38110
S/020/62/144/002/023/028
B101/B110

AUTHORS: Vlasov, A. V., Glazunov, P. Ya., Mikhaylov, N. V., Rafikov, S. R., Tokareva, L. G., Tsetlin, B. L., and Shablygin, M. V.

TITLE: Formation of oriented structures in radiation-induced polymerization of vinyl monomers on fibers

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 2, 1962, 382 - 383

TEXT: An attempt was made to obtain oriented polymers by polymerizing the monomer from the gas phase on oriented macromolecules of fibers acting as "matrices". The experiments were made with a two-chamber apparatus as used for graft polymerization of vinyl monomers on mineral particles (cf. B. L. Tsetlin et al., Tr. 2-go Vsesoyuzn. soveshch. po radiatsionnoy khimii, Izd. AN SSSR, 1962). One chamber contained caprone cord fiber heated to 80°C, and the other contained completely anhydrous acrylonitrile (40°C). Irradiation was made with X-rays (dose rate, $3 \cdot 10^{15}$ ev/cm^3·sec) for 3 - 6 hrs at 10^{-4} - 10^{-5} mm Hg. The weight of the fiber increased by 15 - 33 %. The perpendicular dichroism in the -C≡N stretching vibrations (2235 cm^{-1}),

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Formation of oriented structures in ...

detected by spectroscopy, proved the orientation of the polymer. Experiments with acrylonitrile and non-oriented fiber as well as with liquid acrylonitrile and oriented fiber showed no dichroism. The liquid monomer molecules are assumed to prevent orientation. Further experiments with polymers, man-made and natural fibers used as "matrices" are under way. There is 1 figure.

ASSOCIATION: Institut elementoorganicheskikh soyedineniy Akademii nauk SSSR (Institute of Elemental Organic Compounds of the Academy of Sciences USSR). Vsesoyuznyy nauchno-issledovatel'skiy institut iskusstvennogo volokna (All-Union Scientific Research Institute of Synthetic Fibers)

PRESENTED: January 19, 1962, by V. A. Kargin, Academician

SUBMITTED: January 12, 1962

GLAZUNOV, P. YA.

1

POLAK, L.S., LAVROVSKIY, K.P., GLAZUNOV, P.YA.

Radiation thermal cracking of petroleum hydrocarbons and its commercial application.

Report to be submitted for the Sixth World Petroleum Congress, Frankfurt, 16-26 June 63

VLASOV, A.V.; MIKHAYLOV, N.V.; [illegible]; LAVROV, L.A.; TSETLIN, B.L.; GLAZUNOV, [illegible]

Radiation-induced graft polymerization from the gas phase. Khim.volok no. 6:24-28 '63. (MIRA 17:1)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut iskusstvennogo volokna (for Vlasov, Mikhaylov, Tokareva). 2. Institut elementoorganicheskikh soyedineniy AN SSSR (for Rafikov, Tsetlin). 3. Institut fizicheskoy khimii AN SSSR (for Glazunov).

[illegible], A. A.

TITLE: Thermo-radiation cracking of propane

SOURCE: Neftekhimiya, v. 3, no. 4, 1963, 615-619

TOPIC TAGS: propane cracking, thermo-radiation cracking, propane, thermal cracking, ionized irradiation

ABSTRACT: Authors studied thermo-radiation cracking of propane, which is a much lighter hydrocarbon and which is used as an industrial raw material. The experiments were conducted at temperatures between 500 and 700C. Propane gives a fairly good conversion and a comparatively simple composition of gaseous products when an intensive radiation dose is applied during the thermal-radiation process, as well as during thermal cracking. The results of thermo-radiation cracking of propane and their comparison to thermal cracking under the same conditions are presented. The yields of H_2, CH_4, C_2H_4 and C_3H_6 as a

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L 15478-63

ACCESSION NR: AP3005459 -2-

function of temperature are also given. The activation energy of the propane thermo-radiation cracking process is close to the activation energy of the chain propagation during thermal cracking. The application of ionized irradiation for the initiation of chain reaction permits the carrying-out of the propane cracking process at temperatures which are 100C below ordinary thermal cracking and with good conversion. The experimental and chemical yields under the conducted experimental conditions were approximately 10^3 molecules per 100 ev. Orig. art. has: 5 figures and 3 tables.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of physical chemistry, AN SSSR), Institut neftekhimicheskogo sinteza AN SSSR im. A. V. Topchiyeva (Institute of petrochemical synthesis, AN SSSR)

SUBMITTED: 19Dec62 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: CH NO REF SOV: 004 OTHER: 002

Card 2/2

PIKAYEV, A.K.; GLAZUNOV, P.Ya.; YAKUBOVICH, A.A.

Radiolysis of aqueous neutral solutions of nitrates at high dose rates. Kin. i kat. 4 no.6:835-843 N-D '63. (MIRA 17:1)

1. Institut fizicheskoy khimii AN SSSR.

L 14304-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JF
ACCESSION NR: AP3000096 S/0126/63/015/004/0534/0537

AUTHORS: Troitskiy, O. A.; Glazunov, P. Ya.; Likhtman, V. I.

TITLE: Effect of preliminary electron irradiation upon the strength of zinc coated with fusible eutectics

SOURCE: Fizika metallov i metallovedeniye, v. 15, no. 4, 1963, 534-537

TOPIC TAGS: electron irradiation, zinc, eutectic, Zn-Sn, Zn-Cd, Zn-Pb

ABSTRACT: The adsorption effect of fusible metallic coatings on the mechanical properties of relatively harder-to-fuse metals has been studied. The experiment involved an electron irradiation of polycrystalline zinc samples coated with fusible eutectics: Zn-Sn (85 atomic % Sn), Zn-Cd (73.2 atomic % Cd), and Zn-Pb (97 atomic % Pb). The electron energy used was 1-1.2 Mev. The electron doses obtained from a linear accelerator varied from 10^{16} to 3.7×10^{17} electrons/cm^2. The irradiation doses were determined by the intensity of the electron flux, the irradiation area at a given distance from the accelerator window, and by the irradiation time interval. The relation between the relative hardening and the irradiation time at temperatures of 20C and 200-220C was determined, as was the relation between the relative hardening and temperature. The authors conclude that the irradiation of

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L 14304-63

ACCESSION NR: AP3000096

the polycrystalline zinc samples covered by hard eutectic alloys at 20C results in a maximum hardening of 15%. The electron irradiation activates the process of melted coating penetration into the voids of the crystalline lattice, thus causing hardening up to 40%. The greatest irradiation effect is observed in the Zn-Sn coated samples, because this eutectic has a greater surface activity than Zn-Cd and Zn-Pb coatings. Orig. art. has: 3 figures.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry, Academy of Sciences, SSSR)

SUBMITTED: 14May62 DATE ACQ: 12Jun63 ENCL: 00

SUB CODE: ML, PH NO REF SOV: 009 OTHER: 000

Card 2/2

RYABCHIKOVA, G.G.; SIBIRSKAYA, G.K.; GLAZUNOV, P.Ya.; GRACHEV, A.I.

Semiautomatic proportioning device for gas chromatography. Zav.lab. 29 no.2:243-244 '63. (MIRA 16:5)

1. Institut fizicheskoy khimii AN SSSR.
(Gas chromatography) (Proportioning equipment)

RYABCHIKOVA, G.G.; SIBIRSKAYA, G.K.; GLAZUNOV, P.Ya.; GRACHEV, A.I.

Apparatus for selecting gas samples during chromatographic analysis. (MIRA 16:5)
Zav.lab. 29 no.2:244 '63.

