoretical development of the above was made. Results are charted.

AL'TSHUL, A. D.

USSR/Meteorology - Administration of Hydrometeorological Service Jul 52

"Articles and Communications" "Meteorol i Gidrol" No 7, pp 23-43

O. G. Krichak, Cand Geog Sci, Moscow Cen Inst of Forecasting, "Genetic Classification of Clouds"; K. V. Fetisov, Alma-Ata, "Determination of Baric Tendency"; A. G. Bulavko and N. K. Sorochenkov, Minsk, "Rising Aerial Currents of Unusual Strength"; S. M. Koshcheyev, Novorossiysk, "Abrau-Dyurso" Agrometeorol Sta, "Thermal Regime in Protection of Citrus Plants From Frosts"; A. A. Bystrov, Sinelnikovo, Agrometeorol Sta, UGMS (Admin of Hydrometeorol Sv), Ukrainian SSR, "Problem of Testing Accelerated Methods for Drying Soil During Field Determination of Its Moisture"; V. N. Parashin and M. S. Salov, Moscow, Cen Inst of Forecasting, "Setting Up of Observations of Snow Cover in Regions of Field-Protecting Forest Belts"; A. D. Al'tshul, Cand Tech Sci, Moscow Constr Inst of Moscow Soviet, "Generalized Formula of Coefficient of Shezy for Open River Beds"; K. I. Soloveychik, Vladivostok, Far East Res Hydrometeorol Inst, "Simplified Schemes for Treatment of Daily Cycle of Observation of Currents by the Method of Harmonic Analysis in Accordance With the Method of Arctic Institute."

PA 230T83

AL'TSHUL', A.D.

AL'TSHUL', A.D.

The quadratic formula of resistance to flow in pipes. Trudy Stroi.inst. Mosgorispolkoma no.4:116-120 '53. (MLRA 8:3)
(Hydrodynamics)

ALTSHUL, A. D.

Dissertation: "Investigation of the Capacity of Hydraulic Systems." Dr Tech Sci, Moscow Inst. of Engineers of Water Economy imeni V. R. Vil'yams, 17 May 54. Vechernyaya Moskva, Moscow, 7 May 54.

SO: SUM 284, 26 Nov 1954

Al'tshul', A.D.

USSR/Processes and Equipment for Chemical Industries - Control and Measuring Devices. Automatic Regulation. K-2

Abs Jour : Ref Zhur - Khimiya, No 2, 1957, 6985

Author :
Inst :
Title : Determination of the Rate of Flow in Pipes by Measurement of Velocity at a Single Point.

Orig Pub : Izmerit. tekhnika, 1956, No 3, 40-42

Abstract : Consideration of problems relating to determination of coordinate of mean velocity point during movement of the medium through a pipe. Experiments carried out with tubes of different diameter and different condition of the wall, over the entire range of Re values that is of practical interest, have shown a constant position of the layer moving at mean velocity of the flow and situated at a distance of 0.233 r from the wall. It is noted that minimum diameter of pipes for which it is appropriate to

Card 1/2

USSR/Processes and Equipment for Chemical Industries - K-2
Control and Measuring Devices. Automatic Regulation.

Abs Jour : Ref Zhur - Khimiya, No 2, 1957, 6985

determine the rate of flow according to the method of velocity determination at a single point, is of about 10 mm. Even appreciable deviations in the position of the point, selected for the measurement of mean velocity, from the theoretical value, equal to 0.223 r, cause only very small changes in the determined magnitude of the rate of flow. For example, an error of about 10% in the position of the measuring instrument results in an error of about 1.5% in the determination of the rate of flow.

