CIHAL, V., inz., ScC.; BODNAR, Laszlo, dr. [translator]

Corrosion problems in devices used for high-pressure syntheses. Gep 15 no.10:390-396 O '63.

1. Statni vyzkumny ustav ochrany materialu, Praha.

CIHAL, Vladimir, doc., inz., ScC.; JEZEK, Jaroslav, RNDr., ScC.

Changes in austenitic stabilized steel at elevated temperatures. Hut listy 18 no.5:342-349 My '63.

1. Statni vyzkumny ustav ochrany materialu G.V. Akimova, Praha (for Cihal). 2. Vyzkumny ustav uslechtilych oceli, Praha (for Jezek).

CIHAL, Vladimir; HOCH, Petr

"Steel and alloy corrosion in a gas medium at hi h temperatures" by [CSc.] Pavel Grobner. Reviewed by Vladimir Cihal, Petr Hoch. Hut listy 19 no.10:759 O '64.

1. G.V.Acimov State Instiute of Material Protection, Prague.

L 50763-65 EPF(c)/EWP(z)/EWT(b)/EWA(d)/EWP(t) JD/WB

ACCESSION NR: AP5013220 CZ/0065/65/000/002/0161/0170

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B

AUTHOR: Cihal, V. (Chigal, V.); Vanicek, O. (Vanichek, O.)

TITLE: The properties of stainless steels as determined by the precipitation processes

SOURCE: Kovove materialy, no. 2, 1965, 161-170

TOPIC TAGS: stainless steel, stainless steel property, stabilized stainless steel, corrosion, stainless steel corrosion, carbide precipitation, transpassive state

ABSTRACT: The authors trace the structural changes in stabilized stainless steels with respect to selective types of corrosion. Main consideration is given to delta ferrite and its decomposition in 1Cr18Ni9Ti steel. The electron microscope was used to advantage in the study of changes taking place in ferrite. Apart from the carbide precipitation, which initiates the ferrite decomposition, two phases, sigma and austenite, form from delta ferrite. The sigma phase in stabilized steels starts with the formation of lamellae at the grain boundaries between austenite and ferrite and spreads gradually inside the delta ferrite grains. The local change in

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ACCESSION NR: AP5013220

chemical composition during ferrite decomposition is one of the main causes of increased attack in the given type of steel in the transpassive state. The selective attack on welded joints in these steels (at the weld junction) is closely associated with these structural changes and shows up especially well during treatment with hot concentrated nitric acid.

ASSOCIATION: Statni vyzkumny ustav ochrany materialu G.V. Akimova, Prague (State Research Institute for the Protection of Materials)

SUBMITTED: 25Sep64 ENCL: 00 SUB CODE: MM

NO REF SOV: 001 OTHER: 016

Card 2/2

CIHAL, Vladimir

Problems of corrosional damage of materials in the reactors for the synthesis of ammonia. Chem prum 15 no.2:92-94 F '65.

1. State Research Institute of Material Protection, Prague.

L 21104-66 EWA(d)/EWP(t) IJP(c) JD/JG/WB

ACC NR: AP6008678 (N) SOURCE CODE: CZ/0065/65/000/005/0421/0430

AUTHOR: Tousek, Jaromir—Toushek, Yaromir; Cihal, Vladimir—Chigal, Vladimir; Prazak, Milan—Prazhak, Milan

ORG: Institute for the Properties of Metals CSAV, Brno (Ustav vlastnosti kovu CSAV); State research institute for the protection of materials G. V. Akimov, Prague (Statni vyzkumny ustav ochrany materialu)

TITLE: The problem of point corrosion of Cr-Ni steels modified by molybdenum

SOURCE: Kovove materialy, no. 5, 1965, 421-430

TOPIC TAGS: steel, austenitic steel, corrosion, corrosion resistance, molybdenum, chromium content, annealing

ABSTRACT: The resistance of austenitic Cr-Ni steels (1Cr17Ni12Mo2Ti) against point corrosion rises with increasing Mo and Cr contents and falls with increasing content of Ti. The favorable effect of molybdenum is first felt when its concentration is higher than 2%. The rising concentration of chromium in steel increases its resistance against point attack up to a specified limit. In steels subjected to solution annealing, the resistance against corrosion increases with rising Cr content up to 18%. Further increase of Cr concentration does

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not improve the resistance of these steels to point attack. Results obtained with steels which had been subjected to various heat treatments indicate that specimens which had been subjected to solution annealing (1100C/30 min/water) were maximally resistant to point corrosion. Specimens which had been only heat worked were less resistant, and the least resistant to point corrosion were the specimens annealed at 900C. Under specified conditions (0,6 N HCl + 0,4 N H_2SO_4), the zone of transpassivity on potentiodynamic curves in potential polarization of these steel specimens containing more than 15% Cr occurs. In this zone, point as well as uniform corrosion takes place. On steels containing less than 17% Cr, point attact is present even at potentials under which the reactions leading to secondary passivity, start to act. With increasing Cr content, the value of the potential under which the point attack may occur decreases. This shifting is probably caused by deposition of corroded particles and by adsorption of chromate ions on the surface of the electrode. Point corrosion ceases before the potential attains the value at which the current density in the transpassive zone attains its maximum value on steels with higher chromium content than 17—18%. On the potentiodynamic curves, the extinction of point corrosion is evident from the transient drop in current density even before secondary passivity is attained. The paper was reviewed by Karel Lobl, State research

L 21104-66
ACC NR: AP6008678

Institute for materials and technology, Prague (Statni vyzkumny ustav materialu a technologie). Orig. art. has: 6 figures and 2 tables. [ES]
[Based on author's abstract.]

SUB CODE: 11, 20/ SUBM DATE: 02Feb65/ ORIG REF: 004/ OTH REF: 001
SOV REF: 001

Card 3/3 hv

CIHAL, Vl.

The first international congress on corrosion of metals in London, April 1961. Hut listy 16 no.7:517 Jl '61.

CIHAL, Vladimir

Problem of steel corrosion under conditions of ammoniac synthesis. Hut listy 16 no.7:483-489 Jl '61.

1. Statni vyzkumny ustav ochrany materialu G.V. Akimova, Praha.

ČIHAL, V.L.

Distr: 4E2c

The formation of passive layers on chromium steels. M. Pražák, V. Pražák, and V. L. Čihal (Inst. Material Protection, Prague). *Z. Elektrochem.* 62, 739-45(1958)(English summary).—With the aid of an electronically regulated potentiostat, the authors recorded the polarization curves of steels with 0 to 35% Cr in *N* H_2SO_4. In the region of transpassivity, 2 limiting compns. were distinguished. Up to 16% Cr content, no continual corrosion occurred. Steels with 18 to 30% Cr content were continuously attacked, but exhibited secondary passivity. Steels with more than 35% Cr content were continuously attacked and did not show secondary passivity. This corrosive behavior is attributed to the properties of the corresponding oxide layers and an explanation is proposed on the basis of the formation of the cryst. structure of the oxidic layers. Qual. changes in the properties of the oxide could occur in the case of a spinell structure, when the no. of Cr ions in the spinell basic structure exceeds $^1/_4$ and $^1/_2$ of the no. of lattice positions for the trivalent cations. These limiting conditions correspond to a theoretical compn. of 16.5 or 30.7% Cr, resp., in the Fe-Cr alloy, which is in good agreement with the measured values. On the basis of these ideas, the mechanism of corrosion in the transpassive region can be explained as well as the cause of the secondary passivity, which the authors attribute to O adsorption. H. H. Jaffe

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CZECH/34-59-8-9/16

AUTHORS: Čihal, Vladimír, Candidate of Technical Sciences, Engineer
Ježek, Jaroslav, Doctor of Natural Sciences

TITLE: On the Distribution of Precipitates in Stainless Austenitic Steels

PERIODICAL: Hutnické listy, 1959, Nr 8, pp 695 - 700

ABSTRACT: In earlier work (Ref 9) the authors studied the morphology and the structure of precipitates in austenitic stainless steels by X-ray diffraction and electron structure analysis. The precipitation of the chromium carbides $Cr_{26}C_6$ proceeds at first in the shape of two-dimensional dendrites which grow to certain critical dimensions and then become transformed into more stable crystallographically perfect shapes. It was also found by one of the authors that the rejection of fine acicular carbides of titanium, which is controlled by the lower diffusion speed of titanium, is shifted towards higher temperatures (Ref 8). In this paper the authors studied the distribution of precipitates in austenitic stainless steels by means of an electron microscope. For this purpose, extraction replicas had to be used. A simplified

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method of preparation of extraction replica was applied which was described in an earlier paper of one of the authors (Ref 13). The studies were made on steel of the following composition: 0.05% C, 1.5% Mn, 0.62% Si, 18.48% Cr, 9.34% Ni. The following were studied: the carbide distribution in 18/9 steels; the effect of carbide precipitation on the sensitivity to intercrystallite corrosion and on the impact strength; Cr and Ti carbides in 18/9 steels (in an earlier paper (Ref 17) one of the authors and his team studied the precipitation of Cr and Ti carbides during delta-ferrite decomposition in titanium-stabilised steel of the following composition: 0.08% C, 1.18% Mn, 0.88% Si, 18.24% Cr, 9.25% Ni, 0.21% Mo, 0.8% Ti, 0.003% N); crystalline shape of the chromium carbide $Cr_{23}C_6$. It was found that the chromium carbides precipitate in austenitic steels in the form of discontinuous irregular networks, predominantly on one side of the grain boundaries. The morphology of carbides reproduced in the extraction replica was found to be the same as in isolated

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carbides. Extraction-replica methods can be used not only for studying the precipitation phenomena in stainless steel but also for developing new complex-alloyed high-creep-strength steels and alloys. There are 7 figures, 1 table and 21 references, of which 5 are English, 7 German, 9 Czech.

ASSOCIATIONS: Státní výzkumný ústav ochrany materiálu G.V.Akimova (State Research Institute for Protection of Materials (G.V. Akimov))
Státní výzkumný ústav materiálu a technologie, Praha (State Research Institute for Materials and Technology, Prague)

SUBMITTED: April 23, 1959

V: CiHnL

Distr: 4E2c

Differentiation of phases in metallographic etching. I. Electrolytic etching at a controlled potential. M. Pražák, V. Čihal, and M. Holinka. *Collection Czechoslov. Chem.* [redacted] 24, 9-16(1959)(in German).—See *C.A.* 53, 11851. M. Hudlický

CZECH/34-59-9-7/22

AUTHORS: Ježek, Jaroslav, Doctor of Natural Sciences,
Voboril, Josef, Engineer, Čihal, Vladimír, Engineer,
Candidate of Technical Sciences

TITLE: Nature of the Phases Occurring in the Structure of Brittle Transformer Sheet

PERIODICAL: Hutnické listy, 1959, Nr 9, pp 777-786

ABSTRACT: A comprehensive study of the changes in transformer sheet (4.34% Si, 0.02% C, 0.01% N) based on hardness measurements, thermal analysis, study by optical and electron microscopes, X-ray and electron structure analysis as well as the results of thermo-chemical analysis has shown that nitrogen is the active substance which brings about formation of brittle phases in the basic substance and at the boundary of the ferritic grains. Up to about 250°C it precipitates from the α solid solution in the form of the nitrides $Fe_{16}N_2$-Fe_4N which are embedded in the basic substance. A considerably more dangerous form of separation of a secondary phase caused by nitrogen occurs in the temperature range 250 to 700°C when the nitrides are dissolved again and diffuse, together with silicon, to the boundaries

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Nature of the Phases Occurring in the Structure of Brittle Transformer Sheet

of the ferritic grains, forming there coherent bands of precipitates consisting of Si_3N_4. After annealing at 700°C a compact phase will exist at the grain boundaries, the main composition of which is the nitride Si_3N_4. By annealing at a higher temperature this phase can be made to dissolve again in the basic substance, as a result of which the excessive brittleness of the sheet will be eliminated. On the basis of the obtained results, the following conclusions are drawn relating to the manufacture of transformer sheet: nitrogen present in transformer steel brings about the formation of nitride phases which cause inadmissible brittleness of sheet produced from such steel; such phases can be made to dissolve in the basic ferritic structure by annealing at a temperature above 800°C, followed by rapid cooling (200°C/hour) and, by doing this, it is possible to prevent excessive brittleness of such sheets. Although by so doing it is possible to bring about dissolution of the nitride phases in the basic substance, in many cases such a procedure would require special equipment, quite apart

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from the fact that dissolution of the nitride phases in the basic substance is not favourable from the point of view of the magnetic properties. Therefore, the aim should be to use such processes for manufacturing high grade transformer sheet which prevent the formation of higher nitrogen contents, i.e. in oxygen blast converters. It is possible that in the near future the use of vacuum furnaces with melting off electrodes will become an economic proposition. Acknowledgments are expressed to Engineer P. Schier, Metallurgical Institute, ČSAV, for making an electron microscope available, to J. Ševčíková for her assistance in carrying out the here described work and to Engineer H. Tůma for carrying out the thermal analysis and to Srůta for careful execution of the experimental work relating to the X-ray structural analysis. There are 13 figures, 1 table and 41 references, 6 of which are Czech, 6 German, 26 English and 3 International.

