Effect of the composition ...

S/076/63/037/001/016/029
B144/B186

and adsorption, and a slow strong type in which the entire Pd surface is involved and the hydrogen penetrates into the metal in a single elementary act. An intermediate type is possible in (d), owing to an increased I^- adsorption in the presence of $(C_4H_9)_4N^+$. Tests with (a) + Hg, (b), (c), and (d), indicated that η depends not only on the removal of H_{ads} from the electrode surface but predominantly on the discharge of the H ion. The irreversibility of these two stages was evident from the fact that in (a) with $v_{pol} \simeq v_{dif} \simeq 1/2\ i_{pol}$, $\eta_{pol} \simeq 0.13$, while $\eta_{dif} \approx 0.06$. There are 7 figures and 1 table.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

SUBMITTED: September 25, 1961

Card 3/3

S/020/63/149/001/020/023
B101/B144

AUTHORS: Sabo, K., Bagotskaya, I. A.

TITLE: Study of the hydrogen overvoltage on solid and liquid gallium in sulfuric solution

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 149, no. 1, 1963, 139 - 141

TEXT: The overvoltage η of hydrogen was measured on solid gallium in 1 N H_2SO_4 and hydrogen atmosphere at 28°C, and on liquid gallium at 32°C using a platinum anode and a hydrogen reference electrode. Results: η_{sd} is by 25 - 30 mv less than η_{liq}; the gradient of the polarization curve is the same for liquid and solid gallium, i.e., 0.095 v. In the presence of traces of oxygen, solid Ga oxidizes; subsequently the level of the polarization curve is higher and the gradient is 0.130. On liquid Ga no oxidation was observed; presumably the oxide layer of liquid Ga is very rapidly reduced. The curves C versus η are identical for solid and liquid Ga, for oxidized solid Ga they are lower by about 60 - 66 %. With increasing reduction, η decreases and C increases. There are 4 figures.

Card 1/2

Study of the hydrogen ... S/020/63/149/001/020/023
B101/B144

ASSOCIATION: Institut elektrokhimii Akademii nauk SSSR (Institute of Electrochemistry of the Academy of Sciences USSR)

PRESENTED: December 6, 1962, by A. N. Frumkin, Academician

SUBMITTED: December 6, 1962

Card 2/2

SABO, K.; BAGOTSKAYA, I.A.

Hydrogen overvoltage on gallium as effected by the double electric layer and by pH of the solution. Dokl. AN SSSR 150 no.1:128-131 My '63. (MIRA 16:6)

1. Institut elektrokhimii AN SSSR. Predstavleno akademikom A.N. Frumkinym.

(Overvoltage) (Electrodes, Gallium)

KOVBA, L.D.; BAGOTSKAYA, I.A.

Behavior of atomic hydrogen on a pure iron surface. Zhur. fiz. khim. 38 no.1:217-219 Ja'64. (MIRA 17:2)

1. Institut elektrokhimii AN SSSR.

SABO, K.; BAGOTSKAYA, I.A.

Effect of pH and of the electrolyte concentration on hydrogen overvoltage at a gallium dropping electrode. Dokl. AN SSSR 156 no. 2:420-423 My '64. (MIRA 17:7)

1. Institut elektrokhimii AN SSSR.

FRUMKIN, A. N.; POLYANOVSKAYA, N. S.; GRIGOR'YEV, N.; BAGOTSKAYA, I. A.

"Electrocapillary phenomena on gallium."

report presented at 15th Mtg, Intl Comm of Electrochemical Thermodynamics & Kinetics, London & Cambridge, UK, 21-26 Sep 1964.

Inst of Electrochemistry, AS USSR.

L 16443-65 EWT(m)/EWP(t)/EWT(b) IJP(c) JD/JG
ACCESSION NR: AP[illegible] S/0020/64/157/004/0957/0960

AUTHOR: Frumkin, A.N.; [illegible]; Grigor'yev, N.B.; Bagotskaya, I.A.

TITLE: Investigation of the structure of the electric double layer on gallium by the method of measuring differential capacity

SOURCE: AN SSSR. Doklady, v. 157, no. 4, 1964, 957-960

TOPIC TAGS: electric double layer, gallium, differential capacity, gallium dissolution, charge density, water adsorption, dropping gallium electrode

ABSTRACT: The differential capacity on a dropping gallium electrode was measured at 30C in various Na_2SO_4, $NaClO_4$, LiCl, NaCl, KCl, CsCl, KI and KCNS solutions, 1N neutral salt solutions were used for measurements at potentials from -1.9 to -1.2 volts. For measurements from -1.3 to -1.1 volts the solutions were acidified to 0.01N, and for measurements from -1.15 volts to positive voltages they were acidified to 0.1N; except for KI and KCNS when HCl was used, the acid anions were the same as those of the salt; the total electrolyte concentrations were 1N. The electrode was prepared according to the description by A.N. Frumkin and A.V. Gorodetskaya (Zs. Phys. Chem.,

Card 1/5

L 16443-65
ACCESSION NR: AP4043555

136, 215 (1928)). At negative potentials corresponding to areas of cation adsorption, the differential capacity C increased in going from Li^+ to Cs^+. In solutions containing the same cations but different anions the differential capacity curves almost coincided (fig. 1); C increased sharply at potentials corresponding to the start of anion adsorption in the [illegible] order [illegible] > [illegible] > [illegible] > [illegible] > [illegible] > [illegible]. The capacity was independent of frequency [illegible] to 50 kilocycles/sec.) and was assumed to be the capacity of the electric double layer. The absence of dispersion of C indicated the process of Ga dissolution, which takes place at even more positive potentials, is irreversible. The relationship between the charge density ε and the potential φ for Ga and Hg in 1N solutions was compared (fig. 2). In the vicinity of the zero charge in 1N Na_2SO_4 $C_{Ga} = 135$ and $C_{Hg} = 29.5$ microfarad/cm^2. Further from the zero charge the rate increase in ε for Ga was reduced; it approached ε for Hg. Thus an electric double layer of the same state as on Hg was formed on Ga, only at a more positive potential with repsect to the

Card 2/5

L 16445-65
ACCESSION NR: AP4043555

zero charge point. The increase in C on Ga at less negative values was attributed not to the adsorption of O or OH on the Ga surface, nor to an increase of Ga ions in the boundary layers, but to the adsorption [illegible] the water dipole being oriented with its negative end toward the Ga proportionally to the shift in Ga potential. "I thank B.B. Damaskin for participation in evaluating the obtained results." "Gallium was purified by the Institute of rare metals method. We take the opportunity to thank AN SSSR assoc. member N.P. Sazhin for assistance in obtaining it." Orig. art. has: 3 figures.

ASSOCIATION: None

SUBMITTED: 31Mar64 ENCL: 02

SUB CODE: GC NR REF SOV: 006 OTHER: 005

Cord 3/5

L [illegible]
ACCESSION NR: AP[illegible]

ENCL: 01

0

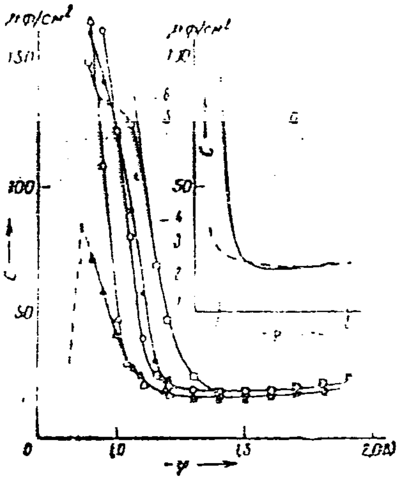


Figure 1

Curves of the differential capacity of gallium in 1N solutions: 1--NaClO$_4$, 2--Na$_2$SO$_4$, 3--KCl, 4--KBr, 5--KI, 6--KCNS. Fig. 1a: dotted line --D. C. Grahame's data (Tr. IV. soveshch. po elektrokhimii, M., 1959, str. 27) for 0.1N KCl; solid line--our data.

Card 4/5

L [illegible]-65

ACCESSION NR: [illegible]43555

ENCL: 02

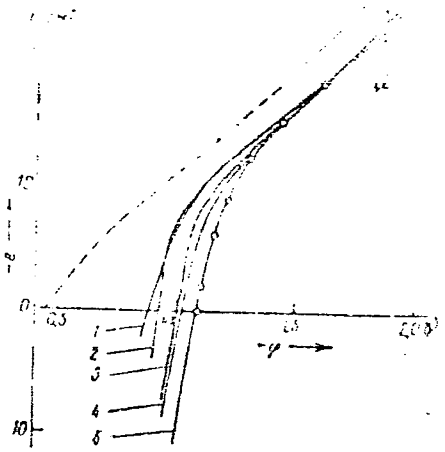


Figure 2

Relationship between charge [illegible]

[illegible]

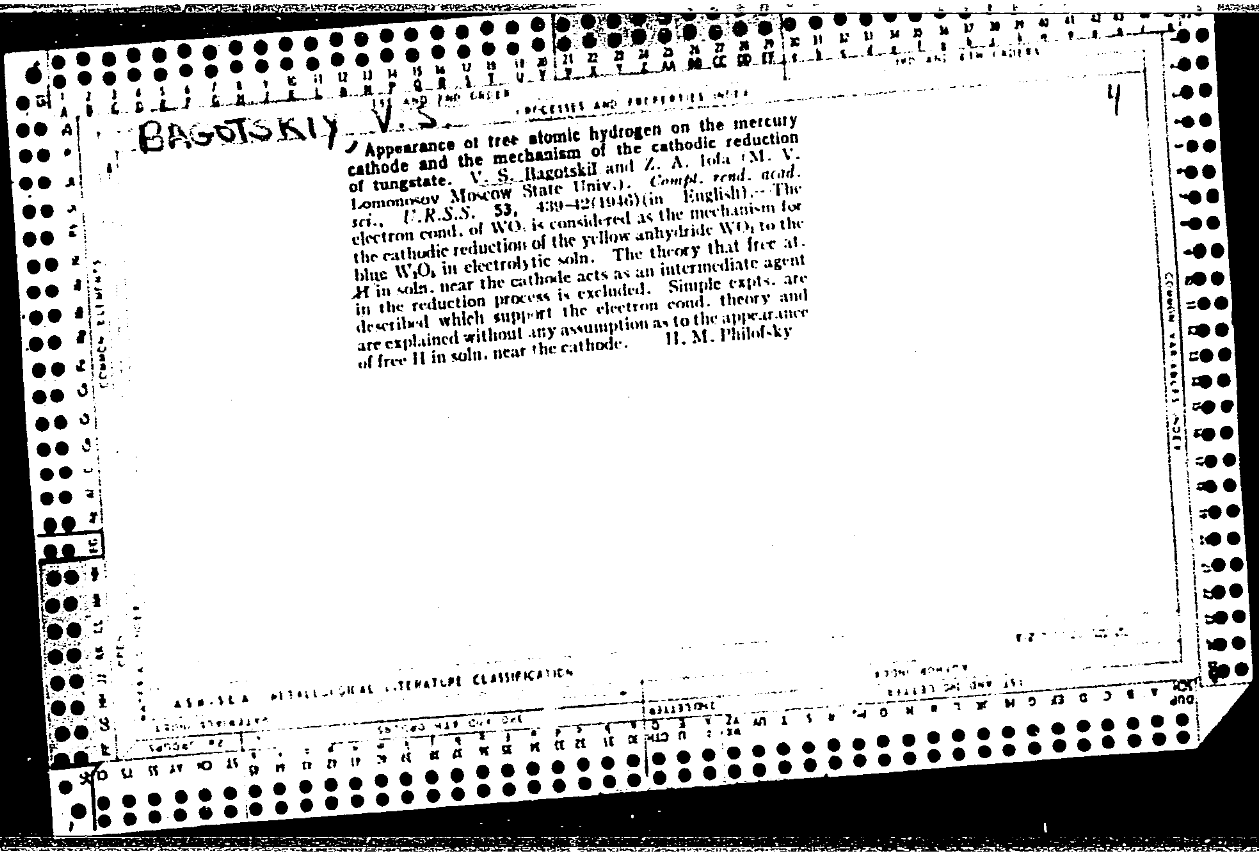
Curve 5--KCNS. Dotted line--[illegible] curve for mercury on 1N Na_2SO_4.