Card 2/2

AL'TSHUL', A.D. (Moskva)

Frictional resistance of plates of average surface roughness in turbulent boundary layers. Izv.AN SSSR Otd.tekh.nauk no.3:162-167 Mr '56. (MLRA 9:7)
(Boundary layer) (Frictional resistance (Hydrodynamics))

AL'TSHUL', A.D. (Moskva)

Basic principles of uniform flow of water through channels. Izv. AN SSSR.Otd.tekh.nauk no.5:85-94 My '56. (MLRA 9:8)
(Hydrodynamics)

AL'TSHUL', A. D.

PERIODICAL ABSTRACTS

Sub.: USSR/Engineering

AL'TSHUL', A. D. AID 4173 - P

O RASPREDELENII SKOROSTEY PRI TURBULENTNOM TECHENII ZHIDKOSTI V TEKHNICHESKIKH TRUBOPROVODAKH (On distribution of velocity in turbulent flow of liquid in conduits). Teploenergetika, no. 2, F 1956: 47-50.

A theoretical analysis simplifying the computation of flow velocities in conduits. Data obtained from a series of experiments with steel conduits are presented and a formula for the calculation of the friction ratio is given. Five diagrams.

AL'TSHUL', A.D.

Tubes having critical depth for measuring waste water flow.
Vod. i san. tekh. no.8:26-29 Ag '56. (MLRA 9:10)

(Flowmeters)

AUTHOR AL'TSHUL', A.D.

TITLE Flow of Liquids of High Viscosity by Variable Level and Theory of Englers Viscosimeter. PA - 2808
(Ob istechenii zhidkostey znachital'noy vyazkosti pri peremennom urovne i teorii viskozimetra englera - Russian)

PERIODICAL Zhurnal Tekhn. Fiz., 1957, Vol 27, Nr 4, pp 805-811, (U.S.S.R.)
Received 5/1957 Reviewed 6/1957

ABSTRACT The experiments show that the flow rate μ may vary considerably and that it does not only depend on the viscosity of the liquid and the diameter of the hole but also on the amount of effective pressure. In 1950 the relation $\mu = f(Re_H)$ was discovered which was later confirmed. On account of the investigations hitherto carried out it is shown that $\mu = \frac{Re_H}{25.2}$ i.e.that theoretical and experimental results agree, and that therefore this expression serves as a basic for further investigations. On the basis of this relation the out-flow time is then calculated, on which occasion the viscosity of the liquid during the outflow period is taken into account, the latter being directly proportional to kinematic viscosity. This is confirmed by experiment. Calculation of an example is carried out, and the out-flow time is shown to be shorter by more than half if viscosity is disregarded. The results of the investigation are applied to the theory of the viscosimeter of Engler for the sake of precision. The curve obtained here practically coincides with that of

Card 1/2

Flow of Liquids of High Viscosity by Variable Level and Theory of Englers Viscosimeter. PA - 2808

Ubellhode but it noticeably deviates from those which correspond to the formulae of Mises and Schiller, who disregarded pressire losses at the entrance into the socket.
(With 6 illustrations and 7 citations from Slav publications)

ASSOCIATION Institute for Municipal Building, Moscow, (Institut inzh. gorodskogo stroitel'stva)
PRESENTED BY
SUBMITTED 7.7.1956
AVAILABLE Library of Congress
Card 2/2

AL'TSHUL', A.D.; SMYSLOV, V.V., kandidat tekhnicheskikh nauk.

Head losses during uniform movement of a fluid in pressure pipes. Gidr. stroi. 26 no.5:47-48 My '57. (MLRA 10:6)
(Hydraulics)

AL'TSHUL', A.D., dots.

Hydraulic modeling of turbulent flows in pipelines. Nauch. dokl.vys.shkoly; stroi. no.2:271-274 '58. (MIRA 12:1)
(Pipelines--Models)

ALTSHUL', A.D., dots., kand.tekhn.nauk; KALITSUN, V.I., aspirant

Stage formula for the distribution of velocities in a pipe. Nauch. dokl.vys.shkoly; stroi. no.3:237-241 '58. (MIRA 12:7)

1. Rekomendovana kafedroy kanalizatsii i gidravliki Moskovskogo instituta inzhenerov gorodskogo stroitel'stva Mosgorispolkoma.
(Hydraulics)

AL'TSHUL', A.D., kand. tekhn. nauk; KALITSUN, V.I., insh.