ASSOCIATIONS: SVÚMT, Prague and SVÚOM, Prague
SUBMITTED: May 13, 1959
Card 3/3

S/137/62/000/002/077/1
A006/A101

AUTHOR: Čihal, V.

TITLE: Properties of stainless and heat-resistant steels

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 2, 1962, 41, abstract 2I241 ("Korose a ochrana mater.", 1960, listop., 77 - 83, Czech.)

TEXT: A classification is presented of stainless and heat-resistant steels, of their mechanical properties, heat treatment conditions and destination. Graphs are given showing the mechanical properties as functions of heat-treatment conditions for hardening steels. A separate table contains composition, heat treatment conditions and mechanical properties of high-strength, dispersion-hardening steels. There are 32 references.

M. Shapiro

[Abstracter's note: Complete translation]

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E073/E535

18.1130

AUTHORS: Čihal, Vladimír, Engineer, Candidate of Technical Sciences, Grobner, Pavel, Ježek, Jaroslav, Doctor of Natural Sciences, Pospíšil, Rudolf, Doctor Engineer

TITLE: On the Problem of Intercrystallite Corrosion of Austenitic, Cr-Ni Steels Containing 24% Cr and 19% Ni

PERIODICAL: Hutnické listy, 1960, No 7, pp 518-524

ABSTRACT: This paper is intended to commemorate the 60th birthday of Professor Doctor of Technical Sciences Engineer Josef Teindl, Mining University, Ostrava. Intercrystallite corrosion on austenitic stainless steels is attributed by some authors to the impoverishment of the grains in chromium due to the segregation of carbides at the grain boundaries, others attribute this property to internal stresses caused by the segregated carbides. It is argued in favour of the latter view that intercrystallite corrosion occurs also in steels containing over 20% Cr in which the chromium content of the grain surface layer cannot decrease sufficiently, to be below 12%. The aim of the work

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described in this paper was to investigate the validity of this argument and to contribute to the elucidation of the problem of intercrystallite corrosion of the austenitic steel 1Cr24Ni19 (0.09% C, 0.4% Mn, 1.5% Si, 23.2% Cr, 18.7% Ni). The higher chromium content can not only prevent a reduction of the chromium content during segregation of carbides at the grain boundaries below the passivation level but, from the theoretical point of view, it should also increase the resistance of the carbides $Cr_{23}C_6$ against dissolution in austenite and thereby reduce the relative quantity of carbon in the solid solution at low austenization temperatures. The steel used in the experiments was produced in a high frequency basic furnace, cast into small ingots from which strips of 25 x 6 mm were forged after machining. On such specimens the tendency to develop intercrystallite corrosion and to separate out chromium carbides in the

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structure after precipitation annealing was investigated. The conditions of heat treatment of the individual specimens are given in Tables 5 and 6, which also contain data on the intensity of intercrystallite corrosion. In these tables "-" denotes no intercrystallite corrosion, "(+)" denotes very slight intercrystallite corrosion, "+" to "+++" means increasing intercrystallite corrosion. The specimens were first austenitized at 1100°C. Following that, they were precipitation annealed in the temperature range 500 to 850°C. To enable comparison of the influence of the austenization temperature, the remaining specimens were additionally annealed at temperatures between 950 and 1250°C with temperature steps increasing by 50°C. A number of photographs (16) are reproduced which were obtained by means of an electron microscope. The obtained results indicate that in spite of the high average chromium content, the chromium content in the

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grain boundaries may drop below the passivation level in the surface layer as a result of rejection of chromium carbides, which provides a basis for intercrystallite corrosion of this steel. This disproves the theory of intercrystallite corrosion being due to internal stresses, not only for the here investigated steel but also for the steel 1Cr18Ni9Ti(Nb), for which it was proved earlier (Refs 1 and 2) that artificially generated segregates at the grain boundaries are chromium carbides $Cr_{23}C_6$ and not titanium or niobium carbides. J. Philibert and H. Bizouard (Ref 15) have established directly by means of X-ray spectral analysis a drop in the chromium content of austenite during rejection of chromium carbides in stainless steels. They used a micro-analyser with an electron probe (Ref 16) which permits making an accurate quantitative analysis and a local identification of the structural lattice

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within a volume of 1 cubic micron. Such local analysis proved unequivocally the fact that the grain boundaries of stainless steel are impoverished in chromium in the neighbourhood of rejected carbides. This study was carried out at the State Research Institute for the Protection of Materials, G. V. Akimov, Prague, jointly with the United Steel Works in Kladno and the State Research Institute for Materials and Technology, Prague. There are 6 figures, 6 tables and 17 references, 6 of which are Czech, 1 Soviet, 2 German, 2 French and 6 English.

ASSOCIATIONS: SVÚOM, Prague (Čihal), Modřanské strojirny (Modřany Engineering Works) (Gröbner), SVÚMT, Prague (Ježek) and SONP Kladno (Pospíšil)

SUBMITTED: February 24, 1960

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81877
S/129/60/000/08/004/009
E073/E135

AUTHORS: Čihal, Vl., (Candidate of Technical Sciences), and Ježek, J., (Doctor of Technical Sciences)

TITLE: Structure and Distribution of Secondary Phases in Stainless Austenitic Steels

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, No 8, pp 17-19 (+ 2 plates)

ABSTRACT: The authors studied the morphology, structure and distribution of rejected phases in stainless steels, using X-ray and electron diffraction methods. In the experiments two titanium stabilized steels with Cr content of about 18% and Ni content of about 9.5% with Ti:C ratios of about 10:1 and 4:1, and one non-stabilized steel with a lower carbon content were chosen. The chemical compositions of the three steels are given in Table 1. All the steels were subjected to the same heat treatment, consisting of heating for one hour at 1250 °C followed by quenching in water and tempering for durations of 5 minutes to 72 hours at temperatures between 550 and 850 °C. The results of the work have shown that the rejection of chromium carbide takes place at first in the form of two-dimensional dendrites which grow to certain

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critical dimensions and then become transformed into more stable and crystallographically more perfect shapes. The rejection of thermodynamically more stable titanium carbide takes place at high temperatures due to the low diffusion speed of the titanium. The character of the titanium carbides differs from that of chromium carbides and the TiC rejections in the structure of titanium-stabilized steels consist of very highly dispersed particles of steel which can only be detected by means of electron microscope techniques. Fig 10 shows a photo of the dispersed rejections from one of the steels (X 12 000). An electron diffraction pattern of the same rejections is reproduced in Fig 11.
There are 11 figures, 2 tables and 8 references: 4 German, 3 Czech and 1 Soviet.

ASSOCIATION: Výzkumný ústav ochranu materiálu G.V. Akimova (Institute for the Protection of Materials imeni "G.V. Akimov") and Státní výzkumný ústav materiálu a technologie, Praha (Research Institute for Materials and Technology, Prague)

2442
Z/034/61/000/007/005/007
E112/E335

18.8300

AUTHOR: Číhal, Vladimír

TITLE: Contribution to the Problem of Steel Corrosion in Synthetic Ammonia Plants

PERIODICAL: Hutnické listy, 1961, No. 7, pp. 483 - 489

TEXT: A considerable amount of literature has already been published on the corrosive effects of hydrogen on the iron or steel parts in synthetic ammonia plants. Very little is known, however, about the complex action of mixed hydrogen-nitrogen gases on the steel components under the thermal and pressure conditions of the ammonia plants. The present paper summarises first the available data about the action of hydrogen and two types of effects are proposed: 1) diffusion of H-in atomic form into iron or steel and solution therein, leading to hydrogen embrittlement. Atomic hydrogen forms at high temperatures, or by thermal decomposition of ammonia at 500 °C, under the catalytic influence of iron. The deleterious effect of hydrogen embrittlement on the durability of the steel components is not considered serious; 2) the considerable destructive

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effect of hydrogen gas under high pressure is given by its reaction with carbon, i.e. decarburization, leading to the formation of methane. The latter is incapable of diffusion and causes internal stresses in the steel. Attempts were therefore made to utilise carbides of higher thermal stability, which would be immune against attack by hydrogen. Steel which had been stabilized with titanium, niobium, vanadium or zirconium showed greater resistance to corrosion by hydrogen. However, corrosive effects of nitrogen also have to be considered and some original contributions by the author to the above problem are presented: molecular, dry and pure nitrogen is inert towards a large number of metals and alloys. Atomic nitrogen, on the other hand, can react with certain types of steel and produce serious corrosion problems. The source of atomic nitrogen may be, under certain conditions, ammonia, which will decompose under the catalytic effect of iron at 400 - 600 °C with the formation hydrogen and mono-atomic nitrogen. The latter will also diffuse into the iron lattices and produce nitrides. Temperature conditions of the ammonia synthesis are considered very favourable

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for the splitting of the nitrogen molecule and the formation of nitride corrosion. The great ease of nitride formation from chromium and atomic nitrogen is discussed. The embrittlement of heat-resistant Cr-Mo-steels at elevated temperatures through nitridation is considerably higher than with carbon steels. Tests with a medium chromium-steel under synthetic ammonia-plant conditions showed considerable blister- and crack-formation. Steels with chromium contents higher than 11-12% gave a better result: the nitride layer was considerably thinner, very hard, compact and without fissures. The formation of nitrides in titanium-stabilized steels was investigated and this was found to be of considerable importance in view of the protective effect of titanium against hydrogen corrosion. Results indicated a great stability of the titanium-carbon bond, which was not attacked and cleaved by nitrogen. A systematic study of different Czechoslovak steels was then undertaken in a low-pressure ammonia converter and in a high-pressure laboratory equipment. Damage by corrosion was assessed by studying changes in mechanical properties, and measuring hardness and its

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distribution across the cross-section of a test specimen. The materials were analysed for hydrogen, nitrogen and loss of carbon. Results are summarised in the form of a diagram showing: a) depth of penetration of hydrogen corrosion and b) total thickness of the nitride layer. The tests comprised 18 Czechoslovak steels, the compositions of which are given in Table 1 ("až" means "to"). The following conclusions are drawn from the results. The corrosion-resistance of steels can be improved by the presence of carbon in the form of carbides of higher thermal stability. Chromium-molybdenum steels which are resistant to hydrogen in hydrogenation processes are prone to excessive nitridation, leading to cracks, when used under conditions of synthetic ammonia plants. In medium chromium-steels diffusion of nitrogen and nitridation will disturb the equilibrium between the carbide Cr_7C_3 and hydrogen, and lead to a decreased stability. Titanium, niobium, etc. on the other hand, form carbides of very high thermal stability which are not decomposed by further nitridation. A correct proportion of titanium is, however, essential, because higher concentrations

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will produce very strong nitridation and embrittlement. Stainless austenitic steels proved to be the most suitable. There are 6 figures, 1 table and 27 references: 7 Czech and 20 non-Czech. The four latest English-language references quoted are: Ref. 11 - G.C. van Ness, B.F. Dodge - Chem.Eng. Progress 51, 1955, pp. 266-271; Ref. 19 - J. Ježek, J. Voboril, Vl. Číhal - J. Iron and Steel Inst., 195, 1960, pp. 49 - 55; Ref. 21 - F.D. Richardson - J. Iron and Steel Inst., 1953, pp. 33-51; Ref. 22 - J. Pearson, U.J.C. Ende - J. Iron and Steel Inst., 175, 1953, pp. 52-57.

ASSOCIATION: Státní výzkumný ústav ochrany materiálu G.V. Akimova, Praha (G.V. Akimov State Research Institute for the Protection of Materials, Prague)

SUBMITTED: April 20, 1961

N.B. The use of titanium stabilized steels is the subject matter of the Czechoslovak Patent No.92 526, 1957.