Card: 5/5

SARC, K.; BAGOTSKAYA, I.A.; GRIGOR'YEV, N.B.

Behavior of a gallium dropping electrode in alkaline solutions in the hydrogen overvoltage region. Zhur.fiz.khim. 38 no.8:2059-2061 Ag '64.
(MIRA 18:1)

1. Institut elektrokhimii AN SSSR.



BAGOTSKIY, V.S.

4

1ST AND 2ND ORDER

PROCESSES AND PROPERTIES INDEX

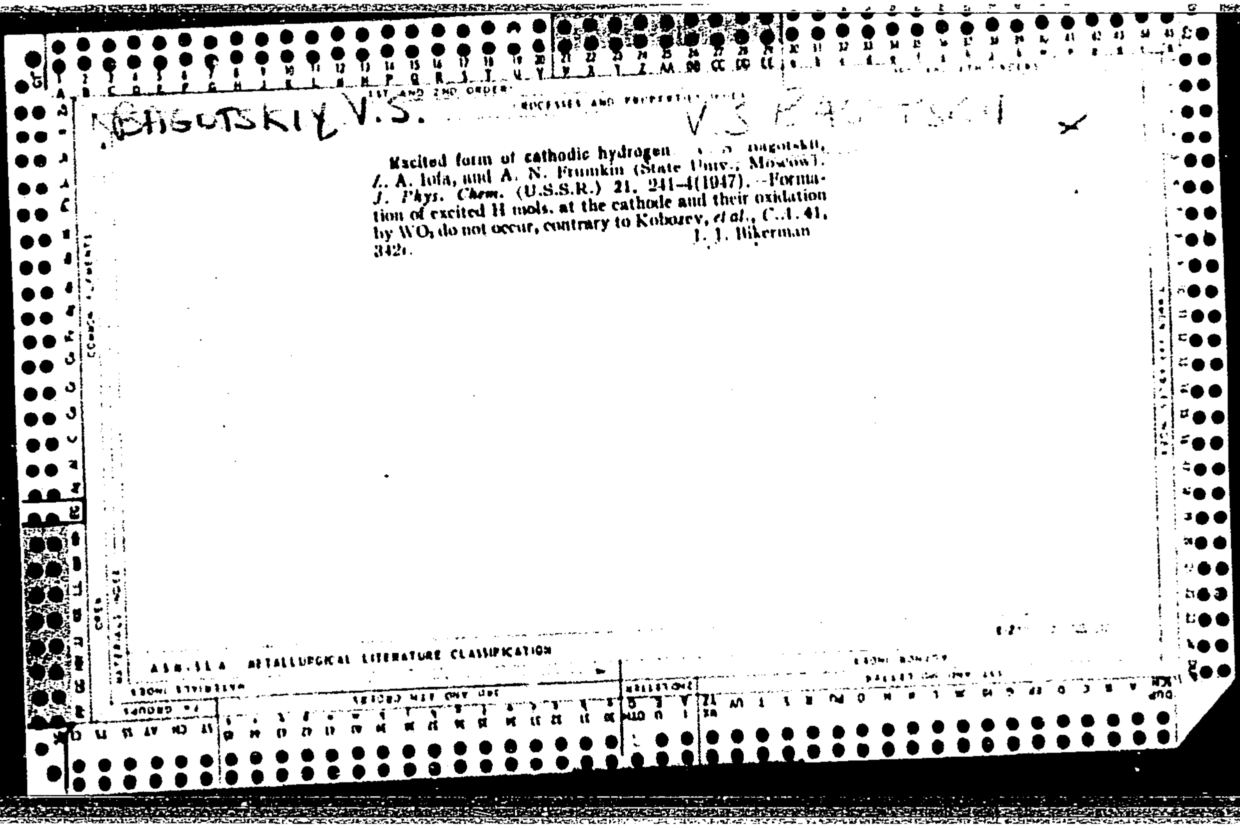
Appearance of free atomic hydrogen on the mercury cathode and the mechanism of the cathodic reduction of tungstate. V. S. Bagotskii and Z. A. Iofa (M. V. Lomonosov Moscow State Univ.). *Compt. rend. acad. sci., U.R.S.S.* **53**, 439-42(1946)(in English).—The electron cond. of WO_3 is considered as the mechanism for the cathodic reduction of the yellow anhydride WO_3 to the blue W_2O_5 in electrolytic soln. The theory that free at. H in soln. near the cathode acts as an intermediate agent in the reduction process is excluded. Simple expts. are described which support the electron cond. theory and are explained without any assumption as to the appearance of free H in soln. near the cathode. H. M. Philofsky

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

BAGOTSKIY, V. S. Cand. Chem. Sci.

Dissertation: "The Kinetics of Hydrogen Evolution on Mercury." Moscow Order of Lenin State U imeni M. V. Lomonosov, 18 Jun 47.

SO: Vechernyaya Moskva, Jun, 1947 (Project #17836)



BAGOTSKIY V.S.

1ST AND 2ND ORDER

PROCESSES AND PROPERTIES INDEX

V.S. BAG[illegible]

Excited form of cathodic hydrogen. V. S. Bagotskii, L. A. Iofa, and A. N. Frumkin (State Univ., Moscow). *J. Phys. Chem.* (U.S.S.R.) 21, 241-4(1947).—Formation of excited H mols. at the cathode and their oxidation by WO_3 do not occur, contrary to Kobozev, *et al.*, C.A. 41, 342i. I. J. Bikerman

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA BAGOTSKIY, V. S.

4

The dependence of the overvoltage of hydrogen at the mercury electrode upon the composition of the solution. V. S. Bagotskii (Lomonosov Univ., Moscow). *Doklady Akad. Nauk S.S.S.R.* **58**, 1387-90(1947); *Chem. Zentr.* (Russian Zone Ed.) **1949**, I, 662.—The equation of Frumkin (cf. *C.A.* **27**, 2885) has been tested by Levina and Zarinskii (cf. *C.A.* **31**, 8388^7; **32**, 4085^9) on $LaCl_3$. B. applied it to KCl solns. contg. HCl and found it to be valid in the following form for concns. up to 0.33 equiv./l.: $\eta = 1.400 + (2RT/F)(\ln i) + \psi_1 - (RT/F)(\ln i)[H^+]$ V, in which η is the overvoltage, i the c.d., and ψ_1 the potential of the diffuse portion of the elec. double layer. M. G. Moore

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

BAGOTSKIY, V.S.