Hydraulic resistance of welded joints with packing rings.
Stroi. truboprov. 3 no.8:4-7 Ag '58. (MIRA 11:11)
(Pipelines--Welding)

AL'TSHUL', A.D.; SVESHNIKOV, I.P.; LASKOV, Yu.M.

Generalized relations for hydraulic calculations of low and high pressure gas pipelines. Vod. i san. tekh. no.4:34-39 Ap '58.
(Gas, Natural—Pipelines) (MIRA 11:4)

AUTHOR: Al'tshul', A.D.

SOV/115-58-6-31/43

TITLE: A Theory of a Viscosimeter for the Determination of Relative Viscosity (K teorii viskozimetra dlya opredeleniya uslovnoy vyazkosti)

PERIODICAL: Izmeritel'naya tekhnika, 1958, Nr 6, pp 78-80 (USSR)

ABSTRACT: The viscosimeter of type VU (Engler) consists of a cylindrical vessel with a spherical bottom and a capillary tube (Figure 1). Viscosity in VU degrees (^{o}E) is determined by the relation of the discharge time of 200 cu cm of a tested liquid to the discharge time of the same quantity of water. The conversion of VU degrees to kinematic viscosity is difficult (Ref. 1). On the basis of References 3,4 and 5 a theory is proposed here which corresponds to the experimental data. The loss of pressure during discharge, the form of the viscosimeter, etc., are taken into account. The relation between VU degrees

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and the kinematic viscosity ν is $^{o}VU = 13.67\,\nu$.
There are 2 graphs, 1 diagram and 8 references, 6 of which are Soviet and 2 German.

AUTHOR: Al'tshul', A.D. (Moscow) SOV/24-58-6-24/35

TITLE: Basis of the Colebrook Equation (On the Speed and Resistance Profile in the Case of Turbulent Flow in Commercial Pipe Lines) (K obosnovaniyu formuly Kolebruka (O profile skorostey i soprotivleniy pri turbulentnom techenii v tekhnicheskikh truboprovodakh)

PERIODICAL: Izvestiya akademii nauk SSSR, otdeleniye tekhnicheskikh nauk, 1958, Nr 6, pp 122-125 (USSR)

ABSTRACT: Over a number of years the formula derived in 1939 by Colebrook (Ref 1) has been extensively used, which was obtained by interpolation between the well-known formulae of Prandtl and of Nikuradzu for hydraulically smooth and completely rough pipes respectively. It can be shown that the Colebrook formula is the result of a more general expression obtained by means of the semi-empirical theory of turbulence which takes into consideration the influence of viscosity of the liquid; it can also be shown that, without loss of accuracy, this formula can be substituted by simpler relations which can be solved directly for the appropriate unknown quantity. Let us consider the steady state uniform turbulent flow of a liquid in a pipe of

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circular cross-section with a diameter d and an average size of the roughnesses k ; the dynamic viscosity coefficient of the liquid will be μ and its density will be ρ . Applying the appropriate relation for the tangential stress in the case of turbulent flow along the wall, $\tau = (\mu + A)\, du/dy$, where $\tau \approx \tau_0$, we obtain

$$u_*^2 = (\nu + \psi)\frac{du}{dy} \qquad \left(u_* = \sqrt{\frac{\tau_0}{\rho}}\right) \qquad (2)$$

where ν and ψ are the kinematic coefficients of molecular and turbulent viscosity and u_* is the dynamic speed. From this the final simplified equation :

$$\frac{u}{u_*} = 7.8 - 5.75 \lg\left(\frac{2.5\nu}{u_* y} + \frac{k}{y}\right) \qquad (11)$$

is obtained, which can be used for calculating the basic relations of turbulent flow in pipelines. In contrast to the known Karman-Prandtl formulae, this formula takes into consideration simultaneously the influence of the viscosity of the liquid as well as the influence of the