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24144
Z/034/61/000/008/001/005
E073/E335

18.1130

AUTHORS: Vyklický, Miloslav, Löbl, Karel, Kabrhel, Adolf, Tůma, Hanuš, Čihal, Vladimír and Pražák, Milan

TITLE: Influence of Molybdenum and Copper on the Properties of Stainless Chromium

PERIODICAL: Hutnické listy, 1961, No. 8, pp. 553 - 560

TEXT: According to data published in the literature (Ref. 2 - Copper in Cast Steel and Iron. Copper Development Association, London), high-alloy chromium steels containing 2-3% Si and 1.5-2% Cu have a high resistance to alum and are extensively used in the food-processing industry. An increased C content in chromium steels reduces their resistance to corrosion, particularly after unsuitable heat-treatment. However, low-carbon chromium steels cause difficulties in the manufacture of castings of complex shapes. Therefore, higher C contents are used and the unfavourable influence of the C content is compensated by adding Cu. Although the effect of Mo on chromium steels is known, the authors are not aware of any published information on the combined influence of Cu and Mo

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on the properties of chromium steels. This is in spite of the fact that such steels are being manufactured, for instance - the Czech steel Poldi-AK1BC (chemical composition: 0.12% C, 0.50% Mn, 0.25% Si, 16.15% Cr, 0.20% Mo and 1.75% Cu) and the ferritic chromium steel for use in the chemical industry, containing 0.6-0.8% C, max. 0.7% Mn, max. 2% Si, 28.0 - 30.0% Cr, 2.0 - 2.5% Ni, 2.0 - 2.5% Mo and 2.0% Cu. The authors considered it interesting to investigate the influence of Cu and Mo on the properties of chromium steel and this paper contains the results of these investigations. A total of 11 heats was produced with chemical compositions varying between the following limits: C 0.6 - 0.11%; Cu 0 - 6.11%; Cr 14.58 - 26.6% and Mo 0 - 3.91%. The heats were produced in a 20-kg high-frequency furnace, using as a charge low-carbon steel, low-carbon ferrochromium, low-carbon ferromolybdenum and copper. Of the mechanical properties only the hardness was measured. In agreement with data published in the literature, heats with higher copper contents showed a higher hardness, both

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Influence of Molybdenum ....

in the as-cast and in the annealed states; metallographic tests showed that addition of Cu brought about pronounced structural changes. The corrosion tests were carried out in a number of corrosive media, subdivided into the following groups:

A. Media with free SO_2

1. H_2SO_3; 2%; 20 °C
2. $NaHSO_3$; 5%; 20 °C

B. Organic oxides

3. lactic acid; 10%; 20 °C
4. oxalic acid; 10%; 80 °C
5. citric acid; 10%; 80 °C
6. tartaric acid; saturated solution; 80 °C
7. acetic acid; concentrated; 80 °C

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C. Inorganic non-oxiding acids

8. hydrochloric acid; 8%; 20 °C
9. phosphoric acid; 65%; 80 °C

D. Inorganic Oxiding acids

10. nitric acid; 65%; 80 °C .

A detailed analysis allowed grouping the time dependence of the weight loss due to corrosion into three basic groups: linear dependence (in hydrochloric acid and, in some cases, also in nitric acid at 80 °C); parabolic dependence with steepness increasing with time ($NaHSO_3$ solution) and, finally, corrosion rate decreasing with time and characterised by a curve which flattens out. The corrosion tests have shown that steel containing 25% Cr, 2% Mo and 2% Cu had the highest resistance to corrosion, which almost equalled the Czech steel ČSN 17241. This type of steel was not investigated in the group of the 17% chromium steels. In the latter steel,

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Influence of Molybdenum ....

Mo improved the resistance to corrosion in solutions with free SO_2 , whilst Cu improved the resistance to corrosion in organic acids. On the basis of laboratory results, SONP Kladno produced two 50-kg heats in a high-frequency furnace with chemical compositions which proved the most favourable in the laboratory tests. The compositions of these heats (in %) were as follows:

Heat	C	Mn	Si	P	S	Cr	Mo	Cu
A 3829	0.13	0.53	0.37	0.019	0.021	15.52	2.05	2.01
B 3830	0.10	0.54	0.30	0.026	0.017	24.75	1.75	1.95 .

The ingots from both heats were forged into 250 x 600 x 20 mm blanks and then rolled down to 1 mm thick sheet. These hot-rolled sheets were then used in mechanical and corrosion tests and in weldability tests. The most favourable heat-treatment for these steels proved to be the following:

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2414

Z/034/61/000/008/001/005
E073/E335

Influence of Molybdenum ....

Heat A ... 800 °C/0.5 hrs/air
" B ... 900 °C/0.5 hrs/air.

The mechanical properties of thus heat-treated steels do not differ substantially from the properties of semiferritic steels containing 17% Cr (ČSN 17041). After this heat-treatment, both heats proved satisfactory in double-bending tests; in Erichsen tests both heats achieved the value of 7.9 mm. Welding tests were carried out by arc-welding in an argon atmosphere; the weldability of Heat A was better than that of Heat B. Potentiostatic polarisation curves were determined to obtain information on the corrosion behaviour of the steels. The following conclusions were reached: Additions of 2% Mo and 2% Cu proved the most suitable. The resistance-to-corrosion of steels with 17% Cr, 2% Mo and 2% Cu is higher than the resistance-to-corrosion of the same type of steel without Mo and Cu. Very good results were obtained with steel containing 25% Cr and an addition of Mo and Cu which, for most corrosive

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Influence of Molybdenum ....

media, will have the same resistance-to-corrosion as the austenitic CrNi steel ČSN 17241. According to the achieved results, the steel with the lower Cr content can be used for less aggressive corrosion media and in cases in which the steel ČSN 17041 cannot be used owing to its lower resistance-to-corrosion or its poor weldability. Steel with a higher Cr content (Heat B) can be used as a substitute for the steel ČSN 17241 but the plasticity and weldability of this material are not as good as those of steel ČSN 17241.
There are 17 figures, 7 tables and 12 references: 6 Czech and 6 non-Czech. The four English-language references quoted are: Ref. 1 - Loring - Metals Handbook, pp. 462 - 465; Ref. 2 - (quoted in text); Ref. 3 - Saklatwalla - Dammler, Trans. Am. Soc. Steel. Treat. 15, 1929; Ref. 4 - Daniloff - The Alloys of Iron and Copper. New York and London, 1934.

Card 7/8

24144

Z/034/61/000/008/001/005
E073/E335

Influence of Molybdenum ....

ASSOCIATIONS: Státní výzkumný ústav materiálu a technologie v Praze (State Research Institute for Materials and Technology, Prague)
Státní výzkumný ústav ochrany materiálu G.V. Akimova v Praze (G.V. Akimov State Research Institute for the Protection of Materials, Prague)

SUBMITTED: November 28, 1960

Card 8/8

37476
S/129/62/000/005/010/011
E073/E535

18.1130

AUTHORS: Vyklický, M., Pražák, M., Čížal, V. (Czechoslovakia)

TITLE: Influence of alloying elements on the properties of austenitic stainless steels

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no. 5, 1962, 52 - 53

TEXT: By analyzing the potentiodynamic polarization curves the influence of molybdenum, copper, tungsten and silicon was investigated (individually and in various combinations) on the corrosion-resistance of Cr-Ni austenitic stainless steels, containing 18 - 22% Cr and 21 - 30% Ni. The polarization curves were recorded at room temperature for a 1 mole solution of hydrochloric acid with 0.01% KCNS added. The following were applied as a criterion of the resistance-to-corrosion: the width of the zone of immunity and the magnitude of the electrochemical potential. It was found that an increase in the nickel content within the investigated limits did not have an appreciable influence on the active state of type X20H5 (Kh20N5) steels,

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Influence of ....

alloyed with silicon, molybdenum and copper. The positive electrochemical potential increased with increasing contents of molybdenum and the range of immunity broadened. Copper had the same influence but to a somewhat lesser extent. Tungsten had no influence on the immunity range and increased only slightly the potential of the active range. After laboratory investigations, experimental heats were produced of the steel X24H20 (Kh24N20), which were alloyed with molybdenum and copper. Specimens of these heats were tested for corrosion-resistance in hydrochloric acid for durations of 480 hours. The steel alloyed with 3% Mo and 3.5% Cu showed the highest resistance-to-corrosion; it was higher than that of the steel type X21H38M5T (Kh21N38M5T). Sheets 1 and 3 mm thick were produced from the new steel and tested in 14 different media, including hydrochloric and sulphuric acids, at various concentrations and temperatures. The resistance-to-corrosion of

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Influence of ....

this steel in these media was considerably higher than that of the steel Kh18N9M2 (Kh18N9M2) and slightly better than that of the steel Kh21N38M2T (Kh21N38M2T). The new steel is very stable against intercrystallite corrosion.

[Abstracter's note: this is a complete translation.]

4

Card 3/3

3282

Z/034/62/000/005/005/007
E073/E535

18.1150

AUTHORS: Čihal, Vladimir, Engineer, Candidate of Sciences and Kubelka, Jiri

TITLE: Research on economy steels for operation in a medium of synthesis gas in the manufacture of ammonia

PERIODICAL: Hutnické listy, no.5, 1962, 369

TEXT: The report is a continuation of the work reported in 1960 on the mechanism of corrosion of steels in the synthesis of ammonia (Research Report SVÚOM No.23/60) and deals with the study of the properties of tungsten-titanium and possibly nickel-titanium steels. Since none of the experimental heats of the stabilized steels suffered from hydrogen corrosion (the tests with the synthesis gas were at a pressure of 900 atm and a temperature of about 500°C), main attention was paid to the investigation of nitriding from the point of view of the contents of alloying elements. Within the range of 0.5 to 5%, tungsten and nickel have no influence on the tendency of titanium stabilized steels to become nitrided. The intensity of nitriding is decisively influenced by the content of uncombined titanium in the steel. If

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the steel has a minimum content of free titanium, there is no longer any danger of nitriding and gradual embrittlement of the surface. The mechanical properties of the steel under normal temperature are influenced primarily by the nickel. The creep strength is favourably influenced by a higher content of tungsten (4.0 to 5.5% W). The influence of titanium is interesting; a high, above stoichiometric, titanium content is unfavourable from the point of view of creep strength. Exploratory tests of weldability, carried out with the cooperation of ŽAZ Vamberk, verified the suitability of the proposed electrode which produces a niobium alloyed weld metal. For getting more precise information on the optimum composition of stabilized economy steels for the synthesis of ammonia, the minimum and maximum contents of titanium with respect to the carbon content will be investigated next, both from the point of view of hydrogen corrosion and nitriding.

Research Report SVÚOM 33/61
16 pages, 13 fibures, 6 tables.

[Abstractor's note: Complete translation]

36181

Z/034/62/000/005/004/007
E073/E535

18.1150

AUTHORS: Pražák, M., Engineer, Čihal, Vl., Engineer, Candidate of Science and Měchura, J., Engineer

TITLE: Influence of chromium, nickel, molybdenum, copper and tungsten on the electrochemical, corrosion and mechanical properties of austenitic stainless steels

PERIODICAL: Hutnické listy, no.5, 1962, 369

TEXT: The report contains data for formulating [developing] highly corrosion-resistant austenitic steels for the chemical industry with economic contents of alloying elements which can be used as an equivalent, from the corrosion point of view, of the steel ČSN N7 252. On the basis of potentiostatic and corrosion tests, the quantitative relations were determined between the contents of the alloying elements and their influence on the corrosion properties of the steels in H_2SO_4 and HCl media. It was found that the economic nickel content is in the range of 16 to 20%. In more concentrated acids in the hot state molybdenum has a favourable effect only from contents of 5% onwards; however, in combination with copper (1 to 3%) molybdenum has a favourable

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effect even from 1% onwards. The very favourable effect of copper from the point of view of corrosion was confirmed. From the point of view of the mechanical properties of the steel at normal temperature, copper has an unfavourable effect from contents of 2.2% onwards and on hot forming from 2.5% onwards. On the example of experimental heats of the steels types 1Cr18Ni16Mo3Cu2 and 1Cr16Ni16Mo8 it was verified that in combination with data on the structural, technological and price effects of alloying elements, the established relations can be applied as a basis for developing economical types of corrosion-resistant steels with predetermined corrosion properties.
Research Report SVÚOM No.30/61
25 pages, 20 figures, 7 tables.

[Abstractor's note: Complete translation]

30175

Z/032/62/012/004/002/007
E073/E535

18.1130

AUTHORS: Čihal, V., Pražák, M. and Měchura, J.