4

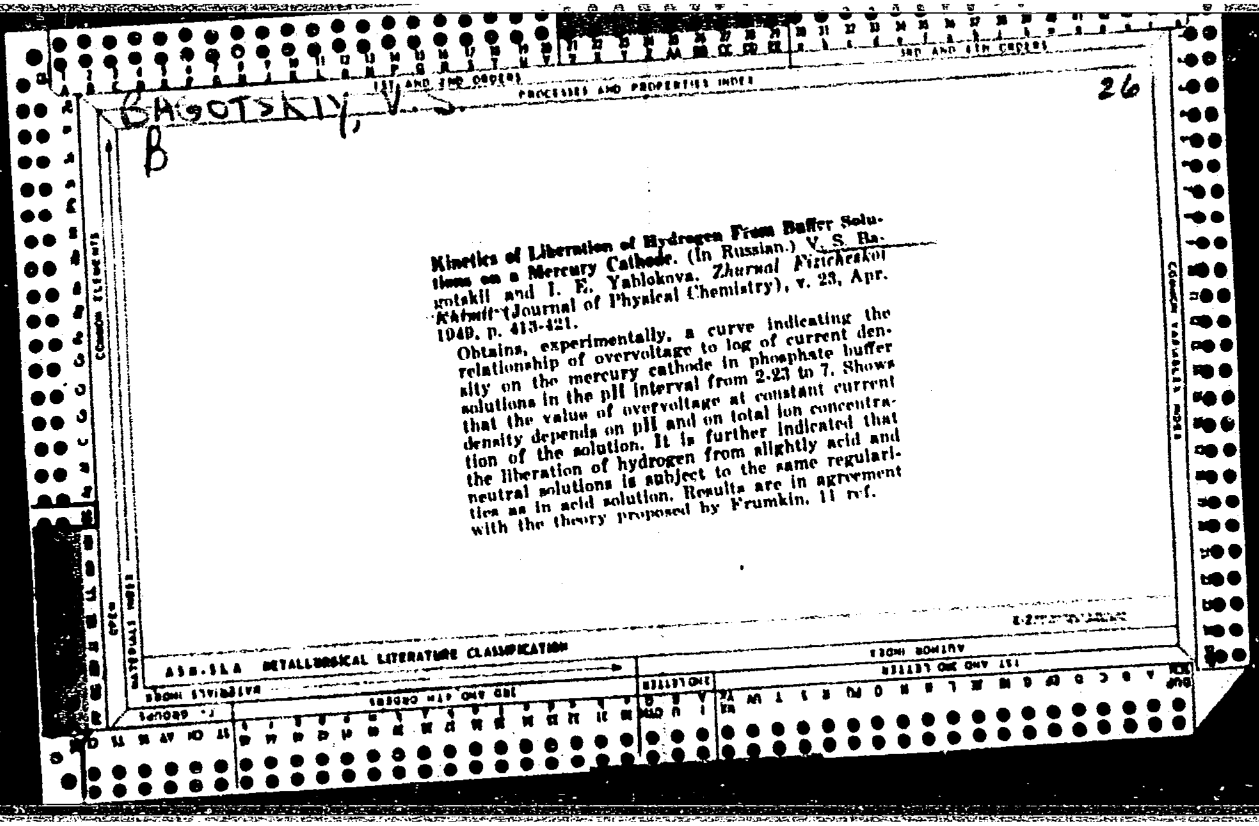
Theory of concentration polarization at a dropping mercury electrode. I. N. Meiman. *Zhur. Fiz. Khim.* (J. Phys. Chem.) 22, 1454-65(1948).—Ilkovič's equation (*C.A.* 29, 2850^9) is valid only if the ionic concn. C next to the drop is independent of the d.c., i. If $C = \beta i$ (β = const.), the equation $I = I_0(7\sqrt{\mu}/6)(\mu^{4/3}/\mu_0^{1/3})\theta(\mu)$ results. I_0 is the av. limiting diffusion current (given by the equation of Ilkovič), μ^2 is $3t/7n^2F^2D\beta^2$, n being ionic charge, F Faraday no., D diffusion coeff., and t time, μ_0 is $3\tau/7n^2F^2D\beta^2$, τ being the life time of a drop, and $\theta(\mu)$ is a function decreasing from 1 at $\mu = 0$ to, e.g., 0.0543 at μ = 10. II. **Curves of the concentration polarization of hydrogen.** V. S. Bagotskii. *Ibid.* 1466-76.—The above equation was confirmed by measuring the current I due to discharge of H^+ as function of the polarization voltage. The soln. was 0.33 N KCl + 0.48 × 10^{-4} or 3.9 × 10^{-4} N HCl and was satd. with H_2. The I was found by subtracting the current in 0.33 N KCl (which is spent for charging the double layer on the growing Hg drop) from that in the solns. contg. HCl. The value of β was calcd. from expts. on stationary Hg cathode in dil. HCl + dil. KCl, and the value of D from Ilkovič's equation; in 4.2 × 10^{-4} N HCl + 0.33 N KCl, D of H^+ was 7.9 × 10^{-5} sq. cm./sec. The τ was lowered by cathodic polarization from, e.g. 5 sec. at −0.5 v. to less than 3 sec. at −1.5 v. Contrary to Heyrovsky (*C.A.* 32, 54^8) there is no essential difference between the kinetics of H discharge at a stationary and that of a dropping electrode. J. J. B.

COMMON ELEMENTS

MATERIALS INDEX

OPEN

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION



BAGOTSKIY, V.S.

B

26

Kinetics of Liberation of Hydrogen From Buffer Solutions on a Mercury Cathode. (In Russian.) V. S. Bagotskii and I. E. Yablokova. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Apr. 1949, p. 413-421.

Obtains, experimentally, a curve indicating the relationship of overvoltage to log of current density on the mercury cathode in phosphate buffer solutions in the pH interval from 2.23 to 7. Shows that the value of overvoltage at constant current density depends on pH and on total ion concentration of the solution. It is further indicated that the liberation of hydrogen from slightly acid and neutral solutions is subject to the same regularities as in acid solution. Results are in agreement with the theory proposed by Frumkin. 11 ref.

BAGOTSKIY, V. S.

Reversible oxygen electrode on mercury in alkaline solutions and the mechanism for the cathode reduction of oxygen. V. S. Bagotskii and D. L. Motov (M. V. Lomonosov State Univ., Moscow). *Doklady Akad. Nauk S.S.S.R.* 71, 501–4(1950).—The cathode reduction of O was studied polarographically in acidic, basic, and neutral solns. to det. its kinetic characteristics. The dropping electrode was polarized with respect to the auxiliary calomel or mercuric oxide (in basic soln.) electrode. The kinetic mixture and the mechanism of this reaction were different in acidic and in basic solns. The data indicated that the reduction of O was reversible in alk. soln. A quant. expression was developed.

I. Rovtar Leach

SOCHEVANOV, V.G.; BAGOTSKIY, V.S., red.; BOGATIN, G.A., red.;
BABOCHKIN, S.N., tekhn. red.

[Galvanic cells] Gal'vanicheskie elementy. Moskva, Gosenergoizdat, 1951. 271 p. (MIRA 16:7)
(Electric batteries)

FRUMKIN, Aleksandr Naumovich, 1895-, redaktor; BAGOTSKIY, V.S.; IOFA, Z.A.; KABANOV, B.N.

[Kinetic energy in electrode processes] Kinetika elektrodnykh protsessov. [Pod red. A.N.Frumkina. Moskva] Izd-vo Moskovskogo universiteta, 1952. 318 p. (MLRA 6:7)
(Electrochemistry)

BAGOTSKIY, V. S. - FRUMKIN., A. N. - IOFA, Z. A.

Overvoltage

N. I. Kobozev's adsorption theory of overvoltage. Zhur. fiz. khim. 26 no. 12 1952

9. Monthly List of Russian Accessions, Library of Congress, May 1953. Unclassified.

BAGOTSKIY V. S.

Equilibrium potential of the system oxygen hydrogen peroxide. I. I. [illegible]

[illegible]

BAGOTSKIY, V.S.

8.

reduction of oxygen on a mercury electrode. V. S. Bagotskii and I. E. Yablokova (M. V. Lomonosov State Univ., Moscow). *Trudy Soveshchaniya Elektrokhim., Akad. Nauk S.S.S.R., Otdel. Khim. Nauk* 1950, 57-70(1953).—The slow discharge theory of Frumkin for H reduction (*C.A.* 44, 8742f) is reviewed. The effect of exptl. variables upon the

BAGOTSKIY, V. S.

USSR/Chemistry - Hydrogen Peroxide; Polarography — Nov 53

"Mechanism of Electrochemical Reduction of Oxygen and Hydrogen Peroxide at a Mercury Electrode,"
①V. S. Bagotskiy, ②I. Ye. Yablokova, ③Moscow State U

Zhur Fiz Khim, Vol 27, No 11, pp 1663-1675

Investigated the kinetics of polarographic reduction of H_2O_2 and O_2 (alone or in the presence of H_2O_2) in solns of different pH. Found that the kinetics of reduction of O_2 on acidic and alkaline solns are different, but formulated a single mechanism which explains the behavior of O_2 in both ranges. Demonstrated that all kinetic phenomena observed in the reduction of H_2O_2 can be explained by the assumption that only molecules and not ions of H_2O_2 are reduced.

274T20

DAGOTSKIY, V.D.

[illegible]

Bagotskiy.V.S

AUTHORS: Shteynberg, G.V. (Engineer) and Bagotskiy V.S. (Cand. Chem.Sci.)

110-7-10/30

TITLE: Some special features of the operation of the positive electrode in a chromic-acid cell. (Nekotorye osobennosti raboty polozhitel'nogo elektroda elementa s khromovoy kislotoy).

PERIODICAL: "Vestnik Elektropromyshlennosti" (Journal of the Electrical Industry, Vol.28, No.7, 1957, pp.34-38 (USSR).

ABSTRACT: Galvanic cells based on the electro-chemical system $C/H_2Cr_2O_7$, H_2SO_4/Zn are still used because of their comparatively high power, their ability to work at low temperatures and the possibility they afford of compact construction. During the discharge of a chromic acid cell some phenomena are observed, the nature of which are not yet clear. For instance, under some conditions of discharge the cell voltage drops in jumps of 0.2 - 0.3 volts after which the element continues to operate at normal capacity. Under other conditions of discharge the cell voltage suddenly falls almost to zero despite the presence of a considerable reserve of unused active substances. Both these phenomena are associated with step-wise change in the potential of the carbon electrode. The effect of

Card 1/5

Some special features of the operation of the positive electrode in a chromic-acid cell. (Cont.) 110-7-10/30

step-wise change in the potential of the carbon electrode by 0.1-0.3 volts in the negative direction has been called the "partial passivation" of the carbon, and the effect of step-wise reduction of potential by one volt or more is called "total passivation" of the carbon. It is well known that cathodic polarisation of metals in chromic acid occurring at some definite current density causes a sharp potential jump in the negative direction after which separation of hydrogen commences. A similar potential jump has also been observed on the carbon electrode. This effect which is apparently analogous with "total passivation" of the carbon is usually explained as being due to the formation on the cathode of a screening diaphragm of trivalent compounds.

Carbon materials may differ widely in physical-chemical properties and it was therefore of interest to find out whether partial passivation is a general property of carbon electrodes or is associated with special features of some particular types of carbon. The investigations were made on 9 types of carbon of different physical-chemical properties, see Table 1. The investigations were

Card 2/5

made by taking polarisation curves, and a number of physical-chemical properties of the carbon were also determined.

Fig.1 shows curves of the relationship between the potential (measured against a normal hydrogen-electrode) and the current density, and Fig.2 shows curves of the potential as a function of time for different types of carbon. It is seen that for all types of carbon, at current densities of 180-200 mA/cm^2 there is a sharp jump of potential of 1 to 1.2 V in the negative direction (total passivation). Separation of hydrogen commences after the jump. At lower current densities of 5-60 mA/cm^2 three of the nine types of carbon investigated displayed step-wise potential displacement of 0.1-0.3 V (partial passivation). The same three types of carbon display step-wise potential reduction during polarisation at a constant current density of 5-40 mA/cm^2.

Fig.3 shows polarisation curves taken on a rotating carbon electrode at different speeds of rotation. As the speed is increased from 0 to 1200 rpm the current density at which

Some special features of the operation of the positive electrode in a chromic-acid cell. (Cont.) 110-7-10/30

total passivation commences increases threefold.

In order to study the influence of the solution composition, potential/time curves were determined with constant current density on the cathode in solutions with different concentrations of chromic and sulphuric acids, trivalent chromium and salt. Fig.4 shows curves taken on solutions with different concentrations of chromic acid with constant total solution acidity. On the basis of the experimental data that was obtained it may be concluded that the effect of total passivation of carbon is caused by definite concentration changes in the layer of solution adjacent to the electrode. The removal of these concentration changes also removes total passivation of the carbon which demonstrates the absence of an insoluble diaphragm of chromium salts at the carbon surface under conditions of total passivation.