1. Institut fizicheskoy khimii AN SSSR.
(Gas chromatography)

YERSHOV, B.G.; PIKAYEV, A.K.; GLAZUNOV, P.Ya.; SPITSYN, Vikt.I., akademik

Electron paramagnetic resonance spectrum of a hydrated electron in irradiated frozen alkaline solutions. Dokl. AN SSSR 149 no.2:363-366 Mr '63. (MIRA 16:3)

1. Institut fizicheskoy khimii AN SSSR.
(Alkalies--Spectra) (Radiation) (Electrons)

PIKAYEV, A.K.; GLAZUNOV, P.Ya.; SPITSYN, Vikt.I., akademik

Mechanism underlying the radiolytic oxidation of bivalent iron in aqueous sulfuric acid solutions containing oxygen when the absorbed dose is high. Dokl. AN SSSR 150 no.5:1077-1080 Je '63. (MIRA 16:8)

1. Institut fizicheskoy khimii AN SSSR.
(Iron compounds) (Radiation) (Oxidation)

PIKAYEV, A.K.; GLAZUNOV, P.Ya.; SPITSYN, V.I., akademik

Approximate values of the rate constants of radiation reactions when a hydrated electron is involved. Dokl. AN SSSR 151 no.6:1387-1389 Ag '63. (MIRA 16:10)

1. Institut fizicheskoy khimii AN SSSR.

L 52567-65

ACCESSION NR: AP5015795

the direct action of radiation on sulfuric acid. The possible mechanism of the radiolytic transformations of Ce^{4+} and Ce^{3+} ions and the formation of peracids at high absorbed dose rates was considered. The values of the relative rate constants were calculated for a number of the radiochemical reactions that take place in aqueous hydrochloric solutions of Ce^{4+} and Ce^{3+}. Orig. art. has: 17 formulas, 8 graphs, and 3 tables.

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

SUBMITTED: 29Jan63 ENCL: 00 SUB CODE: IC, GC

NO REF SOV: 006 OTHER: 011 ATD PRS

Card 2/2

YERSHOV, B.G.; PIKAYEV, A.K.; GLAZUNOV, P.Ya.; SPITSYN, Vikt. I., akademik

Electron paramagnetic resonance method used for proving the participation of the trapped electron in the radiochemical reactions taking place in frozen aqueous solutions. Dokl. AN SSSR 154 no.4:899-902 F '64. (MIRA 17:3)

1. Institut fizicheskoy khimii AN SSSR.

PIKAYEV, A.K.; GLAZUNOV, P.Ya.

Radiolysis of aqueous solutions of ferrosulfate under the effect of decimicrosecond electron pulses. Dokl. AN SSSR 154 no.5: 1167-1170 F'64. (MIRA 17:2)

1. Institut fizicheskoy khimii AN SSSR. Predstavleno akademikom V.I. Spitsynym.

L 0924-65
ACCESSION NR: AP4045098

either nonthermoplastic and insoluble powders or brittle fibers and fabrics. Radiation-induced graft polymerization was carried out in the absence of air in a glass two-chamber apparatus which made it possible to thermostat the glass fiber and the liquid monomer separately at different temperatures. The radiation source was an electron accelerator. The glass substrate was an ordinary, alkali-

L 19609-65 EWG(j)/EWT(m)/EPF(c)/EPF(n)-2/EPR/EWP(j)/EWA(h)/EWA(l) Pc-4/Pr-4/Ps-4/
Pu-4/Peb RPL GG/RM/WW/MLK
ACCESSION NR: AT4049857 S/0000/64/000/000/0183/0188

AUTHOR: Maslovskaya, R. S.; Yanova, L. P.; Glazunov, P. Ya.; Tarbmar, A. B.

TITLE: Peculiarities of the radiolysis of polymethylmethacrylate and polybutylmethacrylate during irradiation in different physical states

SOURCE: Khimicheskiye svoystva i modifikatsiya polimerov (Chemical properties and the modification of polymers); sbornik statey. Moscow, Izd-vo Nauka, 1964, 183-188

TOPIC TAGS: polymethylmethacrylate, polybutylmethacrylate, polymer radiolysis, polymer molecular weight, polymer strength

ABSTRACT: A study was made of gas formation during irradiation within a temperature interval encompassing both transition points of polymethylmethacrylate (PMMA) and polybutylmethacrylate (PBMA). Irradiation was performed in a vacuum and in air, in glass ampoules provided with a heater and a cooling jacket, through a membrane 60-70 microns thick. The radiation source was a 700-kv electron accelerator. The dose was determined by the ferrosulfate method and amounted to 1.8-3.0 x 10^{17} ev/g·sec. Samples were first heated in a vacuum for 6 hrs. at 120C to remove absorbed gas. Gas liberation was judged by pressure measurement, and the volume of non-liberated gas was determined by solution of the samples in dichloroethane. In addition, rupture and compression tests were made under loads of 8 kg/cm^2 (PMMA)

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L 19609-65
ACCESSION NR: AT4049857

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and 4 kg/cm^2(PBMA) and molecular weights were determined from the viscosity of the polymers in an Ostwald viscometer. At 25C there is practically no gas liberation from PMMA, while at 80C gas liberation is intensified and the sample becomes spongy, and at 135C all gaseous products rupture the gas bubbles and escape into the atmosphere. The radiation yield per mole of gas changes very slowly with rising temperature but increases sharply at the transition points. The content of $CO+CO_2+CH_4$ remains practically constant at 26, 85, and 140C, the fraction of H_2 drops, while that of the monomer rises somewhat. This shows that intensive gas formation in PMMA is connected predominantly with the radiation decomposition of lateral ester groups in accordance with a random law and not with the rupture of monomeric links as during thermal destruction. Irradiation reduced the molecular weights from 3.5×10^7(PMMA) and 7.1×10^6(PBMA) to 3.6×10^4 and 1.4×10^5, respectively; when irradiated in a highly elastic state, the weights showed a clear minimum, while on both sides of the minimum, in the vitreous and visco-fluid states, they were constant and alike. Here, too, the rupture of the bonds in the main polymer chains followed the random law and the number of these ruptures was proportional to the dose. With rising temperature of irradiation, the strength gradually dropped, reaching a minimum when the material was in a highly elastic state and then rising. The greatest drop occurred when the polymer was irradiated in a highly elastic and not in a visco-fluid state. "The authors express deep gratitude to M. I. Yanovskiy and M. P. Glazunov for the gas analyses." Orig. art. has: 1

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L 19609-65

ACCESSION NR: AT4049857

table and 5 figures.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry, AN SSSR)

SUBMITTED: 19Nov62 ENCL: 00 SUB CODE: OC, MT

NO REF SOV: 007 OTHER: 012

Card 3/3

L 23407-65 EWG(j)/EWT(m)/EWP(e)/EPF(c)/EPR/EWP(t)/EIP(b) Pr-4/Pu-4 IJP(c)
JD/WW/WH
ACCESSION NR: AP4049927 S/0020/64/159/003/0631/0635

AUTHOR: Glazunov, P. Ya.; Guglya, V. G.