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roughness of the tube walls. The formula Eq (10), and the here-quoted simplified formula, Eq (11), apply to the entire range of turbulent flows in pipes and include as particular cases, the known Karman-Prandtl formulae for hydraulically smooth and for completely rough surface tubes (Ref 5). It is pointed out that both formulae were obtained without applying the Prandtl scheme of sub-dividing the flow into a turbulent nucleus and a laminary sub-layer but considering the turbulent flow as one entity. The drived Eq (10), in the same way as the Colebrook formula (Eq 1), is unsuitable for practical calculations since the unknown coefficient of friction is in the left-hand as well as in the right-hand part of the formula; however, it is possible to present the formula in a simpler form, Eq (14). The calculations of the author of this paper as well as results of other authors, have shown that Eq (14) is practically coincident with the Colebrook formula, Eq (1), but is considerably more convenient for calculations since it

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provides the possibility of determining directly the magnitude of the friction coefficient. Calculations have shown that for the cases which are most likely to occur, the friction coefficient can be approximately expressed by Eq (17). The results of verification of the obtained formula for the friction coefficient, Eqs (14) and (17), have been published by the author as well as by other authors. The verifications were based on the experimental results obtained by MNI, VTI, VODGEO, TsAGI, MIIGS, Freeman, Zimmermann, etc. During recent and during older experiments the here-described semi-empirical theory of turbulent friction was also used for investigating other cases of flow; thereby for obtaining the resistance coefficient of the rough plate, the relation:

$$c_f = 0.034 \left(\frac{k}{x} + \frac{50}{N_{Re}} \right)^{0.2} \qquad (24)$$

was obtained; furthermore, for the Chezy coefficient in the case of turbulent flow in canals the expression:

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$$C = 20 \lg \frac{R}{\varepsilon + 0.004/\sqrt{Ri}} \qquad (25)$$

was obtained, where C is the Chezy coefficient in $\sqrt{m}/sec$, i the inclination of the canal, ε the derived linear roughness in mm, R hydraulic radius in mm. Both formulae were satisfactorily confirmed by experimental data. There is 1 graph and there are 16 references, (13 Soviet, 1 German and 1 English).

SUBMITTED: FEbruary 13, 1956

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SOV/137-59-7-15105

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 7, pp 131 - 132 (USSR)

AUTHORS: Al'tshul', A.D., and Kalitsun, V.I.

TITLE: Hydraulic Resistance of Welded Butts With Backing Rings

PERIODICAL: Stroyo truboprovodov, 1958, Nr 8, pp 4 - 7

ABSTRACT: Special investigations were carried out on an aerodynamic installation to determine the actual hydraulic resistance, caused by backing rings in pipes. Experimental tests were made with pipes of 99.7; 205 and 302.6 mm in diameter, without butts and with butts and backing rings. The tests proved that hydraulic resistance of pipes with butts increased considerably, whereby hydraulic butts appeared as local resistances. In the tests the reciprocal effect of butts on hydraulic resistance did not occur, already at a distance between the butts of l = 2 m. The effect of butts on the resistance increased with reduced pipe diameter and same l (distance between butts). The experimental dependence between the factor of local resistance of the butt (ζ_{st}) and the ω_1/ω_2 ratio was found, where ω_1/ω_2 is the ratio of the pipe cross sections area in portions contracted by the backing

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to that free of it. The relative increase of resistance, caused by butts with backing rings, was determined by the following formula: $K = 1 + \zeta_{st} \cdot d/\lambda l$ where $\lambda = 0.1 (k/d)^{\frac{1}{4}}$; K = 0.3 mm for pipes in operation; ζ_{st} was found according to the experimental curve $\zeta_{st} = f(\omega_1/\omega_2)$.