TITLE: Influence of some alloying elements on the properties of austenitic stainless steels

PERIODICAL: Strojírenství, v.12, no.4, 1962, 283-287

TEXT: For estimating the corrosion properties of various materials, potential polarization curves were used, recorded by means of a potentiostat in accordance with a method published earlier by the authors. So far, the results obtained by means of this method cannot be transformed directly into weight losses in ordinary corrosion tests and therefore the method is suitable only as a basis for comparison. The influence of increasing quantities of copper, molybdenum, tungsten and nickel in steels containing 18% Cr and 9 to 12% Ni on the characteristic values of the polarization curves in the range of immunity and activityy on the resistance to corrosion, the mechanical properties and ductility were investigated on material produced in a 10 kg capacity high-frequency laboratory furnace. 2 kg ingots were pre-heated to 500-600°C for one hour and then forged by means of a steam hammer

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into 18 to 20 mm diameter rods. In addition to measuring the electrochemical values, corrosion tests were made on the same steels using a 10% solution of HCl at 20°C, a 10% boiling H_2SO_4 and concentrated nitric acid at boiling temperature. The authors proved a definite correlation between the measured electrochemical values and the corrosion properties of the tested steel. Molybdenum proved to be a favourable element except as regards resistance to oxiding agents. Copper and nickel have a positive influence on the values characterizing the resistance to corrosion in the active state. Tungsten increases slightly the tendency of steel to become passive and in some cases also increases the resistance in the active state. Of interest is the considerable influence of tungsten on suppressing the corrosion current in the passive state. Within the investigated concentrations, molybdenum and tungsten showed a considerable influence on the mechanical properties, whilst copper had a considerable influence on the hot forming properties. There are 12 figures and 1 table.

ASSOCIATION: SVÚOM, Prague

MITURA, Karel; CIHAL, Vladimir

Lead leakage through the bottom of boilers during lead manufacture and refining. Hut listy 19 no. 3:195-201 Mr '64.

1. Vitkovicke zelezarny Klementa Gottwalda, Ostrava (for Mitura). 2. V.G Akimov State Research Institute of Material Protection, Prague (for Cihal).

L 34926-66 EWP(j)/EWP(k)/T/EWP(t)/ETI IJP(c) JD/WW/HW/WB/RM

ACC NR: AP6026629 SOURCE CODE: CZ/0034/66/000/004/0259/0265

37
B

AUTHOR: Cihal, Vladimir (Docent; Engineer; Candidate of sciences); Zidek, Milan (Docent; Engineer; Candidate of sciences)

ORG: [Cihal] G. V. Akimov State Research Institute for Protection of Materials, Prague (Statni vyzkumny ustav ochrany materialu G. V. Akimova); [Zidek] Klement Gottwald Vitkovice Iron Works, Ostrava (Vitkovicke zelezarny Klementa Gottwalda)

TITLE: Workability and corrosion resistance of steels of the type 1Cr18Ni12Mo2Ti

SOURCE: Hutnicke listy, no. 4, 1966, 259-265

TOPIC TAGS: corrosion resistant steel, austenitic steel, metal grain structure, alloy steel

ABSTRACT: The hot workability of the steels of the described type decreases when the amount of ferrite in the basic austenitic structure reaches 15%. So that a suitable structure of the grains would be obtained Cr content should be minimized; however, corrosion resistance requires a graduated content of Cr up to 17-20%. When the steel containe 2% Mo a minimum Ni content of 11-12% is needed. Results of corrosion tests in sulfuric acid, hydrochloric acid, sulfite liquor, and bleaching liquor are reported. Orig. art. has: 7 figures and 1 table. [Based on authors' Eng. abst.] [JPRS: 36,846]

SUB CODE: 11, 13 / SUBM DATE: none / ORIG REF: 006 / SOV REF: 002
OTH REF: 002

Card 1/1 ULR UDC: 669.15.24

0916 2312

CIHAL, Zdenek, promovany ekonom

Some experiences in the control of action plans of the Northwest Railroad. Zel dop tech 11 no.10:285-286 '63.

KALVODA, Frantisek, kapitan, prom. lekar; CIHALIK, Coutmir, podplukovnik, MUDr.;

Farmer's lung as a little-known form of acute pulmonary disease. Voj. zdrav. listy 34 no.5:205-206 O '65.

1. Vojenska nemocnice v Olomouci, vnitrni oddeleni (nacelnik pplk. MUDr. Coutmir Cihalik).

CZECHOSLOVAKIA UDC 616.233-002.2

KALVODA, Frantisek; CIHALIK, Cestmir; FRANEK, Bohuslav; Military Hospital (Vojenska Nemocnice), Olomouc, Internal Department (Vnitrni Oddeleni) Head (Nacelnik) Dr Cestmir CIHALIK.

"Chronic Bronchitis."

Prague, Vojenske Zdravotnicke Listy, Vol 35, No 6, Dec 66, pp 256-260

Abstract: Problems met during the treatment of chronic bronchitis are reviewed. It is suggested that Fletcher's clasification should be used generally to obtain uniform evaluation of the disease. Differences between bronchitis chronica asthmoides, and b.c. asthmatica are discussed. The origin of the two diseases is described. The etiology and the treatment of chronic bronchitis are evaluated. 1 Figure, 5 Tables, 7 Western, 13 Czech references.

1/1

CA Cihalik, J.

1

Bromometric determination of arsenic and antimony. R. Přibil and J. Čihalík (Charles Univ., Prague). *Chem. Listy* **44**, 224–6(1950); cf. *C.A.* **44**, 5758*d*.—Arsenic and Sb are both oxidized by $KBrO_3$ in acidic soln. In the presence of ICl As is titrated preferentially. A sample of As and Sb(III) is acidified with HCl so as to contain 25–30 ml. concd. HCl in 100 ml. soln., 10 ml. of 0.005 *M* ICl is added, and the soln. is titrated with 0.1 *N* $KBrO_3$. H_2SO_4 interferes slightly at concns. higher than 10 ml. per 100 ml. of soln., and it is recommended that the excess be neutralized. The method is suitable for detg. As and Sb in alloys.

M. Hudlický

Cihalik, J.

6

V. Complexometric titrations in pharmaceutical analysis. J. Ribul, J. Cihalik, L. Doležal, V. Simon, and J. Zýka. *Sborník Celostátní Přednášek Konf. Anal. Chemiků* 1, 217–20 (1959)(Pub. 1953); cf. *C.A.* 49, 2035*e*.—Zn, Mg, and Cu salts are directly titrated in solns. contg. sufficient NH_4Cl and NH_4OH with di-Na ethylenediaminotetraacetate (I) with Eriochrome Black T as an indicator. Hg and Al salts are dissolved in excess of I. The unreacted I is titrated with $ZnSO_4$. Nicholas Feldman

4

CIHALIK, J.

Navody ke cvicenim z analyticke chemie pro pokrocile. J. Cihalik /et al. Vyd. 1./ Praha, Statni pedagogicke nakl., 1953. 153 p. (Ucebni texty vysokych skol) /Instructions for exercises in analytic chemistry for advanced students. diagrs./

SO: Monthly List of East European Accessions/ Vol. 3, No. 3 Library of Congress, March 1954, Uncl.

CIHALIK, J.

Chemical & Met.
Vol. 48 No. 6
Mar. 25, 1954
Pharmaceuticals, Cosmetics, Perfumes

9 (2) Chem

The determination of thiopental by the titration of silver [redacted] J. [redacted] et al. (Univ. Prague). Casopis. Lekarnictva. 3, 25-7(1953).—Na thiopental was estd. by $AgNO_3$ polarometrically, potentiometrically, and gravimetrically. The best results were obtained by the polarometric titration (Ag or Pt indicator electrode) or by the gravimetric estn.
D. Hubíková

4/5/54
BW

CIHALIK, JAROSLAV

Chemical Abst.
Vol. 48 No. 6
Mar. 25, 1954
Inorganic Chemistry

(6)

Polarographic and polarometric study of some noble metals. III. Complexes formed by palladium and gold in solutions of certain amines. Oldřich Tomíček, Jaroslav Cihalík, Jan Doležal, Vladimír Simon, and Jaroslav Zýka (Charles Univ., Prague, Czech.). *Chem. Listy* 47, 363-6 (1953); cf. *C.A.* 47, 4243*e*.—The behavior of the Au^{+++} and Pd^{++} ions in Et_3NH, $H_2NCH_2CH_2NH_2$, $NH(CH_2CH_2NH_2)_2$, $N(CH_2CH_2OH)_3$, $C_4H_{12}N_4$, and $H_2NCH_2CH_2NH_2.HOCO(CHOH)_2COOH$ (I) solns. has been studied. For the polarographic detn. of Pd in the presence of Au, the 1 *M* soln. of I is recommended. E. Erdős

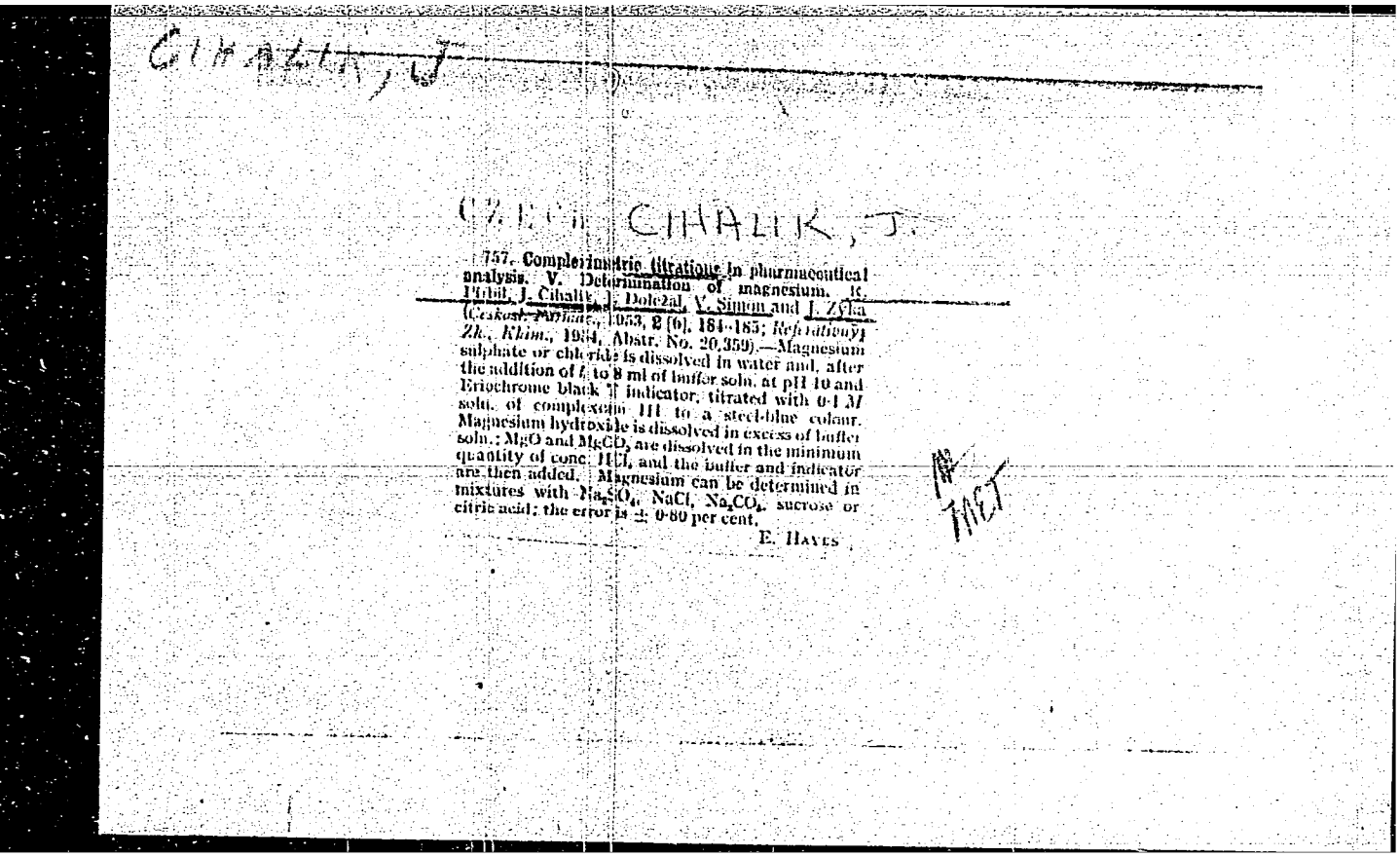
11-5-54

CIHALIK, Jaroslav

Chemical Abst.
Vol. 48
Apr. 10, 1954
Electrochemistry

6 13

Polarographic and polarometric study of some noble metals. IV. Polarographic behavior of gold and palladium in solutions of ethylenediamine tartrate. Přemysl Beran, Jaroslav Čihalík, Jan Doležal, Vladimír Šimon, and Jaroslav Zýka (Karlova univ., Prague, Czech.). *Chem. Listy* 47, 1300–14(1953); cf. *C.A.* 46, 3182h.—The half-wave potential of complex Au^{3+} ions depends on the concn. of ethylenediamine tartrate. The tartrate anion does not take part in the Au^{3+} complex (I) formation. I is suppressed by the presence of Cl^- ions. The $\pi_{1/2}$ of complex Pd^{++} ions is −0.65 v. against the satd. Hg_2Cl_2 electrode. The formation of the Pd^{++} complex is substantially faster than that of I. V. Polarographic behavior of gold, palladium, and other metals in complex-forming electrolytes. *Ibid.* 1315–22.—The polarographic behavior of Au, Pd, Pb, Cd, Cu, Bi, As, Sb, Sn, W, Mo, U, Fe, Cr, Co, Ni, Mn, and Zn in various mixts. of ethylenediamine tartrate with the complexons I, II, and IV (*C.A.* 46, 10960d) is summarized in a table of half-wave potentials and in a chart of polarographic spectra. Au, Pd, and other components of dental alloys can be detd. simultaneously. E. Erdős