TITLE: Reflection of monoenergetic electrons with energies in the range of 600 - 1200 keV by certain metals and graphite

SOURCE: AN SSSR. Doklady*, v. 159, no. 3, 1964, 631-635

TOPIC TAGS: electron bombardment, electron reflection, reflection factor, aluminum target, zinc target, tin target, lead target, graphite target, nuclear charge

ABSTRACT: The authors measured the reflection factors of 600-1200 keV electrons reflected off aluminum, zinc, tin, lead, and carbon (not less than 99.8% pure). The scattering chamber used is described. The pressure in the chamber was 10^{-4} - 5 x 10^{-5} mm Hg, so that the ion current was eliminated. The reflection factor is defined as the ratio of the collector current (I_{coll}) to the primary current, $\eta = \frac{I_{coll}}{I_s + I_{coll}}$, the primary current being the sum of the sample current

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L 23407-65
ACCESSION NR: AP4049927

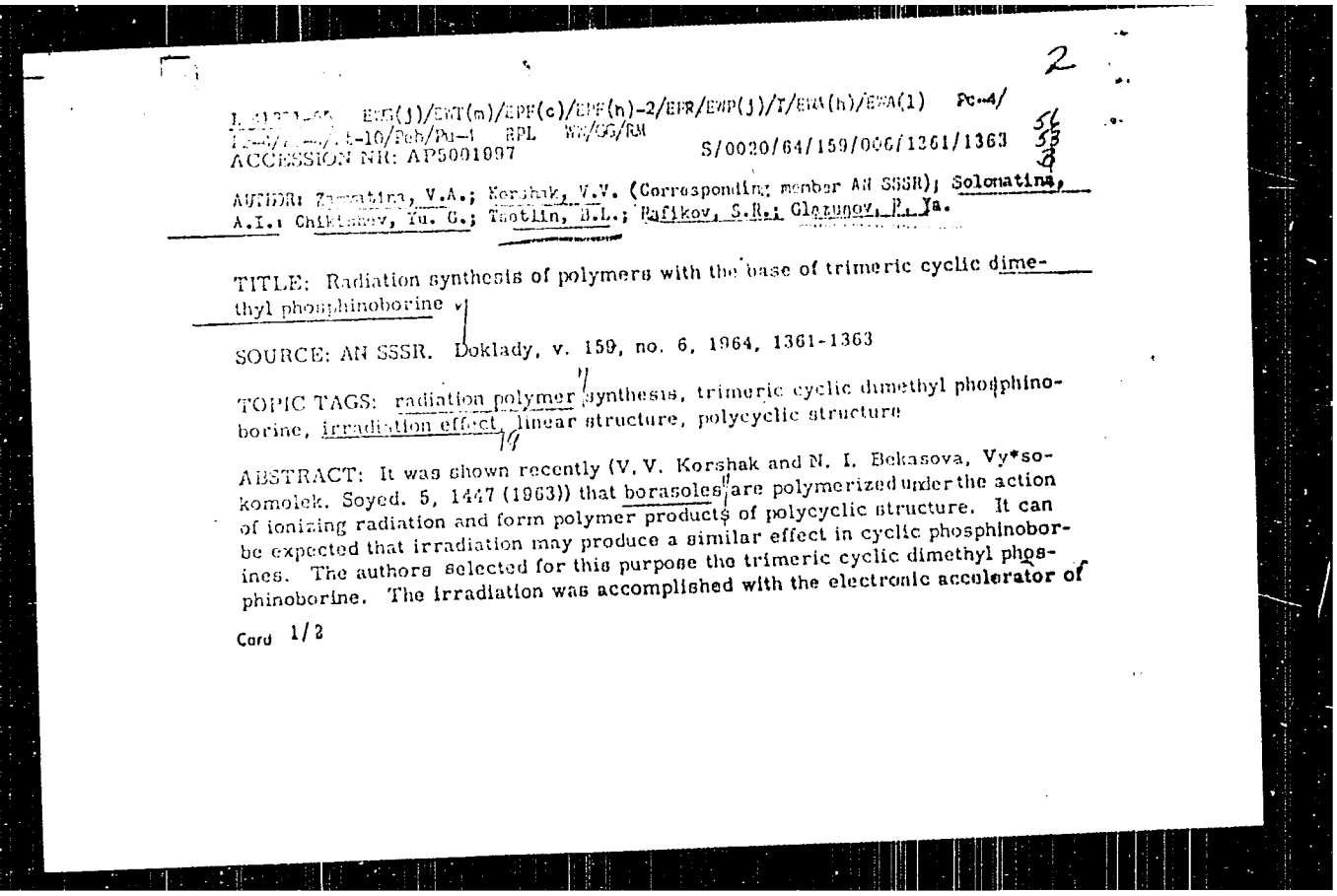
$I_{\varepsilon} + I_{coll}$, and being of the order of one microampere in the experiments. It was found that the total reflection factor (taking electron emission into account) decreases steadily with increasing energy of the primary beam electrons in the energy range of 50 - 350 keV, where an appreciable dependence of the reflection factor on the charge on the nucleus of the reflector was noted. As the charge on the nucleus increased, so did the secondary emission coefficient. Between 600 and 1200 keV, the dependence of the latter coefficient on the nature of the reflector was very slight. Orig. art. has: 4 figures and 1 formula.

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

SUBMITTED: 07May64 ENCL: 00 SUB CODE: NP, MM

NO REF SOV: 000 OTHER: 008

Card 2/2



2

L 41221-65 EWG(j)/EWT(m)/EPF(c)/EPF(h)-2/EPR/EWP(j)/T/EWA(h)/EWA(1) Pc-4/
Pad/Pi-4/Pt-10/Peb/Pu-4 RPL WW/GG/RM
ACCESSION NR: AP5001097 S/0020/64/159/006/1361/1363

AUTHOR: Zamaraeva, V.A.; Korshak, V.V. (Corresponding member AN SSSR); Solomatina, A.I.; Chiklyaev, Yu. G.; Tsetlin, B.L.; Rafikov, S.R.; Glazunov, P. Ya.

TITLE: Radiation synthesis of polymers with the base of trimeric cyclic dimethyl phosphinoborine

SOURCE: AN SSSR. Doklady, v. 159, no. 6, 1964, 1361-1363

TOPIC TAGS: radiation polymer synthesis, trimeric cyclic dimethyl phosphinoborine, irradiation effect, linear structure, polycyclic structure

ABSTRACT: It was shown recently (V. V. Korshak and N. I. Bekasova, Vysokomolek. Soyed. 5, 1447 (1963)) that borasoles are polymerized under the action of ionizing radiation and form polymer products of polycyclic structure. It can be expected that irradiation may produce a similar effect in cyclic phosphinoborines. The authors selected for this purpose the trimeric cyclic dimethyl phosphinoborine. The irradiation was accomplished with the electronic accelerator of

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L 41321-65
ACCESSION NR: AP5001997

3

the Institute for Physical Chemistry AN SSSR at 800 kv with a dose of 6.5×10^4 rad/sec. With irradiation of 4×10^{15} ev/gm. sec, about 70% of the original monomer was transformed into polymer products of two types, one of which was insoluble in benzene, the other soluble. Their composition and thermomechanical properties were investigated. It was established that the products formed are polymers of a linear and of a polycyclic structure. Orig. art. has: 2 figures

ASSOCIATION: Institut elementoorganicheskikh soyedinenly , Akademii nauk SSSR (Institute of Organoelemental Compounds, Academy of Sciences, SSSR)

SUBMITTED: 07Jul64 ENCL: 00 SUB CODE: GC, NP

NR REF SOV: 001 OTHER: 002

Card 2/2

L 34146-65 EPF(c)/EPF(n)-2/EWG(j)/EWA(h)/ EWP(j)/EWT(n)/T/EWA(l) Pu-4/Pr-4/
Pu-4/Peb GG/JAJ/RM/GS

ACCESSION NR: AT4049851 S/0000/64/000/000/0125/0130

AUTHOR: Chao, Hsiang-tsun; Valetskiy, P. M.; Vinogradova, S. V.; Glazunov, P. Ya.; Korshak, V. V.; Rafikov, S. R.; Tsetlin, B. L.