The effect of partial passivation is not associated with changes in concentration near the electrode. Partial passivation is a general property not only of carbon electrodes, but of inert metal electrodes in general

Card 4/5

Some special features of the operation of the positive electrode in a chromic-acid cell. (Cont.) 110-7-10/30

(platinum and gold) in chromic acid. Partial passivation depends on the nature of the carbon, the composition of the solution and preliminary polarisation of the electrode. Change in the composition of the solution or preliminary treatment of the carbon can vary both the electrode potential before and after partial passivation, and the time to the commencement of partial passivation. Data on the influence of mixing, the composition of the solution and preliminary treatment of the carbon on partial passivation show that this effect is not associated with the deposition of chromium compounds of low solubility. Partial passivation is caused by change in the state of surface of the carbon under the influence of the process of reduction of chromic acid.

Card 5/5

There are 4 figures, 9 references, 1 of which is Slavic.

ASSOCIATION: NIEEI.

AVAILABLE:

BAGOTSKIY, V. S.

AUTHORS: Shteynberg, G. V., Bagotskiy, V.S., 20-3-41/59

TITLE: Certain Features in the Cathodic Reduction of Chromic Acid on a Carbon Electrode (Nekotoryye osobennosti katodnogo vosstanovleniya khromovoy kisloty na ugol'nom elektrode)

PERIODICAL: Doklady Akademii nauk SSSR, 1957, Vol. 115, Nr 3, pp. 568-571, (USSR)

ABSTRACT: In the case of cathodic polarization of a carbon - or any other inert electrode - in a solution of chromic acid a sudden check of the reaction of reduction of the chromic acid anion $Cr_2O_7^{--} + 14 H^+ + 6e \longrightarrow 2Cr^{+++} + 7H_2O$ is often observed. This check is accompanied by a instantaneous shift of the potential to the negative, which is followed by a reaction of hydrogen separation (a complete inactivation of the electrode). Apart from this phenomenon, in some instances a small shift of a few tenths of a Volt have been observed in the case of densities, where the potential of hydrogen separation has not been reached. The complete inactivation of inert electrodes in solutions of chromic acid was the object of investigations of several authors. In the paper under consideration the influence of a series of factors (composition of the solution, of stirring and of the treatment of the electrode) on the partial inactivation of the carbon electrode was studied. From the figures it can be seen, that the potential of the upper and lower niveau of the curve, corresponding to the active and partially inactive

Card 1/3

20-3-41/59

Certain Features in the Cathodic Reduction of Chromic Acid on a Carbon Electrode.

condition of the electrode, as well as the duration of the active state are dependent on the composition of the solution. The influence of identical components of the solution on the potential of the active state and on that of the partially inactivated electrode is differing. In particular the effect of an addition of an indifferent salt to a highly concentrated solution is falling into the eyes. The salt instantaneously shifts the potential of the partially inactivated electrode to the negative, whereas the potential of the active electrode is very little affected. An introduction of three-valent chromium, even in high concentration has practically no influence on the partial inactivation. An addition of chromiumsulfate in high concentrations, however, shifts the potential of a partially inactivated electrode. This is apparently not connected with the presence of three-valent chromium. A similar shift also takes place in highly concentrated solutions of sulphuric acid and chromium acid. These effects detailed here are to be considered as a check of the electrochemical reaction and not as a change in their nature. The experimantal results obtained here contradict the conception, that the check is produced by the formation of a diaphragm consisting of compounds with small solubility of the three-valent chromium. It is probable, that the partial in-

Card 2/3

Certain Features in the Cathodic Reduction of Chromic Acid on a Carbon Electrode. 20-3-41/59

activation is connected with a modification of the state of the oxyde layers on the surface of the electrode. Several facts speak in favour of the concept, that some forms of the surface oxydes correspond to the active condition of the electrode. They vanish during the cathodic polarisation and reappear during the soft anodic polarization of the carbon. The phenomenon of partial inactivation of the carbon-electrode can be explained as a modification of the electrochemical mechamism of the reaction of ion-reduction of the 6-valent chromium into three valent chromium. This transition takes place because of the modification of the oxyde layers on the electrode surface. Phenomena of the same qualitative character were observed on inert platimum and gold electrodes. There are three figures.

ASSOCIATION: State Union Scientific Research **Carbon Electrode Institute.** (Gosudarstvennyy soyuznyy nauchno-issledovatel'skiy elemento-elektrougol'nyy institut)

PRESENTED BY: Frumkin, A. N., **Academician, Feb. 11, 1957**

SUBMITTED: February 5, 1957

AVAILABLE: Library of Congress

Card 3/3

BAGOTSKIY, V.S., kand.khim.nauk

Progress in the field of electric power production from chemical action. Khim. nauka i prom. 3 no.4:448-454 '58. (MIRA 11:10)
(Electric power production from chemical action)

BAGOTSKIY, V. S.

5(4) PHASE I BOOK EXPLOITATION SOV/2216

Soveshchaniye po elektrokhimii. 4th, Moscow, 1956.

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

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khimicheskikh nauk.

Editorial Board: A.N. Frumkin (Resp. Ed.) Academician, O.A. Yesin, Professor; S.I. Zhdanov (Resp. Secretary), B.N. Kabanov, Professor, S.I. Zhdanov (Resp. Secretary); B.N. Kabanov, Professor; Ya. M. Kolotyrkin, Doctor of Chemical Sciences; V.V. Losev, P.D. Lukovtsev, Professor; Z.A. Solov'yeva; V.V. Stender, Professor; and G.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 Chemical Sciences and the Institute of Physical Chemistry, Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories and galvanic processes in metal electrodeposition and industrial electrolysis. Abridged discussions are given at the end of each division. The majority of reports not included here have been published in periodical literature. No personalities are mentioned. References are given at the end of most of the articles.

Zaretskiy, G.A., I.G. Zharnitskiy (Deceased), and I.A. Bogdanova. Anodic Behavior of Manganese and Its Alloys 723

Razina, N.F. (Dnepropetrovskiy khimiko-tekhnologicheskiy institut imeni F.E. Dzerzhinskogo; Institut khimii AN KazSSR - Dnepropetrovsk Institute of Chemical Technology imeni F. E. Dzerzhinskiy; Institute of Chemistry, Academy of Sciences, KazSSR). Electrode Processes at a Lead Anode and Its Corrosion During the Electrolysis of Sulfuric Acid Solutions 729

Discussion [F.P. Tsyb and contributing authors] 732

PART IX. CHEMICAL SOURCES OF CURRENT 735

Bagotskiy, V.S. Electrode Processes in New Electrochemical

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Sources of Current 737

Kasparov, Ya. B., E. G. Yampol'skaya, and B. N. Kabanov. Role of Barium Sulfate in the Negative Plate of a Lead Battery 744

Koval', I.I., and V. I. Barilenko. Mechanism of the Loss of Efficiency in the Active Material of the Positive Electrode of a Lead Battery 748

Krivolapova, Ye. V., E. S. Vaysberg, and B. N. Kabanov. Investigating a Lead-Dioxide Electrode for Potential Drop and Oxygen Evolution 757

Kryukova, T.A. (Vsesoyuznyy nauchno-issledovatel'skiy institut istochnikov toka-All-Union Scientific Research Institute of Electric Power Sources). Growth of Zinc Dendrites in Some Swelling Polymers 762

Flerov, V. N. (Gor'kovskiy politekhnicheskiy institut imeni

Card 30/34

5(1, 2) SOV/20-128-3-39/58

AUTHORS: Mendzheritskiy, E. A., Bagotskiy, V. S.

TITLE: Equilibrium Conditions on a Zinc Electrode in Alkaline Solutions Saturated With Zincate

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 3, pp 575-577 (USSR)

ABSTRACT: In spite of many investigations, the type of solid end products (whether zinc hydroxide or -oxide) formed in working the solutions mentioned in the title on the zinc electrode has not been precisely determined (Ref 1). The conversion of primarily separated modifications of zinc hydroxides in stable forms causes an "aging" of the zincate solutions by impoverishment in zinc ions. A publication survey shows (Refs 2-5), that individual investigators disagree with respect to the value of the free energy of the stablest ε-modification of zinc hydroxide. To determine this problem more precisely, the authors measured the electromotive force (emf) of the chain: Zn, ZnO.aq(KOH + zincate)HgO, Hg at different alkali concentrations. In the case of formation of zinc oxide on the discharge of such an element, the electromotive force (emf) must be independent of the concentration

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SOV/20-128-3-39/58

Equilibrium Conditions on a Zinc Electrode in Alkaline Solutions Saturated With Zincate

of the alkaline solution according to the equation $Zn + HgO \longrightarrow ZnO + Hg$ (1). If, however, zinc hydroxide is formed (2), the emf of the chain is bound to decrease with the increasing alkali concentration since the water activity falls. Principal attention in these experiments was paid to the maximum approximation to the state of equilibrium. In preliminary experiments it was found that the emf of mercuric-oxide elements is fully stabilized 2-3 months after the preparation, and remains practically unchanged during the subsequent 9 months and more. A partial additional charge with an elimination of 10-15% capacity of the element greatly accelerates the stabilizing process of the emf. Here, the solution is particularly saturated with zincate, and the solid phase falls out. Figure 1 shows the dependence, found in this way, of the emf on the alkali concentration in the KOH-solutions saturated with potassium zincate between 0.6 and 12.5 n. It shows that the emf is constant between 0.6 and 1.5 n, and amounts to about 1.344 volts. This value approximately corresponds to the data of reference 2 for ε ($Zn(OH)_2$.

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SOV/20-128-3-39/58

Equilibrium Conditions on a Zinc Electrode in Alkaline Solutions Saturated With Zincate

From the emf value of 1.353 volts in higher-concentrated solutions, the value of the free energy of the zinc oxide at 25° follows, i.e. $\Delta F^{0}_{ZnO} = -76.4 \pm 0.1$ kcal. The difference of this value by 0.35 kcal as compared with V. Latimer (Ref 4), is essential since it yields a value of the free energy of the transition of the zinc hydroxide into zinc oxide $\Delta F = +0.5$ kcal instead of -0.15 kcal. The sign of this new value is undoubted, and gives proof of a high thermodynamic resistance of the zinc oxide in diluted solutions (at a water activity = 1). The above conclusion stating that, under equilibrium conditions, zinc oxide, not zinc hydroxide, is formed, is also confirmed by other experimental results. The temperature coefficient of the emf measured amounts to 0 + + 50°C + 0.00004 volt/degree. There are 1 figure and 8 references, 3 of which are Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut istochnikov toka (All-Union Scientific Research Institute of Sources of Current) Moscow (per FIB)

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81233

S/020/60/132/03/42/066
B004/B007

5.1300

AUTHORS: Popova, T. I., Bagotskiy, V. S., Kabanov, B. N.