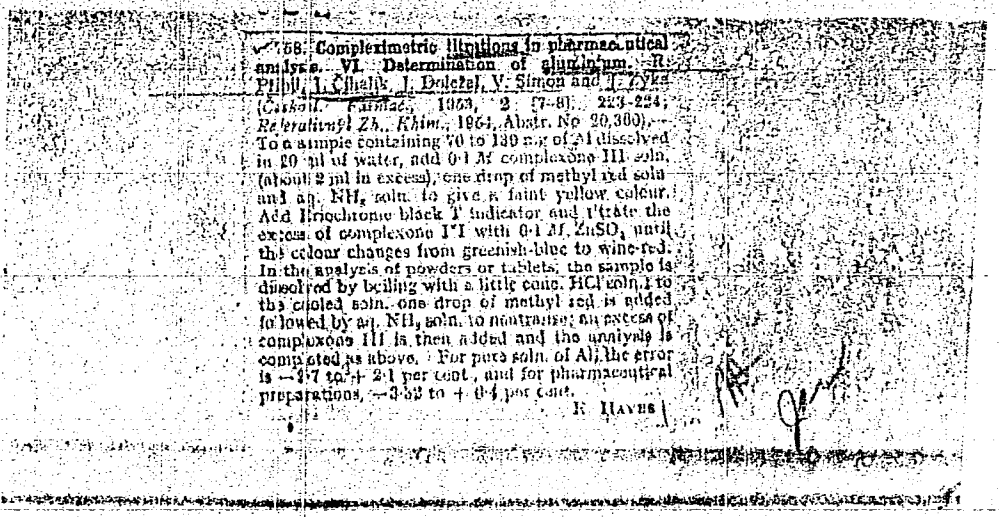
Chalik, J.

CZECH CHALIK, J.

757. **Complexometric titrations in pharmaceutical analysis. V. Determination of magnesium.** K. Ulbit, J. Chalik, J. Dolejal, V. Simon and J. Zyka (*Ceskoslov. Farmac.*, 1953, **2** [6], 184–185; *Referativnyi Zh., Khim.*, 1954, Abstr. No. 20,359).—Magnesium sulphate or chloride is dissolved in water and, after the addition of 5 to 8 ml of buffer soln. at pH 10 and Eriochrome black T indicator, titrated with 0·1 *M* soln. of complexon III to a steel-blue colour. Magnesium hydroxide is dissolved in excess of buffer soln.; MgO and $MgCO_3$ are dissolved in the minimum quantity of conc. HCl, and the buffer and indicator are then added. Magnesium can be determined in mixtures with Na_2SO_4, NaCl, Na_2CO_3, sucrose or citric acid; the error is ± 0·80 per cent.

E. Hayes

CHALK, J.



✓768. Compleximetric titrations in pharmaceutical analysis. VI. Determination of aluminium. R. Přibil, J. Chalk, J. Doležal, V. Šimon and J. Zýka (Českosl. Farmac., 1963, 2 [7–8], 223–224; *Referativnyĭ Zh., Khim.*, 1964, Abstr. No. 20,300).—To a sample containing 70 to 130 mg. of Al dissolved in 20 ml. of water, add 0·1 *M* complexone III soln. (about 2 ml. in excess), one drop of methyl red soln. and aq. NH_3 soln. to give a faint yellow colour. Add Eriochrome black T indicator and titrate the excess of complexone III with 0·1 *M* $ZnSO_4$ until the colour changes from greenish-blue to wine-red. In the analysis of powders or tablets, the sample is dissolved by boiling with a little conc. HCl soln. To the cooled soln. one drop of methyl red is added followed by aq. NH_3 soln. to neutralise; an excess of complexone III is then added and the analysis is completed as above. For pure soln. of Al, the error is −2·7 to + 2·1 per cent., and for pharmaceutical preparations, −3·33 to + 0·4 per cent.

R. HAVRS

Cihalik, J.

Complexometric titrations in pharmaceutical analysis. R. Přibil, J. Čihalík, J. Doležal, V. Simon, and J. Zýka (Charls Univ., Prague). *Pharmazie* 8, 561-72(1953).—A review with 14 references. G. W. Hargreaves

Cihalik, J.

CZECH

2541. Complexometric titration in pharmaceutical analysis. VII. Determination of lead. R. Přibil, J. Cihalík, J. Doležal, V. Šimon and J. Zýka. *Českosl. Farmac.*, 1954, 3 (3), 84–85; *Referativnyĭ Zh., Khim.*, 1954, Abstr. No. 46,824).—Lead in determined in $(CH_3COO)_2Pb.3H_2O$, PbO, $2PbCO_3.Pb(OH)_2$, lead plasters and ointments containing lead compounds by treatment with an excess of EDTA (disodium salt) and titration of the excess with $ZnSO_4$ soln. A sample of a pure lead compound (50 mg) or of a lead-containing pharmaceutical preparation (0·2 to 0·5 g) is dissolved in 5 to 10 ml of 0·1 *M* EDTA (disodium salt) soln. and diluted to 20 ml; 5 ml of aq. NH_3 - NH_4Cl buffer soln. (pH 10) and Eriochrome black T indicator (mixture with NaCl, 1 + 200) are added and the solution is titrated with 0·1 *M* $ZnSO_4$ soln. until the colour changes to wine-red.

E. Hayes

C. ČIHALÍK J.

CZECH

Polarographic and polarometric study of some noble metals. VI. Selective polarographic determination of gold. J. Čihalík, J. Doležal, V. Šimon, and J. Zýka (*Chem. Listy*, 1954, 48, 28–37).—A selective polarographic determination of Au is possible by using 0·5—1 M-ethylenediamine tartrate and 0·1 M-$Na_4P_2O_7$ as electrolyte. The reduction of Au^{+++} in this medium on the dropping Hg electrode (*vs.* standard calomel electrode) is characterised by a diffusion-controlled wave ($E_{\frac{1}{2}}$ = −0·02 v.), its height being a linear function of Au concn. Au can be selectively determined in the presence of Cu^{++}, Bi^{+++}, Fe^{+++}, Pb^{++}, UO_2^{++}, Pd^{++}, Ce^{++++}, Sb^{+++}, Cd^{++}, Tl^{+++}, Mo^{++++}, Ni^{++}, Te^{++++}, Se^{++++}, W^{++++} and Zn^{++}. The simultaneous determination of some of these metals is possible, if their concentrations are approx. equal. A graph of polarographic spectra is given. G. Gerasch

CIHALIK, J.; DOLEZAL, J.; Simon, V.; SERY, V.; ZYKA, J.

Polarometric titration in pharmaceutic analysis. 7. Determination of cyanides in aqua laurocerasi. Cesk. farm. 3 no.4:136-137 Ap '54.

1. Z Ustavu pro chemii analytickou Karlovy university v Praze.
(CYANIDES, determination,
*polarometric titration, in aqua laurocerasi)

CIHALIK J.

PRIBIL, R.; CIHALIK, J.; DOLAZAL, J.; SIMON, V.; ZYKA, J.

Complexometric titration in pharmaceutic analysis. VII. Determination of insulin zinc. Cesk. farm. 3 no.7:242-244 Sept 54.

1. Z Ustavu pro chemii analytickou Karlovy university v Praze.
Z Vyzkumneho ustavu pro farmacii a biochemii v Praze.
(INSULIN, determination,
zinc insulin, complex titration)

ČIHALÍK, JAROSLAV

10

(5)

Polarographic and polarometric study of some noble metals. VI. Selective polarographic determination of gold. Jaroslav Čihalík, Jan Doležal, Vladimír Šimon, and Jaroslav Zýka (Karlova Univ., Prague, Czech.). *Chem. Listy* 48, 28–31(1954); cf. *C.A.* 48, 3813*f*.—The 0.6*M*-ethylenediamine tartrate and 0.1*M*-$Na_4P_2O_7$ soln. is a suitable electrolyte for the selective detn. of Au. Some other metals can be detd. simultaneously. A graph of polarographic spectra and a table of half-wave potentials of 22 metals in this soln. are given. E. Erdös

CIHALIK, J.

CZECH

Use of complexons in chemical analysis. XLIV. Iodometric determination of higher oxides of lead and manganese. Rudolf Přibil and Jaroslav Cihalík (Karlova Univ., Prague). *Chem. Listy* 49, 61–4(1955); cf. *C.A.* 48, 13529a.—A simple iodometric method for detg. Pb and Mn oxides is based on the reduction of the oxides with KI in the presence of complexon, which prevents the formation of insol. products like PbI_2 and forms Fe and Cu complexes which do not react with KI. To det. PbO_2, weigh 0.2 g. (0.03–0.05 g. for semimicrodetn.) PbO_2, add 1.5–3 g. (0.5 g.) freshly dissolved KI, 10–15 ml. (2–5 ml.) 0.1*M* complexon, and 10 ml. (5 ml.) 5% AcOH. Stir 2–5 min. mechanically or 15–20 min. magnetically until the sample dissolves, dil., and titrate I with 0.05–0.1*N* $Na_2S_2O_3$. To det. PbO in PbO_2, add a known amt. 0.1*M* complexon, and after finished titration with $Na_2S_2O_3$, neutralize with NH_3 to methyl orange, add 2 ml. of a buffer (54 g. NH_4Cl and 350 ml. 25% NH_3 in 1 l.), Erichrome Black T, and titrate excess complexon with $MgSO_4$ from blue to red-wine. The amt. of complexon consumed gives the total Pb content. If the sample contains traces of Cu, Zn, etc., KCN is added before retitration. To det. MnO_2, weigh 50 mg., add 10 times the wt. KF, 10 ml. 0.1*M* complexon, 0.5 g. NaOAc, 10 ml. 5% AcOH, stir 10–15 min., dil., and titrate I with $Na_2S_2O_3$.

M. Hudlický

ČIHALÍK, JAROSLAV

CZECH

Use of iodine chloride in analytical chemistry. I. Determination of iodides, thiosulfates, sulfites, and ferrocyanides. Jaroslav Čihalík and Draholmit Vavrečnová (Karlova Univ., Prague). *Chem. Listy* 49, 663–9(1955).—Volumetric soln. of 0.1*N* ICl was prepd. as follows: Dissolve 11.07 g. KI in 50 ml. H_2O, add a soln. of 7.124 g. KIO_3 in 250 ml. H_2O and immediately 200 ml. concn. HCl (purity, no free Cl nor Fe^{+++}), and dil. to one l. The color of the soln. is light-orange, and the potential against the calomel electrode 750 mv. The soln. was used for potentiometric titration of I^- even in the presence of excess Br^- or Cl^-, for the detn. of $S_2O_3^{--}$, indirect detn. of SO_3^{--} (by titrating excess ICl with AsO_3^{---}), and for potentiometric titration of $Fe(CN)_6^{4-}$. M. Hudlický

Chalik, J.