TITLE: Chemical transformations of polymers. XI. Radiation-induced chemical reactions of polyarylates

SOURCE: Khimicheskiye svoystva i modifikatsiya polimerov (Chemical properties and the modification of polymers); sbornik statey. Moscow, Izd-vo Nauka, 1964, 126-130

TOPIC TAGS: polyarylate, radiation chemistry, isophthalic acid, diphenylol propane, polyethylene terephthalate, polycarbonate, polyisobutylene, hydroquinone, ionizing radiation

ABSTRACT: For the investigation of the radiation-induced chemical reactions of polyarylates, a polyarylate (II) obtained by polycondensation of isophthalic acid with diphenylolpropane, a polyarylate (III) based on isophthalic acid and hydroquinone, and a polycarbonate (Makrolon) were used as test samples in both crystalline and amorphous forms. Irradiation was carried out at an electron accelera-

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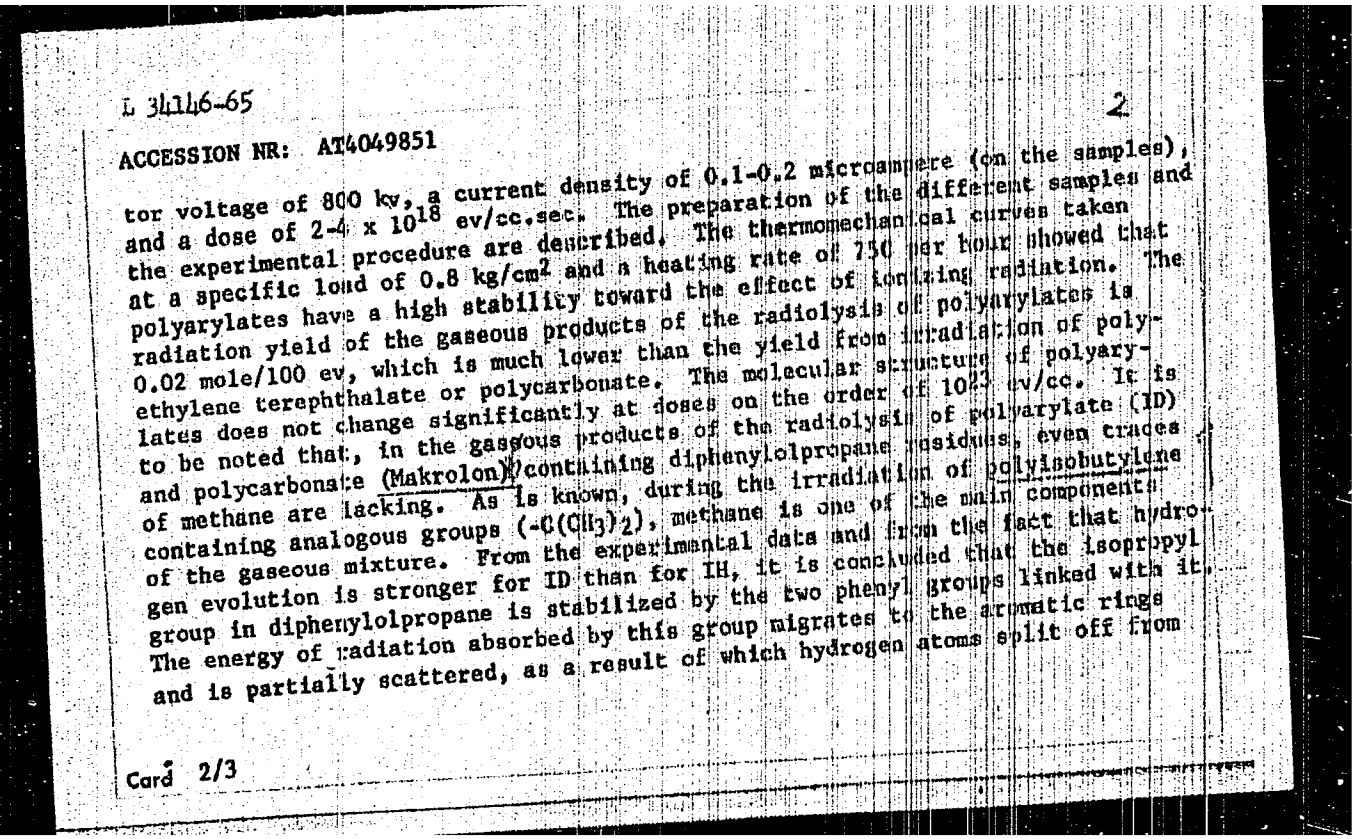


L 34146-65

ACCESSION NR: AT4049851

tor voltage of 800 kv, a current density of 0.1-0.2 microampere (on the samples), and a dose of 2-4 x 10^{18} ev/cc.sec. The preparation of the different samples and the experimental procedure are described. The thermomechanical curves taken at a specific load of 0.8 kg/cm^2 and a heating rate of 750 per hour showed that polyarylates have a high stability toward the effect of ionizing radiation. The radiation yield of the gaseous products of the radiolysis of polyarylates is 0.02 mole/100 ev, which is much lower than the yield from irradiation of polyethylene terephthalate or polycarbonate. The molecular structure of polyarylates does not change significantly at doses on the order of 10^{23} ev/cc. It is to be noted that, in the gaseous products of the radiolysis of polyarylate (ID) and polycarbonate (Makrolon) containing diphenylolpropane residues, even traces of methane are lacking. As is known, during the irradiation of polyisobutylene containing analogous groups (-C(CH_3)$_2$), methane is one of the main components of the gaseous mixture. From the experimental data and from the fact that hydrogen evolution is stronger for ID than for IH, it is concluded that the isopropyl group in diphenylolpropane is stabilized by the two phenyl groups linked with it. The energy of radiation absorbed by this group migrates to the aromatic rings and is partially scattered, as a result of which hydrogen atoms split off from

Card 2/3

L 34146-65

ACCESSION NR: AT4049851

the phenyl groups. Orig. art. has: 2 figures and 3 tables.

ASSOCIATION: Institut elementoorganicheskikh soyedineniy AN SSSR (Heteroorganic compound institute, AN SSSR)

SUBMITTED: 31Aug62 ENCL: 00 SUB CODE: OC, GC

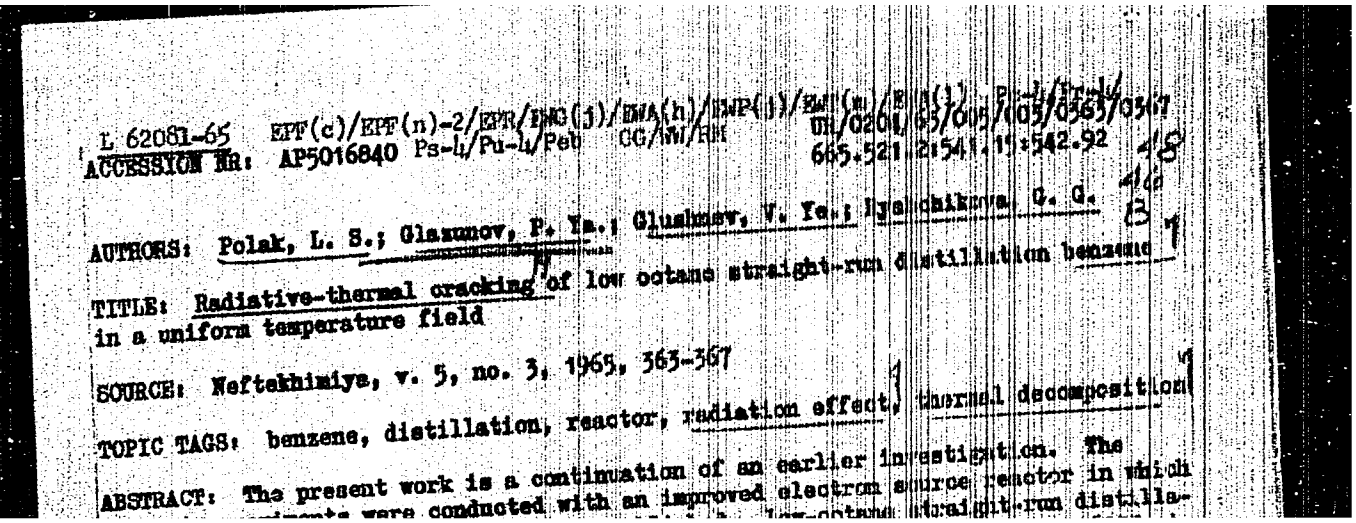
NO REF SOV: 005 OTHER: 002

Card 3/3

YERSHOV, B.G., PIKAYEV, A.K., GLAZUNOV, P.Ye., [illegible], Vlad.I.