TITLE: Anodic Passivation of Zinc in Alkaline Solutions

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3, pp. 639-642

TEXT: It was the aim of this paper to investigate the influence exerted by the adsorption of oxygen and by the formation of an oxide film upon the passivation of zinc. The anodic behavior of Zn was investigated in KOH by means of oscilloscopic recording of the potential - time curve $\varphi(t)$ at constant current density i on a rotating disk electrode. $Q_{pass} = it_n$ was determined (Q_{pass} is the amount of electricity necessary for passivation, t_n is the time up to passivation). Fig. 1 shows the diagram $1/Q_{pass} = f(i)$. At mean current densities there is a linear dependence between $1/Q_{pass}$ and i. In the case of i being low, Q_{pass} becomes dependent on the rate of stirring, and in the case of a very low i and a high rate

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[illegible]

Anodic Passivation of Zinc in Alkaline Solutions S/020/60/132/03/42/066
B004/B007

of stirring, no passivation occurs. From these results as well as from the anodic polarization curve (Fig. 2), the curve of the increase of the potential after 60-min passivation and after switching off the anode current (Fig. 3) as well as from the dependence of the dissolution rate of the passivated electrode on the speed of rotation (Fig. 4) the authors draw the following conclusions: The dissolution of zinc depends on the dissolution rate of the zinc oxide (and peroxide). As passivation occurs already at potentials (-1.1 to -1.0 v), which are more negative than the reduction potential of the zinc peroxide in the oxide film, passivation is primarily based on a change in the concentration of KOH and the zincate retarding dissolution in the liquid layer near the electrode. The formation of the oxide film is a secondary process. There are 4 figures and 7 references: 4 Soviet, 2 German, and 1 Indian.

ASSOCIATION: Institut elektrokhimii Akademii nauk SSSR (Institute of Electrochemistry of the Academy of Sciences, USSR)

PRESENTED: January 25, 1960, by A. N. Frumkin, Academician

Anodic Passivation of Zinc in Alkaline Solutions S/020/60/132/03/42/066
B004/B007

SUBMITTED: January 11, 1960

Card 3/3

OSHE, A.I.; ASTAKHOV, I.I.; NIKITINA, Z.Ya.; REZNIK, I.F.; BAGOTSKIY, V.S.

Change of the structure of a negative electrode in a silver-zinc storage cell in operation. Zhur.prikl.khim. 34 no.10:2254-2260
O '61. (MIRA 14:11)

1. Institut elektrokhimii AN SSSR i Vsesoyuznyy nauchno-issledovatel'skiy institut istochnikov toka.

(Electrodes)

IOFA, Z.A.; KOMLEV, L.V.; BAGOTSKIY, V.S.

Hydrogen overvoltage on a zinc electrode in alkaline solutions. Effect of the concentration of a potassium hydroxide solution. Zhur. fiz. khim. 35 no.7:1571-1577 Jl. '61. (MIRA 14:7)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova i Vsesoyuznyy nauchno-issledovatel'skiy institut istochnikov toka.

(Hydrogen) (Overvoltage)

OSHE, A.I.; BAGOTSKIY, V.S.

Mechanism of the cathodic reduction of zinc oxide phase layers on a zinc electrode. Zhur. fiz. khim. 35 no.7:1641-1642 Jl '61. (MIRA 14:7)

1. Institut elektrokhimii AN SSSR.
(Zinc oxide) (Reduction, Electrolytic)

S/030/62/000/007/002/004
I048/I248

AUTHORS: Bagotskiy, V.S., Doctor of Technical Sciences, and Frumkin, A.N., Acdemician

TITLE: The problem of direct conversion of chemical energy into electrical [energy]

PERIODICAL: Akademii-nauk SSSR, Vestnik. no. 7, 1962, 19-32

TEXT: This reviews the history and the state of development up to 1960 of fuel cells and other electrochemical current generators. Their operations are briefly discussed, the emphasis being on weight vs. power output considerations. The use of fuel-cells is preferred for long times of operation (20 hrs and over), but conventional storage batteries (e.g., lead or Ag-Zn accumu-

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S/030/62/000/007/002/004
I048/I248

The problem of direct....

lators) are superior for short-time uses. Although available fuel cells have a weight of 35-70 kg./kw. output, cells weighing 15-20 kg./kw. could be developed the lowest possible limit being 6-10 kg./kw. Future applications envisaged are in city transport, for military purposes (due to quietness and absence of smoke), and in artificial earth satelites and space rockets. A Scientific Council for Fuel Cells, associated with the USSR Academy of Sciences, has been set up in the USSR. The article is based mainly on Western Sources. There are 4 figures.

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S/076/62/036/007/003/010
B101/B138

AUTHORS: Popova, T. I., Bagotskiy, V. S., and Kabanov, B. N. (Moscow)

TITLE: Anodic passivation of zinc in alkali. I. Measurements at constant current densities

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 7, 1962, 1432 - 1438

TEXT: The potential-time curves for rotating zinc anodes were oscillographically recorded in 0.1 - 1 N KOH at 60 - 5000 rpm, $20^{\circ}C$, and current densities, i, of up to 340 ma/cm^2. The curve $1/Q_{pass}$ showed three sections. Between 10 and 200 ma/cm^2, the total amount of electricity required for passivation rises linearly with i, and is not affected by changes in the rate of stirring; at $i > 200$ ma/cm^2, Q_{pass} becomes independent of i and reaches a limiting value which is independent of the stirring rate but diminishes with decreasing alkali concentration; at $i < 10$ ma/cm^2, Q_{pass} is larger than would correspond to a linear relation between Q_{pass} and i, and the stirring rate affects Q_{pass}. Conclusion: At medium and high i, the

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Anodic passivation of ...

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B101/B138

passivation time t_p of the zinc electrode is shorter than that required for establishment of steady-state diffusion in the pre-electrode layer of the solution. Q_{pass} becomes dependent on the stirring rate only if the passivation time is equal to or greater than this period. This holds for small current densities and high stirring rates. The linear dependence of $1/Q_{pass}$ on i is attributed unsteady diffusion near the electrode surface. This changes the state of the electrode surface and retards the dissolution rate of Zn. In dilute solutions, Q_2, the amount of electricity expended on passivation at high current densities, reaches a limiting value of 1 mcoul/cm^2, which is equivalent to an amount of oxygen or oxide which does not form a complete single layer over the zinc. There are 5 figures and 2 tables.

ASSOCIATION: Akademiya nauk SSSR, Institut elektrokhimii (Academy of Sciences USSR, Institute of Electrochemistry)

SUBMITTED: September 7, 1960

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S/076/62/036/007/004/010
B101/B138

AUTHORS: Popova, T. I., Bagotskiy, V. S., and Kabanov, B. N. (Moscow).

TITLE: Anodic passivation of zinc in alkali. II. Potentiostatic and alternating current measurements; charging curves

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 7, 1962, 1439 - 1444

TEXT: The character of passivating layers was studied on the example of zinc in alkali by potentiostatic recording of the polarization curves, recording of the activation curves, and measurement of the impedance of the zinc electrode. Results: Zn dissolves in anodic polarization up to -1.1 v (versus hydrogen standard electrode); O_2 is liberated at potentials > + 1.7v. The form of the polarization curves is independent of the KOH concentration, but the dissolution rate rises with concentration. When the stirring rate was increased from 6 to 83.5 r/sec the rate of dissolution in 0.5 N KOH increased 2-3 times. There is a linear dependence between i (ma/cm^2) and $\sqrt{\omega}$ (ω = angular velocity of the rotating anode). If the zinc anode is passivated at potentials more positive than -0.3 v, activation is retarded. After 60 min passivation at -0.2 or +0.4 v (i = 0.03 ma/cm^2), Q was 0.2 or

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1.4 mcoul/cm^2, respectively. The appearance of a "limiting current" and its dependence on concentration are attributed to the limited chemical solubility of the dense passivating film. The dependence of the limiting current on $\sqrt{\omega}$ is due to the effect of the zincate ions on the solubility of the film material. The formation of phase layers, apparently containing zinc peroxide, occurs at more positive potentials than the minimum passivation potential, i. e., on already passivated zinc. There are 7 figures.

ASSOCIATION: Akademiya nauk SSSR, Institut elektrokhimii (Academy of Sciences USSR, Institute of Electrochemistry)

SUBMITTED: September 7, 1960

MENDZHERITSKIY, E.A.; BAGOTSKIY, V.S.

Kinetic hindrances in the formation of a new phase in the cathodic reduction of some metal oxides. Dokl. AN SSSR 142 no.1:127-130 Ja '62. (MIRA 14:12)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut istochnikov toka. Predstavleno akademikom A.N. Frumkinym.
(Metallic oxides) (Reduction, Electrolytic)

BAGOTSKIY, V. S.

"Some Characteristics of the Reactions of Oxidation of Organic Compounds and of Oxygen Reduction on Platinum Electrodes."

Report presented at the 14th meeting CITCE, Intl. Comm. of Electrochemical Thermodynamics and Kinetics, Moscow, 19-25 Aug 63.

45117

26.2510

S/170/63/006/002/008/018
B104/B186

AUTHORS: Gurevich, I. G., Bagotskiy, V. S.