3317. Use of iodine chloride in analytical chemistry. II. Determination of arsenic, antimony and tin. J. Chalik (Karlova Univ., Prague, Czechoslovakia). Chem. Listy, 1955, 49 (5), 1167–1175.—

[illegible] is a suitable reagent for the volu-

[illegible] starch soln. The Na$_2$S$_2$O$_3$ can be replaced by Na$_2$HPO$_4$ or Na$_2$B$_4$O$_7$. Antimony and Sn are determined similarly. G. GLASER

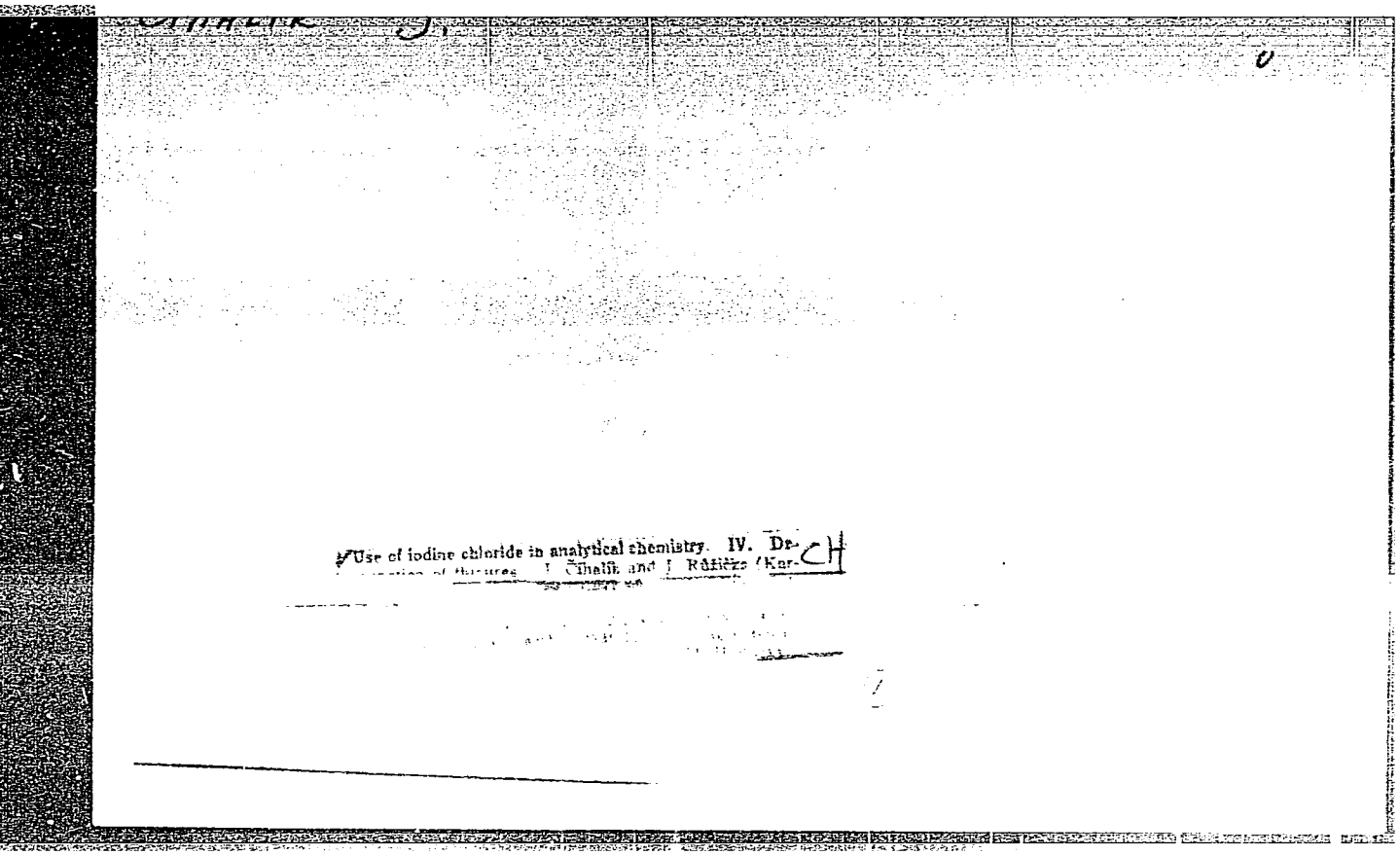
CHALIK, J.

3383. Use of iodine chlorides in analytical chemistry. III. Determination of some organic compounds. J. Chalik and D. Vavrečnová (Karlova Univ., Prague, Czechoslovakia). *Chem. Listy*, 1955, 49 (8), 1170–1174.—Conditions for the potentiometric and visual determination of quinol and *p*-methylaminophenol (I) by means of ICl have been studied. Quinol can be determined potentiometrically in soln. containing $NaHCO_3$ with an average error of ±0·18 per cent. For the less accurate visual titration, treat a soln. of quinol in 50 to 100 ml of boiled H_2O with 1 g of $NaHCO_3$ and 0·5 ml of starch soln. and titrate with 0·1 *N* ICl until the blue coloration persists for 2 min. I is determined similarly. Conditions for the potentiometric determination of *o*-, *m*- and *p*-phenylenediamine with ICl are also given. G. GLASER

ČIHALÍK, JAROSLAV

Polarometric determination of heavy metals with mercaptobenzothiazole. Jaroslav Čihalík and Eva Kudrnovská-Pacáková (Karlova Univ., Prague). *Chem. Listy* 49, [illegible]. A soln. of 2-mercaptobenzothiazole in 90% [illegible] was used for the polarometric detn. of Pb, Cd, and Cu. The optimum conditions for the detn. of Pb were 2-10 mg. in 20 ml. vol. in 0.5*M* KNO$_3$ by imposing at least 0.5 v. and by using pH 3-7. In more alk. solns., the potential of −0.9 v. was required. The following did not interfere: Ag, Hg, B, Cu, Cd, As, Fe, Sb, Al, Cr, Ni, Co, Mn, Ca, Sr, and Ba. To det. Cd, 4-16 mg. Cd in 20 ml. vol. was titrated at potentials of 0.8-1.0 v. in solns. contg. acetate buffers of pH 5-6. Ag and Cu interfere. Ag was [illegible] as AgCl. Cu and Cd [illegible]

(1)



Use of iodine chloride in analytical chemistry. IV. De-
[illegible] J. Čihalík and J. Rážička (Kar-

CIHALIK, J.

CIHALIK, J. Use of iodine monochlorides in analytic chemistry. II. Determination of arsenic, antimony, and tin. In Russian. p. 131. Vol. 21, No. 1, Feb. 1956. SBORNIK CHEKHOSLOVATSKIKH KHIMICHESKIKH RABOT. COLLECTION OF CZECHOSLOVAK CHEMICAL COMMUNICATIONS. Praha, CZECHOSLOVAKIA.

SOURCE: EAST EUROPEAN ACCESSIONS LIST (EEAL) VOL6, NO 4, APRIL 1957

CIHALIK, J.

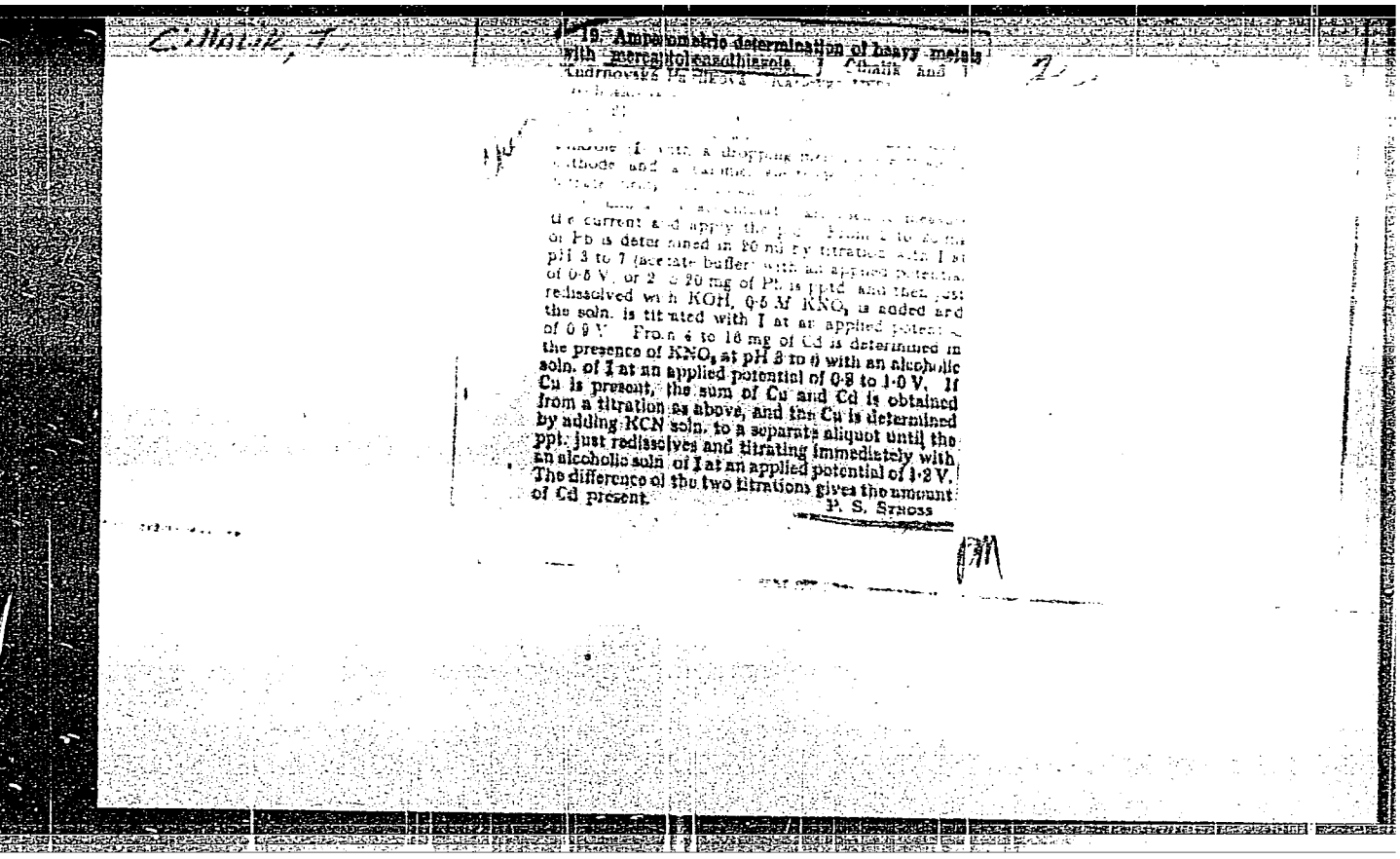
CIHALIK, J. Use of iodine monochloride in analytic chemistry. III. Determination of some organic compounds. In Russian. p. 192. Vol. 21, No. 1, Feb. 1956. SBORNIK CHEKHOSLOVATSKIKH KHIMICHESKIKH RABOT. COLLECTION OF CZECHOSLOVAK CHEMICAL COMMUNICATIONS. Praha, CZECHOSLOVAKIA.

SOURCE: EAST EUROPEAN ACCESSIONS LIST (EEAL) VOL 6, no. 4, APRIL 1957

CIHALIK, J.

CIHALIK, J. Use of iodine monochloride in analytic chemistry. IV. Determination of thiourea. In German. p. 262. Vol. 21, No. 1, Feb. 1956
SBORNIK CHEKHOSLOVATSKIKH KHIMICHESKIKH RABOT. COLLECTION OF CZECHOSLOVAK CHEMICAL COMMUNICATIONS. Praha, CZECHOSLOVAKIA.