Electron paramagnetic resonance spectra of irradiated frozen aqueous solutions. Izv. AN SSSR. Ser. khim. no.10:1705-[illegible] 1964. (MIRA 17:12)

1. Institut fizicheskoy khimii AN SSSR.



L 62081-65 EPF(c)/EPF(n)-2/EPR/EWG(j)/EWA(h)/EWP(j)/EWT(m)/EWA(j) Pc-4/Pr-4
ACCESSION NR: AP5016840 Ps-4/Pu-4/Peb GG/WW/RM UR/0286/65/000/003/0365/0367
665.521.2:541.11:542.92

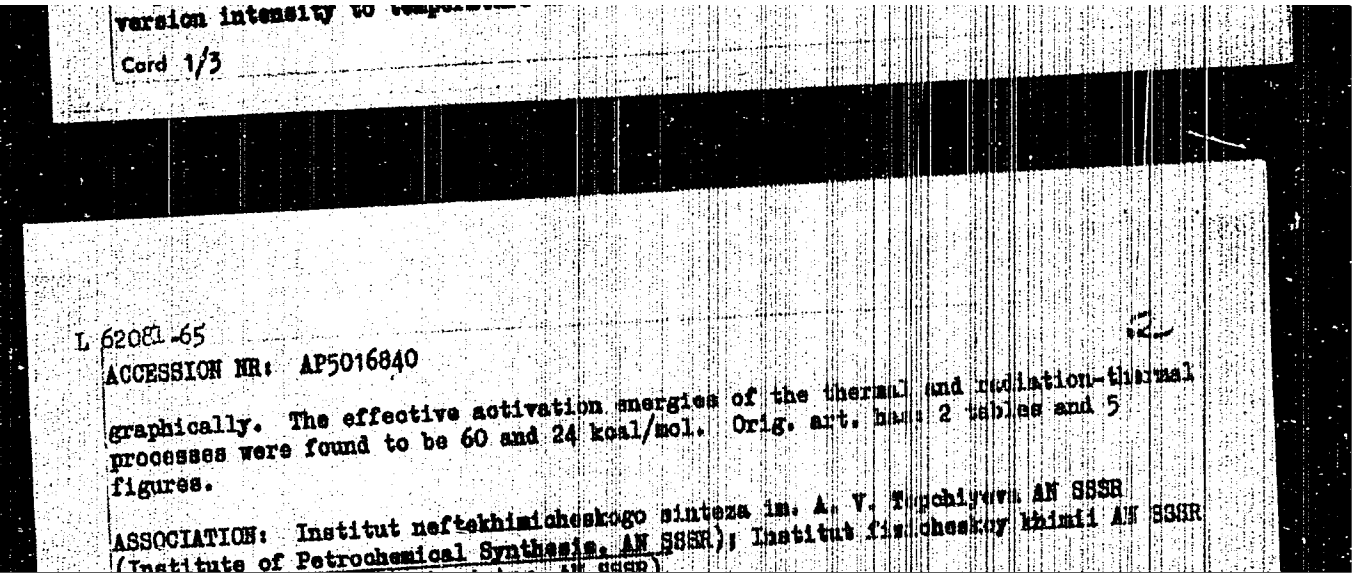
AUTHORS: Polak, L. S.; Glazunov, P. Ya.; Glushnev, V. Ya.; Ilyashikova, Q. G. 13

TITLE: Radiative-thermal cracking of low octane straight-run distillation benzene in a uniform temperature field

SOURCE: Neftekhimiya, v. 5, no. 3, 1965, 363-367

TOPIC TAGS: benzene, distillation, reactor, radiation effect, thermal decomposition

ABSTRACT: The present work is a continuation of an earlier investigation. The experiments were conducted with an improved electron source reactor in which low-octane straight-run distilla-



version intensity to [illegible]

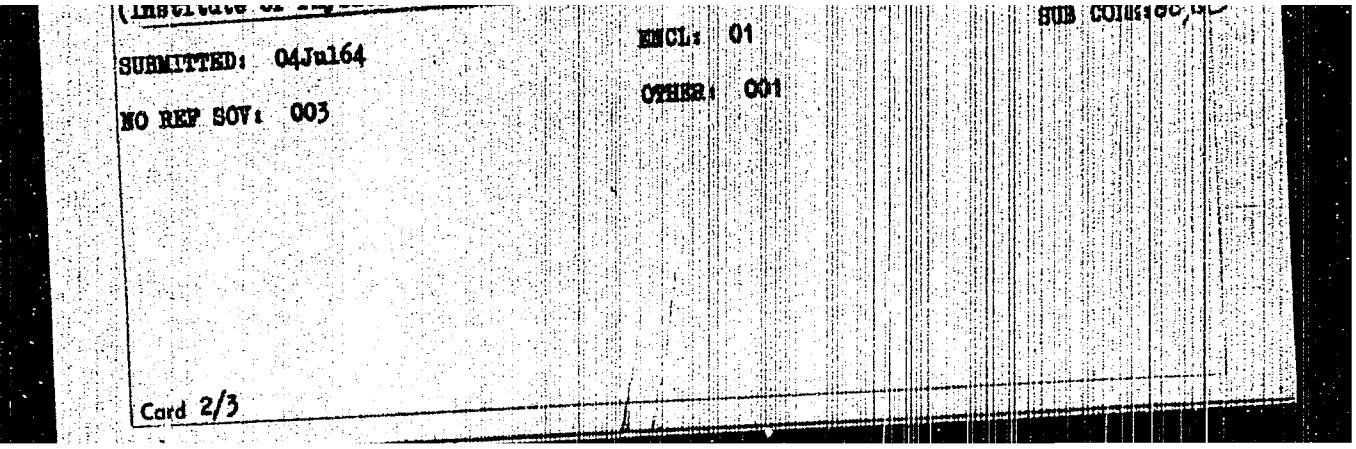
Card 1/3

L 62081-65

ACCESSION NR: AP5016840

graphically. The effective activation energies of the thermal and radiation-thermal processes were found to be 60 and 24 kcal/mol. Orig. art. has: 2 tables and 5 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza im. A. V. Topchiyeva AN SSSR (Institute of Petrochemical Synthesis, AN SSSR); Institut fizicheskoy khimii AN SSSR



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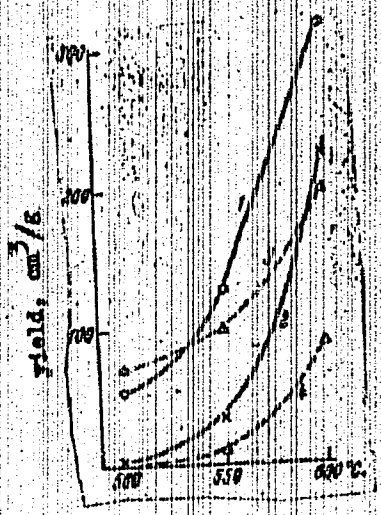
ACCESSION NR: AP5016840

[2] CLOSURE: 01

Fig. 1. The relation between the yield of gaseous products in thermal and radiation-thermal cracking of the straight-run distillation benzene with the boiling end at 140C to temperature. 1- radiation-thermal cracking in the reactor with a uniform temperature field; 2- thermal cracking in the same reactor; 3- radiation-thermal cracking in the reactor with nonuniform temperature field; 4- thermal cracking in the same reactor



Card 3/3

L 48981-65 EWG(j)/EWT(m)/EPF(c)/EPF(n)-2/EWP(j)/EWA(h)/EWA(l) Pc-4/Pr-4/Peb/
Pu-4 RPL GG/RM

ACCESSION NR: AP5009656 UR/0062/65/000/003/0401/0408

AUTHOR: Pikayev, A. K.; Glazunov, F. Ya.; Spitsyn, Vikt. I.