M.K.

AUTHOR: Al'tshul', A.D. (Cand.Tech.Sci.)

SOV/96-58-10-18/25

TITLE: The velocity profile and resistance during turbulent flow in industrial pipe-work. (O profile skorostey i soprotivlenii pri turbulentnom techenii v tekhnicheskikh truboprovodakh)

PERIODICAL: Teploenergetika, 1958, No.10. pp. 76-78

ABSTRACT: This article gives simplified semi-empirical expressions for the velocity profiles and frictional resistance in pipe-work. A previously published general formula for the velocity profile during turbulent flow in pipes is stated. Further expressions are then offered for the coefficient of friction, the velocity profile and the velocity distribution. Relationships are then established between the exponents in these functions. A convenient expression is then obtained for the approximate velocity distribution during turbulent flow in pipe-work. Published data in the recommended system of co-ordinates are plotted in Figs. 1 & 2, and it is shown that general agreement with the recommended formula is good. The recommended formula may also be useful in boundary-layer theory, where the use of logarithmic velocity distribution formulae complicates the calculation. Calculated and experimental data for tests on pipes of

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various materials and diameters are compared graphically in Fig.3; agreement is good. There are 3 figures and 8 Soviet references.

ASSOCIATION: The Moscow Institute of Urban Construction Engineers (Moskovskiy Institut Inzhenerov gorodskogo stroitel'stva)

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AL'TSHUL', A.D.

Generalized dimensionless number of resistance and its use in hydraulic calculations.[with summary in English]. Inzh.-fiz.zhur. no.12:79-82 '58. (MIRA 11:12)

1. Institut inzhenerov gorodskogo stroitel'stva, g. Moskva.
(Hydrodynamics)

SOV/24-59-1-21/35

AUTHOR: Al'tshul', A.D., (Moscow)

TITLE: Hydraulic Models for Uniform Turbulent Flow in Pipes and Channels (O gidravlicheskom modelirovanii ravnomernykh turbulentnykh potokov v truboprovodakh i kanalakh)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Energetika i Avtomatika, 1959, Nr 1, pp 121-123 (USSR)

ABSTRACT: Pipe Flow. The general nature of hydrodynamic forces involving the equality of Reynolds number is briefly discussed. If Newton's condition, given by Eq (1.1), holds then there must be geometrical similarity between model and full scale. Further, the Darcy friction coefficient λ must be identical and its relation to Reynolds number and to the relative surface roughness is briefly discussed. The semi-empirical theory of turbulence gives Eq (1.7) and leads to the final relation given by Eq (1.9), suffix M referring to the model and suffix H to the full scale. Eq (1.10) refers to the particular case of equal surface roughness and it is pointed out that the use of identical Reynolds numbers alone is valid only for very

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smooth surfaces.
Channel Flow. Eq (2.1) shows the equality of the Chezy coefficient, while Eq (2.2) indicates that the Froude number must be the same for both model and full scale. The bed slope i is brought into Eq (2.3) and the semi-empirical Eq (2.5) involves the roughness of the channel surface. Eq (2.6) and (2.7) show the relations which must hold between model and full scale.
The roughness values recommended are based on the work of Manning or Bazin; for small Reynolds numbers and special types of roughness the Chezy coefficient depends upon Reynolds number. There are 9 references of which 7 are Soviet and 2 Italian.

SUBMITTED: 20th May 1957

Card 2/2

[redacted] kand.tekhn.nauk, dots.; KALITSUN, V.I., inzh.

Investigating the hydraulic resistance of welded joints with lining rings. Izv.vys.ucheb.zav.; energ. 2 no.5:135-142 My '59. (MIRA 12:10)

1. Moskovskiy institut inzhenerov gorodskogo stroitel'stva.
(Pipe--Hydrodynamics)

AL'TSHUL', A.D., kand.tekhn.nauk dots.