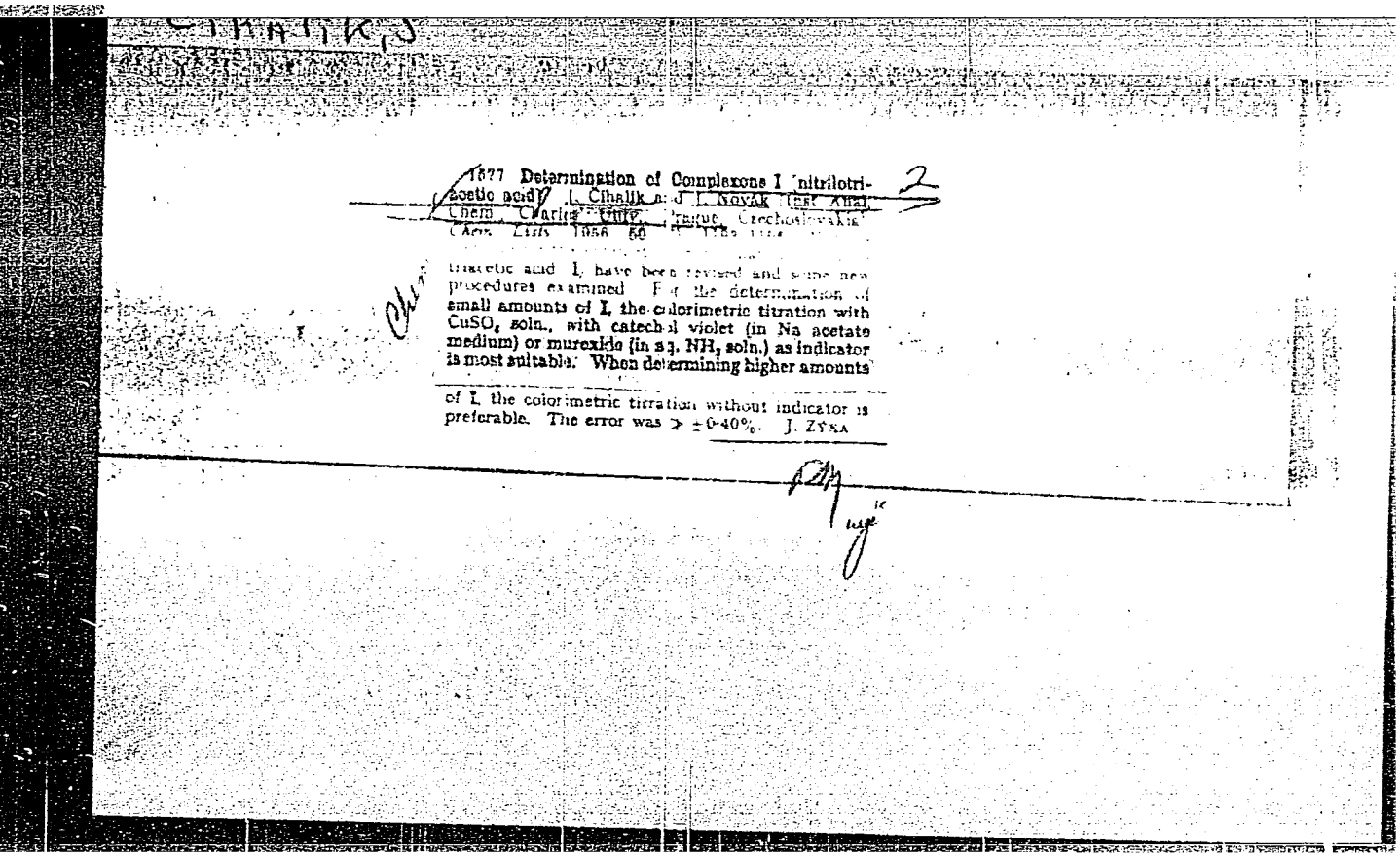
SOURCE: EAST EUROPEAN ACCESSIONS LIST (EEAL) VOL 6 NO 4 APRIL 1957



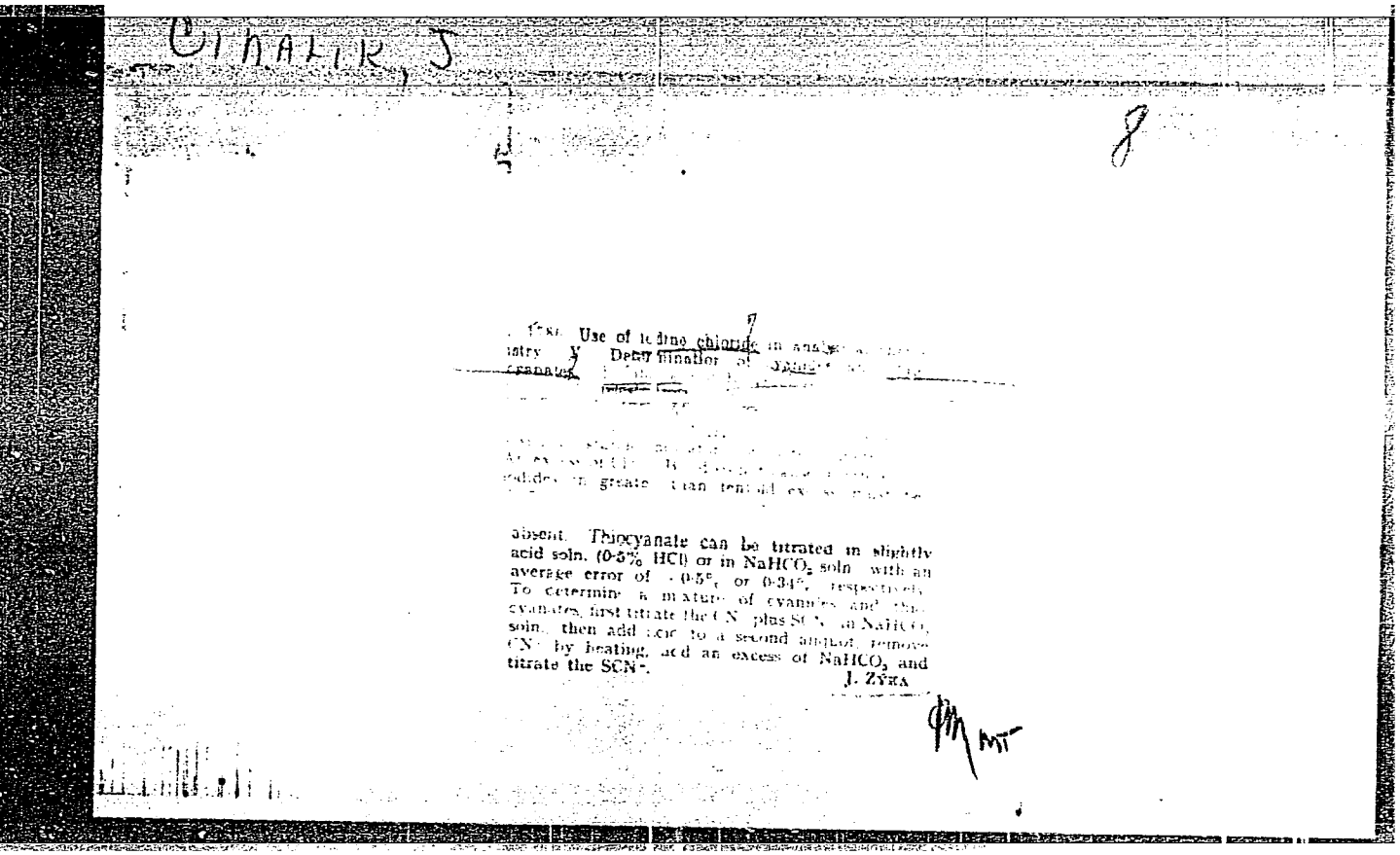
19. Amperometric determination of heavy metals with mercaptobenzothiazole. [illegible] and [illegible] Andronovskaya [illegible]

[illegible] current and apply the [illegible] of Pb is determined in 20 ml by titration with I at pH 3 to 7 (acetate buffer) with an applied potential of 0·6 V, or 2 to 20 mg of Pb is ppt. and then just redissolved with KOH, 0·5 M KNO_3 is added and the soln. is titrated with I at an applied potential of 0·9 V. From 4 to 16 mg of Cd is determined in the presence of KNO_3 at pH 3 to 9 with an alcoholic soln. of I at an applied potential of 0·8 to 1·0 V. If Cu is present, the sum of Cu and Cd is obtained from a titration as above, and the Cu is determined by adding KCN soln. to a separate aliquot until the ppt. just redissolves and titrating immediately with an alcoholic soln. of I at an applied potential of 1·2 V. The difference of the two titrations gives the amount of Cd present.

P. S. Steiss

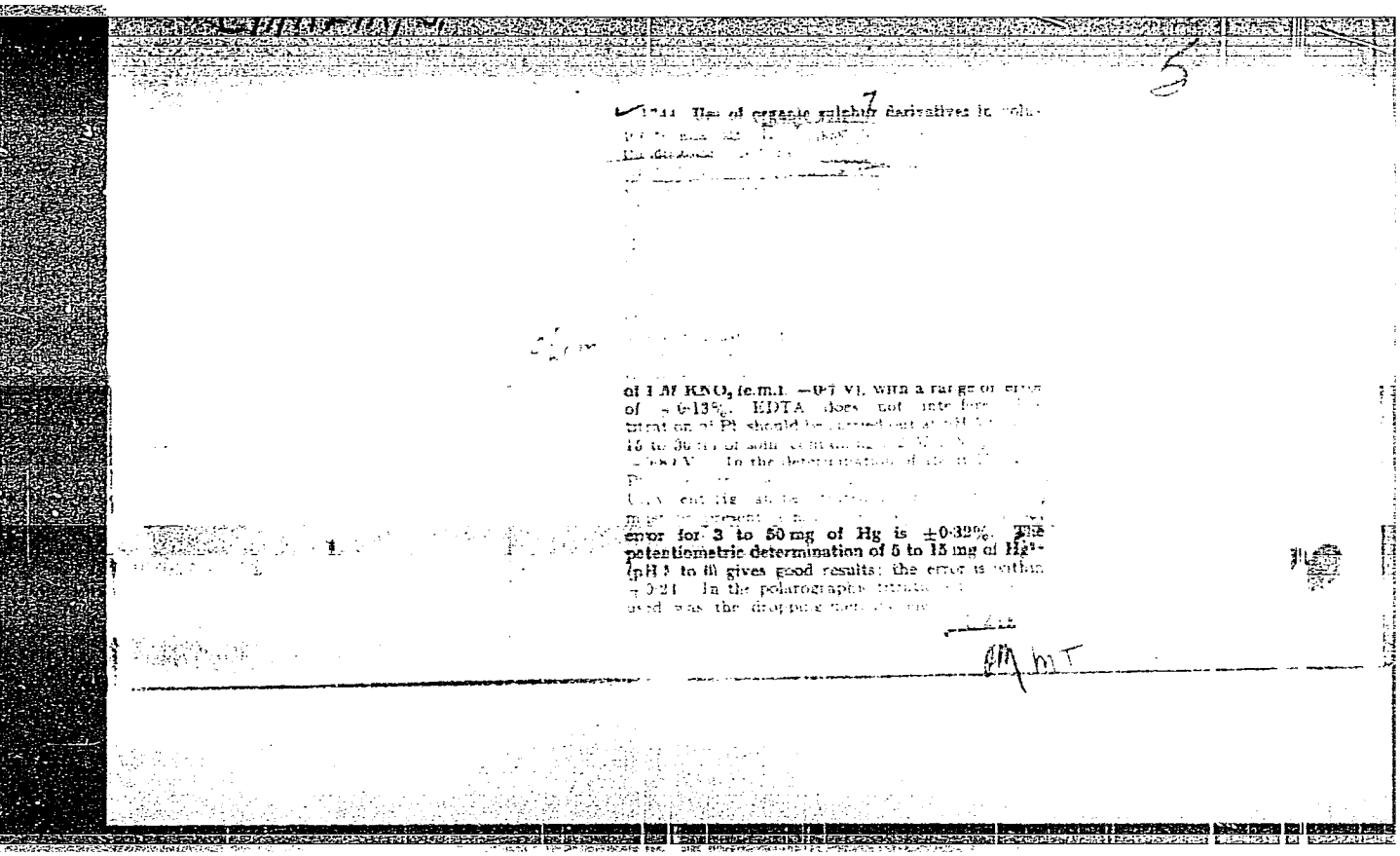


1877 Determination of Complexone I (nitrilotriacetic acid). L. Cihalík and J. Novák (Inst. Anal. Chem., Charles Univ., Prague, Czechoslovakia). Chem. Listy 1956, 50, [illegible]. The titrimetric acid I, have been reviewed and some new procedures examined. For the determination of small amounts of I, the colorimetric titration with $CuSO_4$ soln., with catechol violet (in Na acetate medium) or murexide (in aq. NH_3 soln.) as indicator is most suitable. When determining higher amounts of I, the colorimetric titration without indicator is preferable. The error was $\geq \pm 0.40\%$. J. Zýka



absent. Thiocyanate can be titrated in slightly acid soln. (0·5% HCl) or in $NaHCO_3$ soln. with an average error of ±0·5% or 0·34%, respectively. To determine a mixture of cyanides and thiocyanates, first titrate the CN^- plus SCN^- in $NaHCO_3$ soln., then add iodine to a second aliquot, remove CN^- by heating, add an excess of $NaHCO_3$ and titrate the SCN^-.

J. ZÝKA



of 1 *M* KNO_3 (e.m.f. −0·7 V), with a range of error of ± 0·13%. EDTA does not interfere ... titration of Pt should be carried out at ... 15 to 30 ml of ... In the determination of ... error for 3 to 50 mg of Hg is ±0·32%. The potentiometric determination of 5 to 15 mg of Hg^{2+} (pH 3 to 4) gives good results: the error is within ± 0·2 ... In the polarographic titration ... used was the dropping ...

CIHALIK, J. : VORACEK, J.