TITLE: Approximate values of the rate constants of radiation-induced reactions of hydrogen atoms and hydroxyl radicals in aqueous solutions

SOURCE: AN SSSR. Izvestiya. Seriya khimicheskaya, no. 3, 1965, 401-408

TOPIC TAGS: radiochemical reaction, rate constant, atomic hydrogen, hydroxyl radical, electron bombardment, ferrous ion oxidation, radiolytic oxidation

ABSTRACT: The article describes a new method of evaluating the absolute rate constants of radiation-induced reactions involving H and OH radicals, based on the use of two independent methods of kinetic treatment of experimental data obtained by studying the radiolysis of aqueous sulfuric acid solutions of ferrous sulfate containing oxygen and subjected to pulses of electron radiation. The mechanism of radiolytic oxidation of Fe^{2+} ions at high rates of the absorbed dose was examined. The decrease in the yield of Fe^{3+} is attributed to the competition of the reactions H + OH, Fe^{2+} + OH and H + O_2. Absolute values of the reaction rate constants were determined: $k_{Fe^{2+}+OH} = 2.7 \times 10^8$; $k_{H+O_2} = 5.3 \times 10^9$

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L 48981-65
ACCESSION NR: AP5009656

and $k_{H+OH} = 4.5 \times 10^{10}$ /mole·sec. On the basis of literature data on the relative constants and absolute values obtained, the rate constants of a series of radiation-induced reactions of H and OH radicals were estimated. Orig. art. has: 3 figures, 5 tables, and 19 formulas.

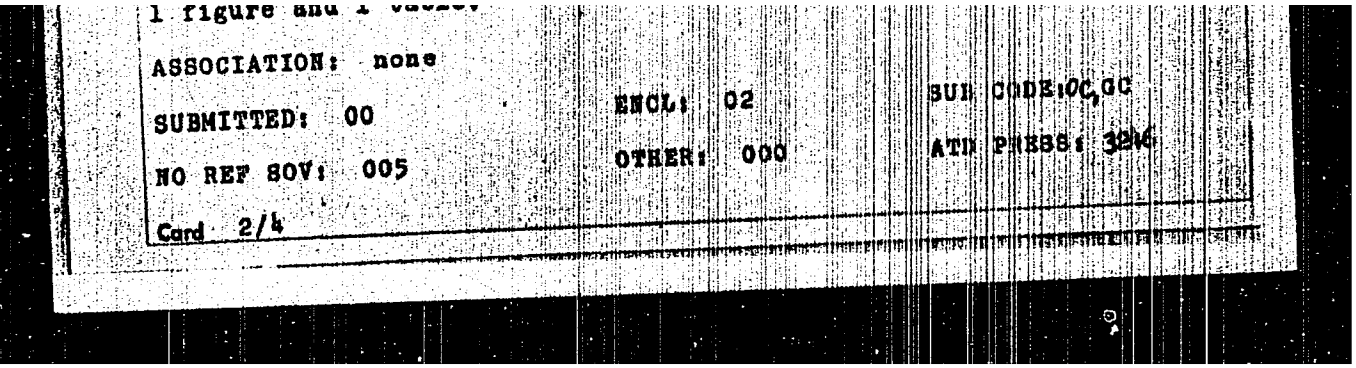
ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry, Academy of Sciences, SSSR)

SUBMITTED: 10Apr63 ENCL: 00 SUB CODE: GC, NP

NO REF SOV: 012 OTHER: 024

Card 2/2

first case, to prevent monomer vapor condensation in the reactor and the pipe, the liquid monomer temperature in the feed tank is always maintained 30—50C below the working gas temperature. In the second case, the gaseous monomer is fed directly from a pressure cylinder. Two reactor types are available: one specifically designed for fibers, films, and fabrics, and the other, for powders. The experimental results shown in Table 1 of the Enclosure were in good agreement with results obtained in glass ampuls, indicating the feasibility and ex-



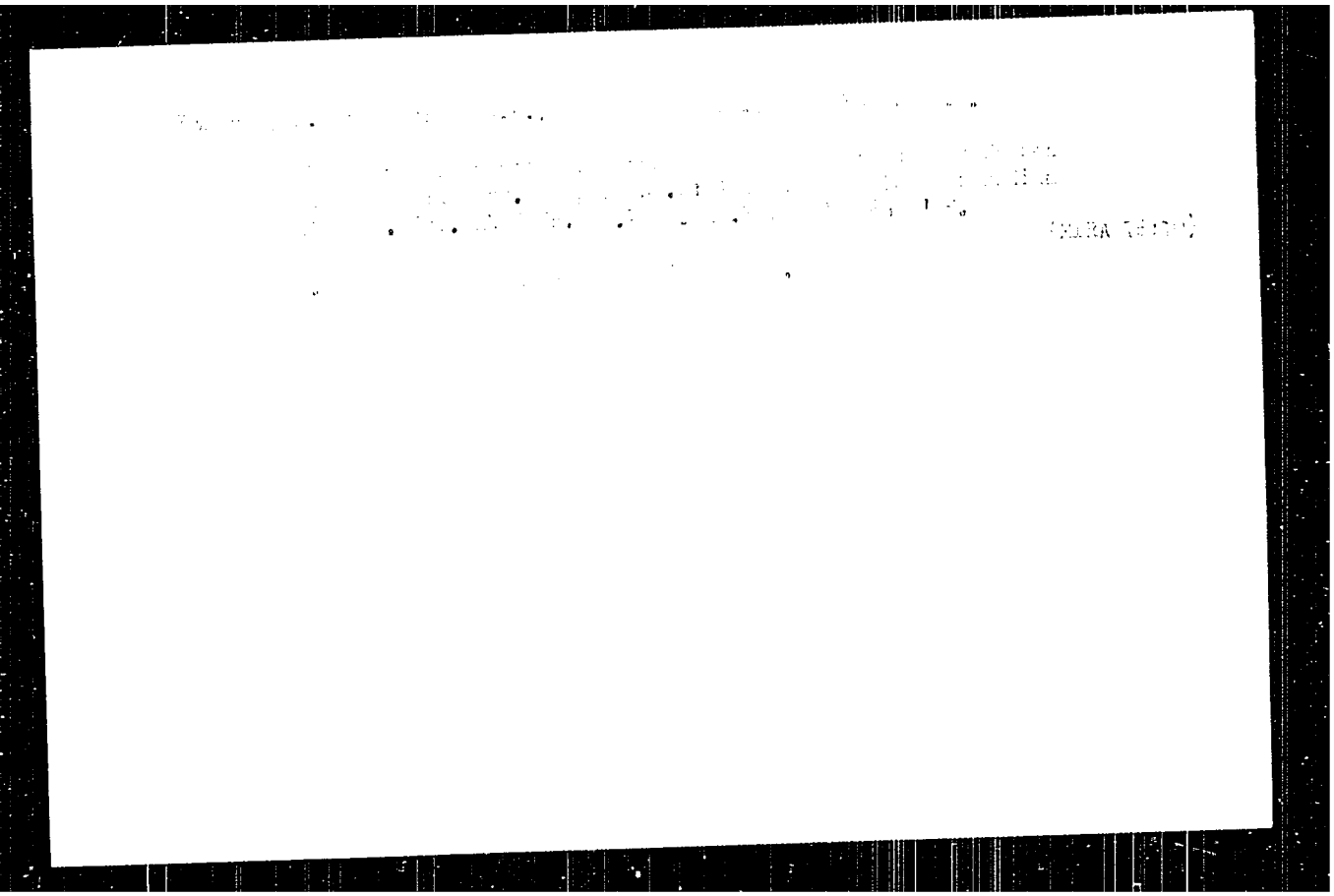
1 figure and 2 [illegible]