TITLE: Porous electrodes operating under diffusion type reagent feeding conditions

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 6, no. 2, 1963, 60-68

TEXT: Here the work of porous electrodes is studied, allowing for polarization- and ohmic losses in an electrode of finite thickness, unlike other papers (O. S. Ksenzhek, ZhFKh, 36, no. 3, 1962; 36, no. 2, 1962; L. G. Austin, Symposium on Fuel Cells, Chicago Meeting, Division of Petroleum Chemistry, Am. Chem. Soc., September 3-8, 1961). Electrically neutral molecules are assumed to act as one reagent, the ions of the electrolyte as the second. The neutral molecules move in the system electrode-electrolytic chamber only by molecular diffusion, the ions by diffusion and migration in the electric field of the electrodes. It is further assumed that the mixture filling the electrode has an ionic concentration much exceeding the concentration of the neutral molecules. Thus the conductivity of the mixture may be considered constant, and the potential developing through ion migration can be neglected. In

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accordance with Ya. B. Zel'dovich (ZhFKh, 13, no. 2, 1939) the expressions

$$\eta \equiv \frac{RT}{\alpha F}\frac{\Theta}{\Omega_{\text{пред}}}u \approx \frac{RT}{\alpha F\,\Omega_{\text{пред}}}\Theta \times \left\{ \frac{\sqrt{-\Delta}\,\mathrm{ch}\left[\zeta\sqrt{a} + \mathrm{Arch}\frac{2ac_0+b}{\sqrt{-\Delta}}\right] - b}{2aK} + \frac{\Omega_{\text{пред}}}{\Theta}\ln\left(Q' + \sqrt{Q'' - B'}\right)\right\}, \quad (31)$$

$$i \equiv \frac{j_0}{A\psi}c'' \approx \frac{1}{2}\frac{j_0\sqrt{-\Delta}}{A\psi}\,\mathrm{ch}\left[\zeta\sqrt{a} + \mathrm{Arch}\frac{2ac_0+b}{\sqrt{-\Delta}}\right]. \quad (32)$$

for distribution of polarization and of the current over the depth of the porous electrode are obtained by extensive calculation. Here are

$$\zeta \approx \frac{1}{\sqrt{a}}\left[\operatorname{Arch}\frac{2ac+b}{\sqrt{-\Delta}} - \operatorname{Arch}\frac{2ac_0+b}{\sqrt{-\Delta}}\right], \qquad (28),$$

$$a = 2A\psi\left(\frac{M}{K_1}+K_1\right); \quad b = -2A\psi\frac{E}{K_1};$$

$$\Delta = 8A\psi\left(\frac{M}{K_1}+K_1\right)\left\{K^2 - 2A\psi\left(\frac{M}{K_1}+K_1\right)c_1^2 + 2A\psi\frac{E}{K_1}c_1\right\} - \\ -4(A\psi)^2\frac{E^2}{K_1^2}.$$

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$$K_1 = Q + \sqrt{Q^2 - B}, \qquad (25)$$

$$Q = \frac{K^2 K_2^2}{4A\psi}\left(z_1^{K_1}\,[K_2 \ln z_1 - 1] - z_0^{K_1}\,[K_2 \ln z_0 - 1]\right)^{-1};$$

$$B = \frac{EK_2\left(\frac{1}{z_1^{K_1}} - \frac{1}{z_0^{K_1}}\right) - M\left\{\frac{1}{z_1^{K_1}}\,[K_2 \ln z_1 + 1] - \frac{1}{z_0^{K_1}}\,[K_2 \ln z_0 + 1]\right\}}{z_1^{K_1}\,[K_2 \ln z_1 - 1] - z_0^{K_1}\,[K_2 \ln z_0 - 1]}, \qquad (26)$$

$$C_2 = \frac{\Omega_{\text{пред}}}{\theta} \ln\left(Q + \sqrt{Q^2 - B}\right).$$

$K = \psi\theta$, $A = I_0/I_{limit}$, $R_Э$ is the effective resistance of the mixture in the pores, F the Faraday number, δ the thickness of the diffusion layer at the frontal area of the electrode, θ the electrode charge factor, I_0 the effective exchange current to the porous electrode, $\Omega_{пред}$ characterizes

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Porous electrodes operating under ... S/166/63/006/002/008/018
B104/B186

the relation between polarizability of the electrode, the limit value of the current and the effective resistance of the mixture. There is 1 figure.

ASSOCIATION: Energeticheskiy institut AN BSSR, g. Minsk
(Power Engineering Institute AS BSSR, Minsk)

SUBMITTED: July 19, 1962

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45416

S/170/63/006/003/008/014
B104/B186

26.2510

AUTHORS: Gurevich, I. G., Bagotskiy, V. S.

TITLE: The efficiency of porous electrodes working under diffusion feeding of reagent

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 6, no. 3, 1963, 69 - 80

TEXT: The efficiency of a porous electrode was defined by L. G. Austin (Symposium on Fuel Cells. Chicago Meeting, Division of Petroleum Chemistry, Am. Chem. Soc., September 3 - 8, 1961) and O. S. Ksenzhek (ZhFKh, 36, no. 3, 1962). Working on this basis, the authors derive two particular solutions for small and large polarization areas of an electrode to their equations

$$c'' = A\Psi\left\{c\exp\left[\frac{\Theta}{\Omega_{\text{пред}}}u\right] - (E - Mc)\exp\left[-\frac{n-\alpha}{\alpha}\frac{\Theta}{\Omega_{\text{пред}}}u\right]\right\}. \quad (2)$$

and

$$u = \frac{c}{K} + C_2. \quad (3)$$

for the general case (IFZh, no. 2. 1963). In the first case, equation (2) is linearized and the dimensionless concentration c is given by

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The efficiency of porous ...

$$c = \frac{\psi\Theta}{\sqrt{K_э}\,\mathrm{sh}\sqrt{K_э}}\left[\mathrm{ch}(\zeta\sqrt{K_э}) - \mathrm{ch}\sqrt{K_э}\right] + (1-\Theta), \qquad (10)$$

the dimensionless polarization is

$$\eta = \frac{1}{\sqrt{K_э}}\,\frac{\mathrm{ch}(\zeta\sqrt{K_э})}{\mathrm{sh}\sqrt{K_э}} + \frac{\Omega_{\text{пред}}}{(n-\alpha)/\alpha}\left[1 + \frac{\psi}{\sqrt{K_э}}\,\mathrm{cth}\sqrt{K_э}\right]. \qquad (11)$$

and the distributions of polarization and of the current in the depth of the electrode are given by

$$\eta = \Theta\frac{RT}{\alpha F}\left\{\frac{1}{\Omega_{\text{пред}}\sqrt{K_э}\,\mathrm{sh}\sqrt{K_э}}\,\mathrm{ch}(\zeta\sqrt{K_э}) + \frac{\alpha}{n-\alpha}\left[1 + \frac{\psi}{\sqrt{K_э}}\,\mathrm{cth}\sqrt{K_э}\right]\right\}, \qquad (12)$$

$$i = \Theta\frac{j_0\sqrt{K_э}}{A\,\mathrm{sh}\sqrt{K_э}}\,\mathrm{ch}(\zeta\sqrt{K_э}). \qquad (13)$$

In the second case, equation (2) is simplified and the concentration distribution is given by

$$c \approx (1-\Theta)\left[\operatorname{ch}\frac{\Psi\Theta}{1-\Theta}\right]^{-1}\operatorname{ch}\left[\zeta\frac{\Psi\Theta}{1-\Theta}\operatorname{cth}\frac{\Psi\Theta}{1-\Theta}\right]. \qquad (15'),$$

the polarization distribution and the current distribution are given by

$$\eta \approx \frac{RT}{\alpha F}\left\{\frac{1-\Theta}{\Psi\Omega_{\text{пред}}}\left[\operatorname{ch}\frac{\Psi\Theta}{1-\Theta}\right]^{-1}\operatorname{ch}\left[\zeta\frac{\Psi\Theta}{1-\Theta}\operatorname{cth}\frac{\Psi\Theta}{1-\Theta}\right] + \ln\frac{\Psi}{2A} + 2\ln\left[\frac{\Theta}{1-\Theta}\operatorname{cth}\frac{\Theta\Psi}{1-\Theta}\right]\right\}. \qquad (17)$$

$$i \approx \frac{j_0\Psi\Theta^2}{A(1-\Theta)}\operatorname{cth}^2\frac{\Psi\Theta}{1-\Theta}\left[\operatorname{ch}\frac{\Psi\Theta}{1-\Theta}\right]^{-1}\operatorname{ch}\left[\zeta\frac{\Psi\Theta}{1-\Theta}\operatorname{cth}\frac{\Psi\Theta}{1-\Theta}\right]. \qquad (18).$$

These solutions are studied and the efficiency

$$h = \frac{J}{sLi_1} = \left\{\sqrt{A\Psi\left(1+\frac{\nu d'_{\text{p.n}}}{\xi}\right)\left[1+\frac{n-\alpha}{\alpha}\frac{1}{\Omega_{\text{пред}}\Psi}\right]} \times \operatorname{cth}\sqrt{A\Psi\left(1+\frac{\nu d'_{\text{p.n}}}{\xi}\right)\left[1+\frac{n-\alpha}{\alpha}\frac{1}{\Omega_{\text{пред}}\Psi}\right]}\right\}^{-1} \qquad (21)$$

for small polarization areas is derived. In the case of large polarization the efficiency is $h = \frac{1-\vartheta}{\psi\vartheta}$ (24). (21) and (24) are analyzed in detail. c_p^v is the reagent volume concentration, $u = \eta / R_э L j$ is the dimensionless polarization, and R is the effective resistance of the electrode filled with operating mixture, $\Omega_{\eta peq}$ is the dissipation factor, and Ψ a parameter characterizing the relation between reduction of the transfer in the diffuse boundary layer and the reduction of the transfer in the electrode. There are 2 figures.

ASSOCIATION: Institut teplo- i massoobmena AN BSSR, g. Minsk (Institute of Heat and Mass Transfer AS BSSR, Minsk)

SUBMITTED: July 21, 1962

L 17136-63 EWT(m)/BDS ESD-3 RH
ACCESSION NR: AP3000444 S/0170/63/006/005/0075/0085

55
54

AUTHOR: Gurevich, I. G.; Bagotskiy, V. S.

TITLE: Operation of porous electrodes under conditions of forced reagent supply

SOURCE: Inzhenerno-fizicheskiy zhurnal, v. 6, no. 5, 1963, 75-85

TOPIC TAGS: porous electrode, forced reagent supply, polarization, electrochemistry, electrochemical reaction, mass transfer

ABSTRACT: A solution was found for the problem of the distribution of an electrochemical process over the depth of a porous electrode of finite thickness under conditions of forced reagent supply. The mode of forced reagent supply is indicated for cases where the rate of an electrochemical reaction and the speed of all electrode processes are governed by the mass-transfer rate. Two alternative forms of reagent supply to the electrode were considered: from the front and from the back. Corresponding expressions are obtained for the distribution of polarization, current and reagent concentration over the depth of the electrode. It was shown that the first alternative, supply of reagent from the front, results in a decrease in polarization, as compared with the second. The gain in polarization was estimated. These conclusions apply only to the region of small polarizations. Orig. art. has:

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L 17136-63

ACCESSION NR: AP3000444

34 formulas and 4 figures.

ASSOCIATION: Institut teplo- i massoobmena AN BSSR, Minsk (Institute of Heat and Mass Transfer of the AN BSSR)

SUBMITTED: 20Dec62 DATE ACQ: 10Jun63 ENCL: 00

SUB CODE: PH NO REF SOV: 007 OTHER: 000

Card 2/2

FRUMKIN, A. N.; BAGOCKIH, V. Sz. [Bagotskiy, V. S.]

Direct conversion of chemical energy to electric power. Technika 7 no.3:2 Mr '63.

VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Electrolytic oxidation of formic acid and its salts on a rotating platinum electrode. Dokl. AN SSSR 148 no.1:132-135 Ja '63.
(MIRA 16:2)

1. Institut elektrokhimii AN SSSR. Predstavleno akademikom A.N. Frumkinym.
(Formic acid) (Oxidation) (Electrodes, Platinum)

YAO LU-AN' [Yao Lu-an]; KAZARINOV, V.Ye.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Effect of adsorption on the rate of processes taking place on a platinum electrode in the system quinone - hydroquinone. Dokl. AN SSSR 151 no.1:151-154 Jl '63.
(MIRA 16:9)

1. Institut elektrokhimii AN SSSR. Predstavleno akademikom A.N.Frumkinym.

(Quinone) (Hydroquinone) (Adsorption)

BAGOTSKIY, Vladimir Sergeyevich; FLEROV, Valeriy Nikolayevich;
[redacted], red.; FRIDKIN, L.M., tekhn. red.

[New developments in the field of chemical sources of electric current] Noveishie dostizheniia v oblasti khimicheskikh istochnikov toka. Gosenergoizdat, 1963. 254 p. (MIRA 16:9)
(Electric power production from chemical action)

BAGOTSKIY, V. S.; GUREVICH, I. G.; LYKOV, A. V. (prof)

"Sur la theorie de l'action des electrodes poreuses dans les convertisseurs d'energie electrochimiques employant les combustible liquides."

report submitted for Conf on Combustion & Conversion of Energies, Paris, 19-23 May 64.

BAGOTSKIY, V. S.

"Problems of electrochemical conversions of energy."

report submitted for 10th Anniv Festivities, Leuna-Merseburg Tech Inst for Chemistry, Leuna-Merseburg, E. Germany, 2-7 Nov 64.

BAGOTSKIY, V.S., prof., doktor tekhn. nauk, otv. red.; VASIL'YEV,
Yu.B., kand. khim. nauk, otv. red.; YASTREBOV, V.V., red.

[Fuel cells; some theoretical problems] Toplivnye elementy;
nekotorye voprosy teorii. Moskva, Nauka, 1964. 139 p.
(MIRA 17:9)

1. Soveshchaniye po toplivnym elementam. 2d, Moscow, 1962.

YAO LU-AN' [Yao Lu-an]; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Electrochemical processes in the system quinone - hydroquinone.
Zhur. fiz. khim. 38 no.1:205-208 Ja'64. (MIRA 17:2)

1. Institut elektrokhimii AN SSSR.

POPOVA, T.I.; SIMONOVA, N.A.; BAGOTSKIY, V.S.

Mechanism of the oxidation of polyhydric alcohols and formamide on a platinum electrode. Zhur. fiz. khim. 38 no.10:2452-2455 O '64. (MIRA 18:2)

1. Institut elektrokhimii AN SSSR.

TIKHOMIROVA, V.I.; OSHE, A.I.; BAGOTSKIY, V.S.; LUK'YANYCHEVA, V.I.

State of oxygen adsorbed on platinum. Dokl. AN SSSR 159 no.3:
644-647 N '64
(MIRA 18:1)

1. Institut elektrokhimii AN SSSR. Predstavleno akademikom
A.N. Frumkinym.

KHAZOVA, O.A.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Electrolytic oxidation of organic substances on a platinum electrode. Report 1: General aspect of potentiostatic curves and the nature of inhibition of electrochemical oxidation processes. Izv. AN SSSR. Ser. khim. no.9:1531-1539 '65. (MIRA 18:9)

1. Institut elektrokhimii AN SSSR.

KHAZOVA, O.A.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Electrolytic oxidation of organic substances on a platinum electrode. Report No.2: Kinetics of oxidation of alcohols, aldehydes, and carboxylic acids with the estimation of the surface inhomogeneity of the platinum electrode. Izv. AN SSSR. Ser.khim. no.10:1778-1787 '65. (MIRA 18:10)

1. Institut elektrokhimii AN SSSR.

[illegible] RM [illegible]

ACCESSION NR: AP5007750 S/0364/65/001/001/0084/0089

[illegible] ...ov, [illegible] V. [illegible]

[illegible] electrode [illegible]

[illegible]

TOPIC TAGS: adsorption, methanol, platinum

ABSTRACT: The effect of the potential and concentration of the adsorption of methanol on a smooth platinum electrode was studied. The filling of the electrode surface with methanol was studied with the help [illegible]

[illegible] glass was used. A model [illegible] ...ary cathode-anode [illegible] ...ration of meth... [illegible]

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L 43956-[illegible]
ACCESSION NR: AP50[illegible]

point of zero charge, but by the location of the potential region in which the ad- [illegible] and oxygen is a minimum [illegible] figures, 1 equa-

[illegible]

SUBMITTED: 03Oct64 ENCL: 00 SUB CODE: GC, IC

NO REF SOV: 016 OTHER: [illegible]

Card 2/2

YAO LU-AN' [Yao Lu-an]; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Kinetics of electrochemical processes in the system quinone - hydroquinone. Part 1: Effect of specific adsorption of the reactant on the kinetics of reactions on a platinum electrode. Elektrokhimiia 1 no.2:170-175 F '65. (MIRA 18:6)

1. Institut elektrokhimii AN SSSR.

YAO LU-AN' [Yao Lu-an]; KAZARINOV, V.Ye.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Kinetics of electrochemical processes in the system quinone - hydroquinone. Part 2: Effect of the adsorption of particles nonparticipating in the reaction. Elektrokhimiia 1 no.2:176-181 F '65. (MIRA 18:6)

1. Institut elektrokhimii AN SSSR.

LUK'YANYCHEVA, V.I.; TIKHOMIROVA, V.I.; BAGOTSKIY, V.S.

Effect of the state of platinum surface on the electrochemical adsorption of oxygen in acid solutions. Elektrokhimiia 1 no.3:262-266 Mr '65. (MIRA 18:12)

1. Institut elektrokhimii AN SSSR.

KHAZOVA, O.A.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Effect of the adsorption of foreign ions and molecules on the oxidation rate of organic substances on a platinum electrode. Elektrokhimiia 1 no.4:439-445 Ap '65. (MIRA 18:6)

1. Institut elektrokhimii AN SSSR.

TIKHOMIROVA, V.I.; LUK'YANYCHEVA, V.I.; BAGOTSKIY, V.S.

Oxygen-hydrogen peroxide equilibrium on a degassed platinum in the presence of oxygen traces. Elektrokhimiia 1 no.6:645-650 Je '65. (MIRA 18:7)

1. Institut elektrokhimii AN SSSR.

OSHE, A.I.; TIKHOMIROVA, V.I.; BAGOTSKIY, V.S.

Oxygen ionization on an oxidized platinum cathode in acid solutions. Elektrokhimiia 1 no.6:688-691 Je '65. (MIRA 18:7)

1. Institut elektrokhimii AN SSSR.

BESKOROVAYNAYA, S.S.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Adsorption of aliphatic alcohols on a smooth platinum electrode. Elektrokhimiia 1 no.6:691-695 Je '65. (MIRA 18:7)

1. Institut elektrokhimii AN SSSR.

L 00916-66 EWT(m)/EWG(m)/EWP(j)/T/EWP(t)/EWP(b) IJP(c) DS/JD/JG/RM

ACCESSION NR: AP5020387

UR/0364/65/001/008/0968/0974
541.13

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B

AUTHOR: Polyak, A. G.; 55 Vasil'yev, Yu. B.; 55 Bagotskiy, V. S. 55

TITLE: Oxidation of organic substances through a palladium membrane 55 27

SOURCE: Elektrokhimiya, v. 1, no. 8, 1965, 968-974

TOPIC TAGS: formic acid, formaldehyde, oxidation, electrochemistry, palladium

ABSTRACT: The diffusion of hydrogen (produced during chemisorption of formic acid and formaldehyde) through a palladium membrane was studied. It was found that the activity of the palladium membrane depends to a significant extent on its pretreatment. In this work the membrane was heated in an oxidizing bunsen burner flame, washed with 1:1 HCl and twice with distilled water. After pretreatment the membrane was tightly mounted between the ground surfaces of two different cells. When the cells on both sides of the membrane contained the same solution, the potential difference did not exceed 10 mv. Formic acid or formaldehyde was introduced into one of the cells and the potential shift was recorded on both sides of the membrane on two S1-19 oscillographs. It is believed that the membrane potentials on both sides

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ACCESSION NR: AP5020387

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are controlled by the equilibrium between the adsorbed hydrogen and hydrogen ions in the solution:

$$H_{abs} \rightleftarrows H_{ads} \rightleftarrows H^{+} + e^{-}$$

Electrooxidation of formic acid and formaldehyde through a palladium membrane was studied. On the diffusion side the membrane was anodically polarized by an electronic potentiostat, usually at $\phi_r = 0.6$ v. When there was no organic substance on the contact side of the membrane a weak cathode current was observed in the diffusion side of the cell. When the organic substance was introduced into the solution on the contact side of the cell an anode current began to flow through the diffusion side of the cell. When this solution was replaced again by 7N KOH or 1N H_2SO_4 without the organic substance, the diffusion current dropped to zero. This behavior was reproducible upon numerous trials (see fig. 1 of the Enclosure). The anode current in the diffusion part of the cell which occurs in the presence of organic substance in the contact part of the apparatus results only due to ionization of hydrogen which diffuses through the palladium membrane. It is shown that the occurrence of hydrogen on the diffusion side of the membrane is explained only by the dehydrogenation of formic acid during chemisorption on the membrane. It is shown that the oxidation current through the membrane is determined by the rate of formation of the

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ACCESSION NR: AP5020387

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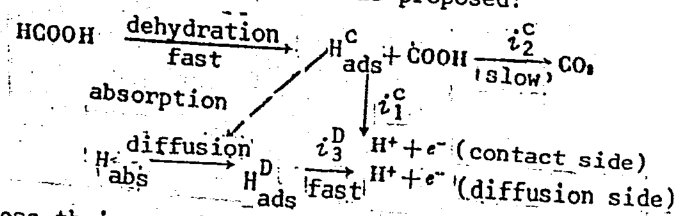
adsorbed hydrogen and competition of relatively fast ionization processes of the adsorbed hydrogen on the contact side, absorption by palladium and diffusion to the other side. The following general scheme is proposed:



"The authors express their gratitude to A. N. Frumkin 55 for valuable discussion and I. A. Bagotskaya 55 for consultation and help in the organization of this work." Orig. art. has: 6 figures.