Efficiency of a pipeline. Izv.vys.ucheb.zav.; energ. 2 no.6: 114-116 Je '59. (MIRA 13:2)

1. Moskovskiy institut inzhenerov gorodskogo stroitel'stva. Predstavlena kafedroy gidravliki i kanalizatsii.
(Pipelines)

AL'TSHUL', A.D., kand.tekhn.nauk; KALITSUN, V.I., inzh.; KISLYUK, F.I., doktor tekhn.nauk; KAMERSHTEYN, A.G., kand.tekhn.nauk

Hydraulic resistance of pipeline joints made by resistance butt welding on KTSA-1 equipment. Stroi.truboprov. 4 no.1:7-10 Ja '59. (MIRA 12:1)
(Pipelines--Welding) (Pipelines--Testing)

AL'TSHUL', A.D.

Selecting a formula for the hydraulic calculation of gas pipelines. Gaz.prom. 4 no.8:40-43 Ag '59. (MIRA 12:11)
(Gas, Natural--Pipelines)

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~~8 (6), 24 (7)~~ 10.4000 SOV/143-59-10-17/22

AUTHORS: Al'tshul', A.D., ~~Candidate~~ Doctor of Technical Sciences, Docent, and Borisov, S.N.

TITLE: The Calculation of Head Loss in a Turbulent Flow in Pipes by Nomographs With Tangential Contact

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Energetika, 1959, Nr 10, pp 98-102

ABSTRACT: For determining the loss of head in a turbulent flow in pipes the equation i = F (Q, d) is derived from the well-known Darcy-Weissbach formula in combination with C.F. Colebrook's interpolation formula [Ref 1]; where i - hydraulic gradient and Q - liquid flow. The solution of the aforementioned equation by nomographs is discussed. Usually, nomographs of adjusted points are plotted for solving problems of the loss of head during the motion of a liquid or gas in pipes. The equation i = F (Q, d) cannot be represented by nomographs of adjusted points and therefore nomographs with tangential contact had to be plotted. The solu-

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tion of the aforementioned equation is discussed as one of the practical applications of a general method described in S.N. Borisov's paper [Ref 4]. Another application of nomographs with tangential contact was discussed in D.G. Laptev's paper [Ref 5] for equation sets $f_2(v) = f_1(u) + f_3(w)$; $f_2(v) = f_1(u) + f_4(t)$. The equation $i = F(Q, d)$ is represented by a nomograph with tangential contact consisting of parallel logarithmic scales Q and i and arcs d, as shown in Fig 1. The plotting of the nomograph is described in detail. As an example, a nomograph with tangential contact is shown in Fig 3, which is used for calculating a low-pressure gas pipeline according to a generalized formula shown by D.A. Al'tshul' and others [Ref 8]. Parametric equations for the elements of the nomograph for $i = F(Q, d)$ are given. This paper was presented by the Kafedra gidravliki i kanalizatsii (Chair of Hydraulics

The Calculation of Head Loss in a Turbulent Flow in Pipes by Nomographs With Tangential Contact

and Sewerage). There are 3 diagrams and 8 references, 7 of which are Soviet and 1 English.

ASSOCIATION: Moskovskiy institut inzhenerov gorodskogo stroitel'stva (Moscow Institute of City Construction Engineers) (A.D. Al'tshul') Vychislitel'nyy tsentr AN SSSR (Computing Center of the AS USSR) (S.N. Borisov)

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ALTSHUL', A. D. (Moscow)

"On the Velocity Profile and on Hydraulic Pressure of Turbulent Flows In Commercial Pipes."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb 1960.

AL'TSHUL', A.D., KALITSUM, V.I.

Losses of pressure in reduction and diffusion pipe sections with gate valves. Gaz.prom. 5 no.2:35-39 F '60. (MIRA 13:6)
(Pipelines)