ASSOCIATION: none

SUBMITTED: 00 ENCL: 02 SUB CODE: OC, GC

NO REF SOV: 005 OTHER: 000 ATD PRESS: 3214

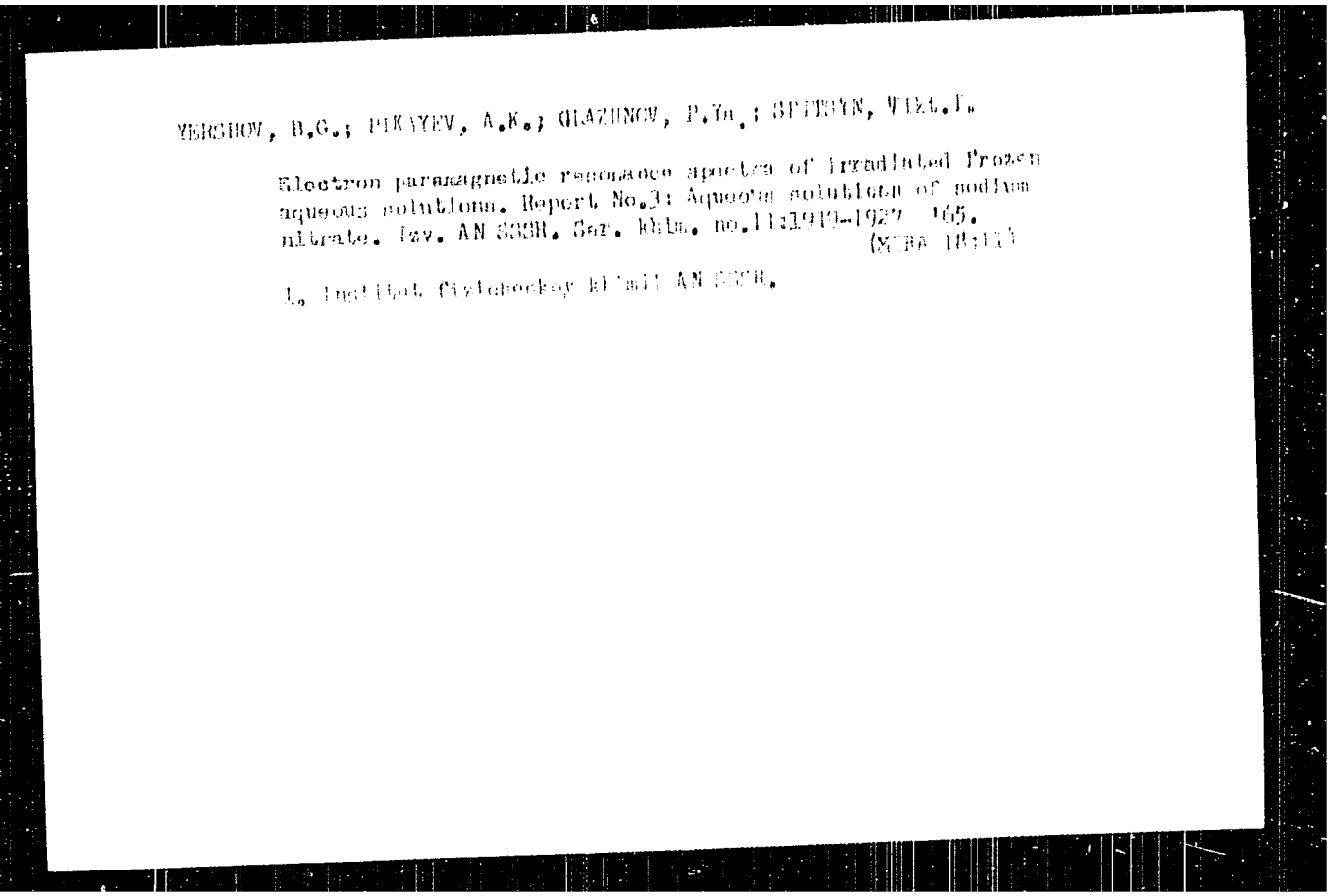
Card 2/4



PIKAYEV, A.K.; SIBIRSKAYA, G.K.; RYABCHIKOVA, G.G.; GLAZUNOV, F.Ya.

Mechanism of hydrogen peroxide formation in a 0,4 M aqueous solution of sulfuric acid at high dose rate of absorption. Kin. i kat. 6 no.1:41-47 Ja-F '65. (MIRA 18:6)

1. Institut fizicheskoy khimii AN SSSR.



YERSHOV, B.G.; PIKAYEV, A.K.; GLAZUNOV, P.Ya.; SPITSYN, V.I.

Electron paramagnetic resonance spectra of irradiated frozen aqueous solutions. Report No.3: Aqueous solution of sodium nitrate. Izv. AN SSSR. Ser. khim. no.11:1919-1927 '65. (MIRA 18:11)

1. Institut fizicheskoy khimii AN SSSR.

ACC NR: AT6034057 SOURCE CODE: UR/0000/66/000/000/0160/0164

AUTHOR: Morozov, Yu. L.; Vitushkin, N. I.; Glazunov, P. Ya.; Rafikov, S. R.; Khomutov, A. I.; Tsetlin, B. L.

ORG: Institute of Organometallic Compounds AN SSSR (Institut elementoorganicheskikh soyedineniy AN SSSR); Scientific Research Institute for Fiberglass (Nauchno-issledovatel'skiy institut steklovolokna); Institute of Physical Chemistry AN SSSR (Institut fizicheskoy khimii AN SSSR)

TITLE: Radiation gas phase graft polymerization on glass fibers

SOURCE: Simpozium po radiatsionnoy khimii polimerov. Moscow, 1964. Radiatsionnaya khimiya polimerov (Radiation chemistry of polymers); doklady simpoziuma. Moscow, Izd-vo Nauka, 1966, 160-164

TOPIC TAGS: radiation polymerization, graft copolymer, polymerization kinetics, glass fiber, acrylonitrile

ABSTRACT: The kinetics of radiation gas phase graft polymerization onto inorganic surfaces were investigated using X ray tube URS-3a as the radiation source, acrylonitrile as the monomer, and three types of glass fibers as substrate--1) conventional nonalkaline nonporous glass fiber, 6-7 micron diameter; 2) fine-pored (6-7 Å effective pore diameter) fiber made by treating the former with hydrochloric