ASSOCIATION: Institut elektrokhimii Akademii nauk SSSR (Institute of Electrochemistry, Academy of Sciences, SSSR) 55

SUBMITTED: 16Mar65 ENCL: 01 SUB CODE: OC, GC

NO REF SOV: 007 OTHER: 008

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ACCESSION NR: AP5020387

ENCLOSURE: 01

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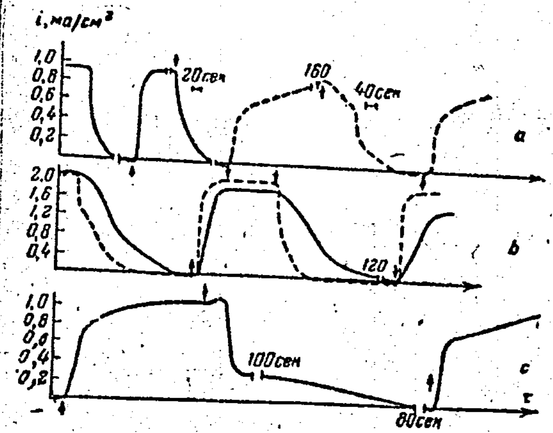

Fig. 1. Measurement of hydrogen ionization current at $\phi = 0.60$ v on the diffusion side of the membrane upon introduction (↑) and removal (↓) of formic acid (a, b) and formaldehyde (c) on the contact side of the cell.

a) 1--0.9 N H_2SO_4 1.8 *M* HCOOH | $\delta = 30$ μ
2--2.5 N KOH + 3.4 *M* HCOOH |
b) 0.1 N H_2SO_4 + 1.8 *M* HCOOH $\delta = 10$ μ
c) 5.4 N KOH + 3 *M* CH_2O $\delta = 100$ μ
$\delta = 30$ μ

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BESKOROVAYNAYA, S.S.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Kinetics of methanol adsorption on a platinum electrode.
Elektrokhimiia 1 no.9:1029-1035 S '65. (MIRA 18:10)

1. Institut elektrokhimii AN SSSR.

L 7971-66 EWT(m)/ETC/EWG(m)/T DS

ACC NR: AP5025082 44,55 6 SOURCE CODE: UR/0364/65/001/010/1235/1244 46 43 03

AUTHOR: Gurevich, I. G.; Bagotskiy, V. S. 44,55

ORG: Heat and Mass Transfer Institute AN BSSR 44,55 (Institut teplo- i massobmena AN BSSR)

TITLE: Liquid porous electrodes 44,55 in unsteady state operation. I. The galvanostatic case with diffusion feed of the reagent

SOURCE: Elektrokhimiya, v. 1, no. 10, 1965, 1235-1244

TOPIC TAGS: electrode, electrolytic cell, cathode polarization

ABSTRACT: The article treats the subject of transitional processes in porous electrodes. A porous electrode is place in an electrolytic chamber which contains the electrolyte mixture, along with the reagents and the reaction products. In examining the transport stage of the electrolytic process there are considered only the flows of electroneutral substances (reagents and products); it is assumed that their transfer in the electrode-electrolytic chamber system consists only in molecular diffusion. It is further assumed that the concentrations of the ionic com-

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ACC NR: AP5025082

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ponents of the working mixture are considerably larger than the concentrations of the electroneutral reagents and products. The article gives an analytical solution for the problem of a transition process taking place in a liquid porous electrode of finite thickness, with diffusion feed of the reagent. A solution is given to the problem for galvanostatic operating conditions, taking into account chemical (activation) and concentration boundaries, as well as ohmic losses with a small degree of polarization. Expressions are given for calculating a number of characteristics of the transition process, among them the measured degree of polarization. "The authors take the opportunity to thank L. A. Pott for discussing the work." Orig. art. has: 28 formulas and 2 figures 44 55

SUB CODE: GC/ SUBM DATE: 26Apr65/ ORIG REF: 005/ OTH REF: 005

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Card 2/2

L 22244-66 EWT(m)/ETC(f)/EWG(m)/T/EWP(t) IJP(c) DS/JD

ACCESSION NR: AP6005751 (A) SOURCE CODE: UR/0074/65/034/010/1697/1720

AUTHOR: Bagotskiy, V. S.; Nekrasov, L. N.; Shumilova, N. A. 51 50

ORG: Institute of Electrochemistry, AN SSSR (Institut elektrokhimii AN SSSR); B MGU im. M. V. Lomonosov

TITLE: Electrochemical reduction 7 of oxygen 21

SOURCE: Uspekhi khimii, v. 34, no. 10, 1965, 1697-1720

TOPIC TAGS: oxygen reduction reaction, chemical reduction, electrode, electrochemistry

ABSTRACT: This review examines the results obtained for metal electrodes in the experimental reduction of oxygen. The oxygen electroreduction process is among the more complicated electrochemical reactions, the mechanism of which may be established only as a result of an entire series of varied experiments. This review testifies to the successes in the study of this reaction, mostly due to the development and application of new experimental research methods. A large share of the work, the results of which are presented in this paper, was performed at the Department of Electrochemistry, Moscow State University im. M. V. Lomonosov 2 (Kafedra elektrokhimii Moskovskogo gosudarstvennogo universiteta) and at the

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UDC: 541.138.3:546

L 22244-66

ACCESSION NR: AP6005751

Institute of Electrochemistry, Academy of Sciences SSSR (Institut elektrokhimii Akademii nauk SSSR) under the supervision of A. N. Frumkin, who has advanced several concepts which are now fundamental in research on the electroreduction of oxygen. In spite of the existing achievements, the problem of cathode reduction of oxygen is not exhausted, there are still many unresolved questions. Still unclear, for example, are such questions as the mechanism of the heterogeneous process of the catalytic decomposition of hydrogen peroxide; there is not enough information on the nature of the energy distribution on the surface of solid electrodes, on the nature and forms of adsorbed oxygen with various potentials of the electrode, etc. However, taking into consideration the rapid development of the theory of electrochemical kinetics and the progress in the field of experimental technology, there is firm confidence that many questions unclear at the present time will be resolved soon. Orig. art. has: 15 figures and 28 formulas.

SUB CODE: 07 / SUBM DATE: none / ORIG REF: 057 / OTH REF: 028

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[illegible]NOV, M.M.; KABANOV, B.N.; BAGOTSKIY, V.S.

Aleksandr Naumovich Frumkin, 1895-; on his seventieth birthday. Zhur.fiz.khim. 39 no.10:2629-2633 O '65.

(MIRA 18:12)

BESKOROVAYNAYA, S.S.; VASIL'YEV, Yu.B.; BAGOTSKIY, V.S.

Theory of the potentials of a platinum electrode in contact with organic substances. Elektrokhimiia 2 no.1:44-49 Ja '66. (MIRA 19:1)

1. Institut elektrokhimii AN SSSR, Moskva. Submitted February 9, 1965.

L 30217-66 EWP(j)/EWT(m)/ETC(f)/T JAJ/RM/DS/WE

ACC NR: AP6015009 (A) SOURCE CODE: UR/0364/66/002/005/0515/0521

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54
B

AUTHOR: Veber, Yan; Vasil'yev, Yu. B.; Bagotskiy, V. S.

ORG: Polarographic Institute imeni J. Heyrovsky, Czechoslovak Academy of Sciences, Prague (Polyarograficheskiy institut Chekhoslovatskoy Akademii nauk); Institute of Electrochemistry, Academy of Sciences SSSR, Moscow (Institut elektrokhimii Akademii nauk SSSR)

TITLE: Electrooxidation of ethylene glycol 1 on a platinum electrode. 1 I. Adsorption of ethylene glycol from acid solutions

SOURCE: Elektrokhimiya, v. 2, no. 5, 1966, 515-521

TOPIC TAGS: ethylene glycol, adsorption, platinum, electrode, anodic oxidation, chemisorption, dehydrogenation

ABSTRACT: The kinetics of adsorption of ethylene glycol from a 1 N H_2SO_4 solution on the surface of a smooth platinum electrode were investigated. The adsorption was shown to be associated with a partial dehydrogenation of the adsorbed molecules. The process of chemisorption of ethylene glycol on a smooth platinum electrode is represented as follows:

$$HOCH_2CH_2OH + 10\cdot \xrightarrow{v_{ads}} HO-C-C-OH + 4H.$$

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L 30217-66

ACC NR: AP6015009

At temperatures above 70°C, the process of adsorption and dehydrogenation is described by the equation

$$HOCH_2CH_2OH \xrightarrow{v_{ads}} H\underset{\cdot}{O}-\underset{\cdots}{C}+\underset{\cdots}{C}-\underset{\cdot}{O}H+4\underset{\cdot}{H}$$

The adsorption rate is directly proportional to the volume concentration of ethylene glycol in the solution and decreases exponentially with increasing coverage (θ) of the electrode surface. Under stationary conditions, when $0.1<\theta<0.9$, the adsorption of ethylene glycol obeys a logarithmic isotherm. It is concluded that the absorption behavior of ethylene glycol is similar to that of methanol. Orig. art. has: 7 figures, 8 formulas.

SUB CODE: 07/ SUBM DATE: 02Jun65/ ORIG REF: 018/ OTH REF: 017

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L 30218-66 EWP(j)/EWT(m)/ETC(f)/T JAJ/RM/DS/WE

ACC NR: AP6015010 (A) SOURCE CODE: UR/0364/66/002/005/0522/0528

AUTHOR: Veber, Yan; Vasil'yev, Yu. B.; Bagotskiy, V. S.

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B

ORG: Polarographic Institute imeni J. Heyrovsky, Czechoslovak Academy of Sciences, Prague (Polyarograficheskiy institut Chekhoslovatskoy Akademii nauk); Institute of Electrochemistry, Academy of Sciences SSSR, Moscow (Institut elektrokhimii Akademii nauk SSSR)

TITLE: Electrooxidation of ethylene glycol on a platinum electrode. II. Effect of electrode potential on the adsorption of ethylene glycol

SOURCE: Elektrokhimiya, v. 2, no. 5, 1966, 522-528

TOPIC TAGS: ethylene glycol, adsorption, platinum, electrode, anodic oxidation, hydrogenation, dehydrogenation

ABSTRACT: The effect of the potential of a smooth platinum electrode on the kinetics of adsorption of ethylene glycol from 1 N H_2SO_4 solutions was studied. The dependence of the steady-state coverage of the electrode surface by adsorbed particles on the potential is represented by a curve with a maximum lying at potentials of 0.4-0.5 v, i. e., in the region of potentials where the adsorption of hydrogen and oxygen is minimal. Measurements at various temperatures showed that the activation energy of adsorption increases linearly with the coverage of the electrode surface by the adsorbed particles. It is shown that at ϕ_r<0.7 v, the rate of the adsorption process involv-

UDC: 541.138 : 541.135.8-183 : 547

Card 1/2