"Application or organic sulfur compounds in volumetric analysis.
II. Titration with the potassium salt of mercaptophenylthiothiodiazole.
In German."

p. 407 (COLLECTION OF CZECHOSLOVAK CHEMICAL COMMUNICATIONS. SBORNIK CHECKSHOSOLVATSKIKH KHMICHESKIKH RABOT. -- Praha, Czechoslovaka.)
Vol. 22, No. 2, April 1957

SO: Monthly Index of East European Accession (EEAI) LC, Vol. 7, No. 5, May 1958

CIHALIK, J.

CZECHOSLOVAKIA/Analytical Chemistry - General Questions. E-1

Abs Jour : Ref Zhur - Khimiya, No 8, 1958, 24682

Author : Cihalik, J., Terebova, K.
Inst :
Title : Use of Iodine Monochloride in Analytical Chemistry. VI. Determination of Hydrazine, Phenul Hydrazine, Hydroxylamine and Iodine Monochloride.

Orig Pub : Sb. chekhosl. khim. rabot, 1957, 22, No 3, 756-763

Abstract : See RZhKhim, 1957, 51545.

Card 1/1

[redacted] Cihalik, Jaroslav

CZECHOSLOVAKIA/Analytical Chemistry - General Topics E-1

Abs Jour : Ref Zhur - Khimiya, No 4, 1958, No 10952

Author : Jaroslav Cihalik, Eva Kudrnovska-Pavlikova
Inst : Not Given
Title : Application of Organic Sulphur Derivatives to Titrimetric Analysis. III. Titration with Mercaptobenzothiazole.

Orig Pub : Chem. listy, 1957, 51, No 1, 76-81

Abstract : An ampere-metric method of Ag, Hg(1+), Hg(2+) and Bi determination by titration with mercaptobenzothiazole (I) solution and with a Hg drop electrode and a st. c. e. was developed. I produces with Ag, Hg and Bi precipitates of a very little solubility product; titration of weakly dissociated salts (for example, $HgCl_2$) or in a complex producing medium (for example, a Ag salt in NH_4OH medium) is possible. Bi is titrated at the potential of -0.35 v, all the others are titrated with short-circuited electrodes. Titration was carried out in air with stirring by a magnetic stirrer or by a current of an inert gas. 0.5 M of KNO_3 was added to

Card : 1/2

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~~[illegible]~~ CIHALIK, J.

CZECHOSLOVAKIA / Analytical Chemistry. Analysis of Organic Substances. E-3

Abs Jour- : Ref Zhur - Khim., No 10, 1958, No 32232

Author : Jaroslav Cihalik, Jaromir Ruzicka.
Inst : -
Title : Use of Iodine Chloride in Analytic Chemistry. VII. Determination of Thiosemicarbazide, Bismuthone and Dimercaptopropanol.

Orig Pub : Chem. listy, 1957, 51, No 2, 264-271; Sb. chekhosl. khim. rabot, 1957, 22, No 3, 764-772.

Abstract : The thiourea derivatives (for example, thiosemicarbazide) (I) and substances containing the -SH group, for example, bismuthone (K salt of 5-mercapto-3-phenyl-2-thio-1,3,4-thiadiaxolone-2) (II) and dimercaptopropanol (II) are easily oxidized by iodine chloride (IV) and are determined by potentiometric titration with IV solution and a Pt electrode. The titration of I proceeds according to the summary equation

Card 1/3

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JAROSLAV CIHALIK

CZECHOSLOVAKIA / Analytical Chemistry. Analysis of Organic : Substances. E-3

Abs Jour : Ref Zhur - Khim., No 10, 1958, No 32210

Author : Jaroslav Cihalik, Kveta Terebova.
Inst : -
Title : se of Iodine Chloride in Analytic Chemistry. VIII. Determination of Some Analytically Important Organic Substances.

Orig Pub- : Chem. listy, 1957, 51, No 2, 272-277; Collect. czechoal. chem. communs, 1958, 23, No 1, 110-115.

Abstract : The potentiometric titration with ICL solution described in the foregoing reports was used for the determination of mercaptobenzothiazole (I), 8-oxyquinoline (II) and anthranilic acid, (III). I reacts according to the equation $2C_7H_4SN.SH + I^+ \rightarrow C_7H_4SN.S-S.NSH_4C_7 + I^- + 2H^+$. ICl oxidizes I^- to I_2 in the second reaction stage. The corres-

Card 1/2

CZECHOSLOVAKIA/Analytical Chemistry. General Questions. E-1

Abs Jour: Ref Zhur-Khim., No 13, 1958, 42991.

Author : Cihalik Jaroslav, Voracek Jaroslav.
Inst :
Title : Use of Organic Derivatives of Sulfur in Titrimetric Analysis. IV. Titration with Potassium Salt of Mercaptophenyl-Thio-Thiadiazolone.

Orig Pub: Chem. listy, 1957, 51, No 2, 278-282.

Abstract: Description of indirect potentiometric and amperometric determination of Di, and of direct amperometric determination of Cu and Cd, by titration with a solution of Dismuthol (I; K-salt of mercaptophenyl-thio-thiazolone). Determination of Di: to a known excess of solution of I is added, in a 15-20 ml measuring flask, the solution

Card : 1/2

CIHALIK, J. ; SIMEK, J.

"Polarography in anhydous acetic acid. I. Introduction. p. 1283"

P. 1283 (Chemicke Listy, Vol. 51, no. 7, July 1957, Praha, Czechoslovakia)

Monthly Index of East European Accessions (EEAI) LC, Vol. 7, No. 7, July 1958

CIHALIK, S.

CZECHOSLOVAKIA / Analytic Chemistry. General Topics. E

Abs Jour: Ref Zhur-Khimiya, No 18, 1958, 60559.

Author : Jaroslav Cihalik, Josef Simek, Jaromir Ruzicka.
Inst :
Title : Polarographing in Glacial Acetic Acid. II. Polarographic Behavior of Thallium, Cadmium, Copper, Uranium and Palladium.

Orig Pub: Chem. listy, 1957, 51, No 9, 1663-1668.

Abstract: The following half-wave potentials with reference to a saturated calomel-acetate electrode, the potential of which had the value of 0.076 v with reference to the normal aqueous calomel electrode, were found: Tl: 1 M of H_2SO_4 - -0.48 v, saturated ammonium acetate solution - -0.35 v, saturated Na acetate solution - -0.34 v; Cd: 1 M H_2SO_4 - -0.41 v, saturated ammonium acetate solution - -0.48 v,

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CIHALIK, J.; TEREBOVA, K.

SCIENCE

Periodical COLLECTION OF CZECHOSLOVAK CHEMICAL COMMUNICATIONS. SBORNIK CHEKHOSLOVATSKIKH KHIMICHESKIKH RABOT. Vol. 23, no. 1, Jan. 1958.

CIHALIK, J.; TEREBOVA, K. Use of iodine monochloride in analytic chemistry. VII. Determination of some analytically important organic compounds. In German. p. 110.

Monthly List of East European Accessions (EEAI) LC, Vol. 8, no. 3, March, 1959. Uncl.

Cihalik, Jaroslav

CZECHOSLOVAKIA/Analytical Chemistry - General Topics. E

Abs Jour: Ref Zhur-Khim., No 9, 1959, 30927.

Author : Čihalík, Jaroslav.
Inst : Karlova Univ., Prague
Title : The Application of Iodine Monochloride in Analytical Chemistry. IX. Determination of Divalent Iron. Trivalent Titanium and EDTA.

Orig Pub: Chem. listy, 1958, 52, No 6, 1075-1082.

Abstract: ICl was used for the potentiometric titration of Fe^{2+}, Ti^{3+} and of EDTA (II) separately, and also for the simultaneous determination of Ti^{3+} and Fe^{2+}. The direct titration of Fe^{2+} with ICl solution according to the equation $2Fe^{2+}+2I = 2Fe^{3+} + I_2$ does not succeed because of the high oxidation-

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Abs Jour: Ref Zhur-Khim., No 9, 1959, 30927.

lent to the I present. To remove Fe^{3+}, the $FeSO_4$ solution, acidified slightly with hydrochloric acid, is agitated with metallig Hg. O_2 is removed from the II solution by passing inert gas through it. The described method may also be used for the determination of titers of II solutions. Oxidation of Ti^{3+} by the action of ICl proceeds easily with the formation of I-. By further addition of ICl I- can be oxidized to I_2. By this method it is possible to determine Ti^{3+} without the use of inert atmosphere. The titration of Ti^{3+} proceeds still better in the presence of NH_4F which lowers the ORP of the Ti^{3+}/Ti^{4+} system to close to -0.362v (in 1 H_2SO_4). In contrast to stronger oxidizing agents

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Cihalik, J.

CZECHOSLOVAKIA / Analytical Chemistry--Analysis of inorganic substances. E-2

Abs Jour : Ref Zhur - Khimiya, No 14, 1959, No. 49213

Author : Cihalik, J.; Voracek, J.
Inst : [redacted] Karlova Univ., Prague
Title : Applications of Iodine Chloride in Analytical Chemistry. X. Microtitrations with Iodine Chloride

Orig Pub : Chem Listy, 52, No 7, 1269-1273 (1958)

Abstract : The authors have determined optimum conditions for the potentiometric titration of microgram quantities of As^{3+}, $Fe(CN)_6^{4-}$, and I^- with 0.001 - 0.0001 M solutions of ICl. The microdetermination of An in acid and neutral medium is not feasible because of the long time required for the potential to become stabilized; hence the titration in this case must be carried out in alkaline medium where the oxidation of As^{3+} proceeds according to the equation

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CZECHOSLOVAKIA / Analytical Chemistry--Analysis of inorganic substances. E-2

Abs Jour : Ref Zhur - Khimiya, No 14, 1959, No. 49213

and proceeds best in $NaHCO_3$ at pH ca. 8.2; the titration cannot be carried out in acid medium. The slope at the endpoint is 6,000 per 0.02 ml titrant volume; the titration curves are symmetrical. The endpoint potential is +0.36v. 2 - 400γ $Fe(CN)_6^{4-}$ can be determined in 3 - 5 ml solution with a probable average deviation of ±0.59%. The titration of I^- can be carried out in either weakly acid or in neutral medium or in weakly neutral medium; I^- is oxidized to I_2. More acid solutions cannot be used in the titration, since the pH of the solution must be below 8; at pH >8 the hydrolysis of ICl takes place. Very small amounts of I^- are titrated in 0.05 M HCl. The titration curves follow Peters' ratio and their intersection point in neutral and weakly acid medium lies at +0.55v. The slope at the endpoint attains 1,000 per 0.04 ml titrant volume.

Card 3/4

CIHALIK, J.; PLUHAR, J.

Application of iodine chloride in analytic chemistry. Pt.11.
Coll Cz Chem 30 no.5:1473-1479 My '65.

1. Institute fur analytische Chemie, Karls-Universitat, Prague.
Submitted April 9, 1964.

CIHALIK, J.; SEVCIK, J.

Application of iodine chloride in analytic chemistry. Pt.12.
Coll Cz Chem 30 no.5:1480-1489 My '65.

1. Institut fur analytische Chemie, Karls-Universitat, Prague.
Submitted April 9, 1964.

CIHALIK, J.

"pH measuring technique" by K. Schwabe. Reviewed by J. Cihalik.
Chem listy 59 no.3:341-342 Mr '65.

CZECHOSLOVAKIA

Lt Col Cestmir CIHALIK MD, Department of Internal Medicine of Military Hospital (Vnitrni oddeleni Vojenske nemocnice,) Olomouc.

"Our Experiences with Cholecysto-Cholangiography Laparoscopy."

Prague, Vojenske Zdravotnicke Listy, Vol 31, No 6, Dec 62; pp 277-280.

Abstract: Done in 12 patients since 1956: pneumoperitoneum then transcutaneous 0.5 mm. x 15 cm. needle puncture of gallbladder to take bile specimens and make sure of location; then 25% di-iodone injection and rentgenogram. Eight rentgenograms with details about cases; indications, contra-indications and complications are listed. Two Czech and 2 Western references.

1/1

CIHAR, J.

CHIGARZH, Irzhi [Cihar, J.]

Notes on the systematics of crucian carp (Carassius carassius m. humilis Heckel, 1840). Vop. ikht. no.11:136-141 '58.
(MIRA 12:1)

1. Institut sistematicheskoy zoologii Karlova universiteta v Prage.
(Elbe River--Carp)

CIHAR, J.

Spraking of physical characteristics of airports, p. 120

LETECKY OBZOR. (Minesterstvo deprovy) Praha, Czechoslovakia. Vol. 3, no. 4, Apr. 1959

Monthly List of East European Accessions (EEAI), LC. Vol. 9, no. 2, Feb. 1960 Uncl.