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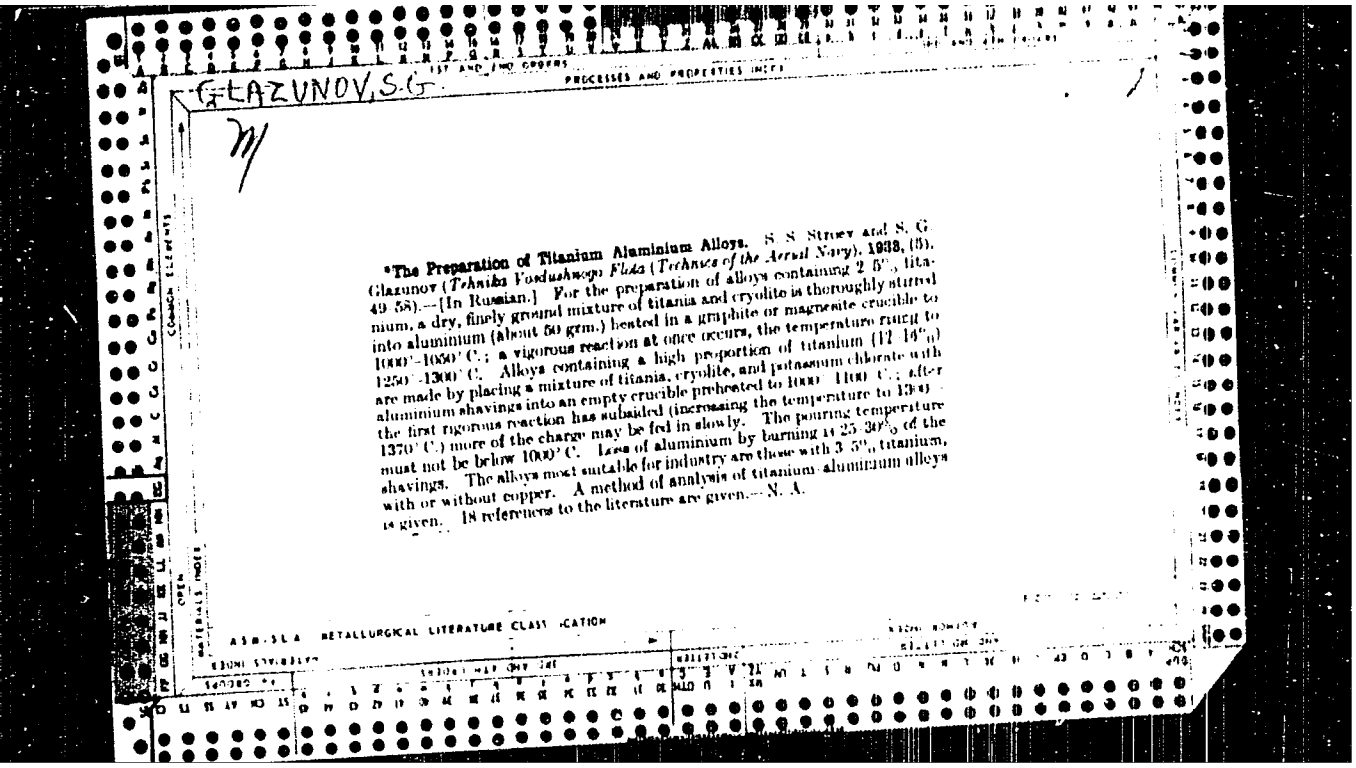
ACC NR: AT6034057

acid; and, 3) coarse-pored fiber (40 Å effective pore diameter) made by acid treatment of sodium borosilicate fiberglass. Reaction rates were measured directly under the beam with the help of a McBain type device. Induction of the graft polymerization reaction on the nonporous fiber was slow; with the porous materials the induction period was short, with more polymer forming on the coarser material. However when the pores were filled, the graft polymerization reaction rate was about the same as on the nonporous surface. Initial polymerization rates on all three fibers reached limiting values with monomer concentrations--at acrylonitrile vapor pressures were well under 100 mm Hg. In the porous samples the process rate is a linear function of the sorbed monomer concentration; the energy of activation is about 3 kcal/mol. The polymerization rate is proportional to the square root of the dosage for nonporous substrates--glass fiber, aerosil, powdered silica gel. Radical reaction mechanism was confirmed. The polymerization rate is a linear function of the dosage for the fine pored material, probably due to steric hindrance inside the pores rather than to a different reaction mechanism. Reaction initiation on metallic oxide and silicate materials is probably associated with the formation of the oxygen ion radical under ionizing radiation. Orig. art. has: 4 figures.

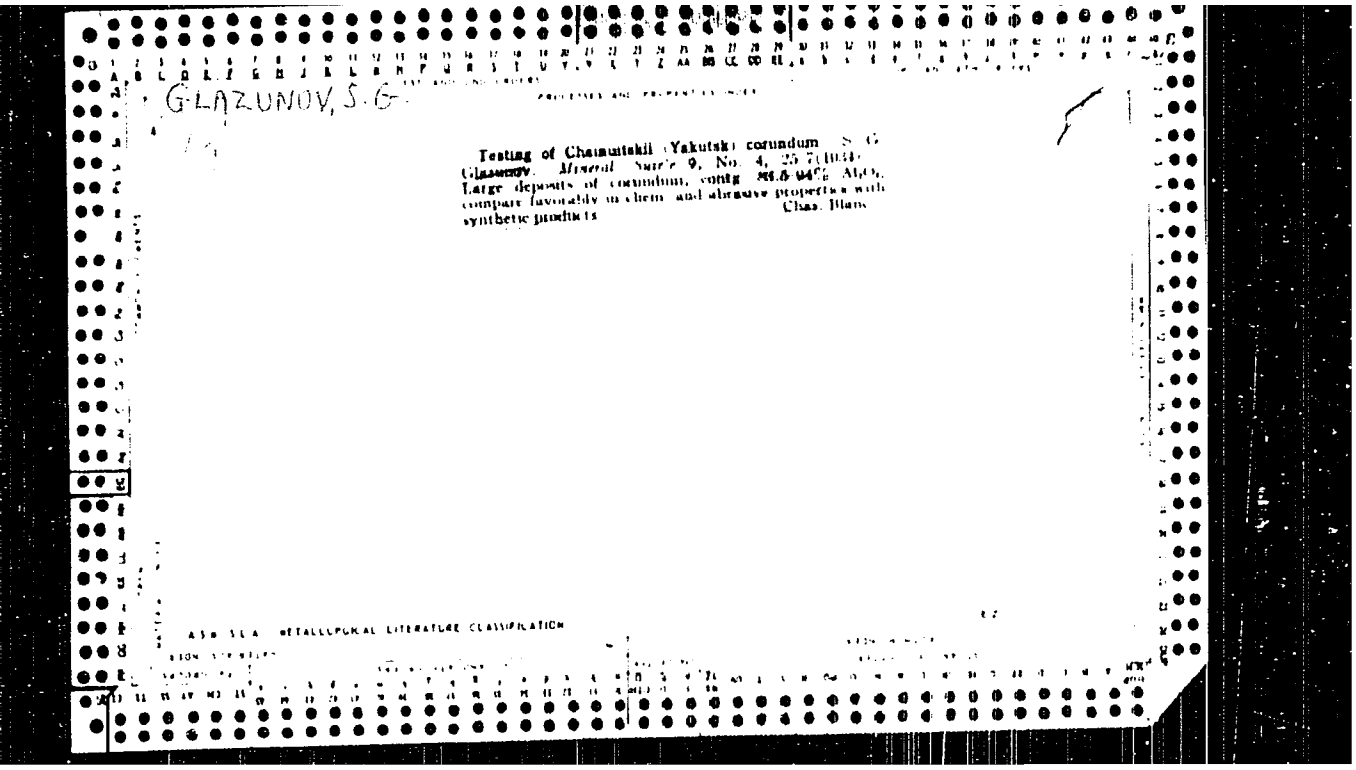
SUB CODE: 07, 11/ SUBM DATE: 25Jul66/ ORIG REF: 007

Card 2/2



GLAZUNOV, S.G.

***The Preparation of Titanium Aluminium Alloys.** S. S. Strnev and S. G. Glazunov (*Tekhnika Vozdushnogo Flota* (*Technics of the Aerial Navy*), **1938**, (5), 49–58).—[In Russian.] For the preparation of alloys containing 2–5% titanium, a dry, finely ground mixture of titania and cryolite is thoroughly stirred into aluminium (about 50 grm.) heated in a graphite or magnesite crucible to 1000°–1050° C.; a vigorous reaction at once occurs, the temperature rising to 1250°–1300° C. Alloys containing a high proportion of titanium (12–14%) are made by placing a mixture of titania, cryolite, and potassium chlorate with aluminium shavings into an empty crucible preheated to 1000°–1100° C.; after the first rigorous reaction has subsided (increasing the temperature to 1340°–1370° C.) more of the charge may be fed in slowly. The pouring temperature must not be below 1000° C. Loss of aluminium by burning is 25–30% of the shavings. The alloys most suitable for industry are those with 3–5% titanium, with or without copper. A method of analysis of titanium–aluminium alloys is given. 18 references to the literature are given.—N. A.



GLAZUNOV, S. G.

Testing of Chamuttskii (Yakutsk) corundum. S. G. Glazunov. *Abrazivi* Sarat. 9, No. 4, 25-7(1933). Large deposits of corundum, containing 86.8-94% Al_2O_3, compare favorably in chem. and abrasive properties with synthetic products. Chas. Blanc

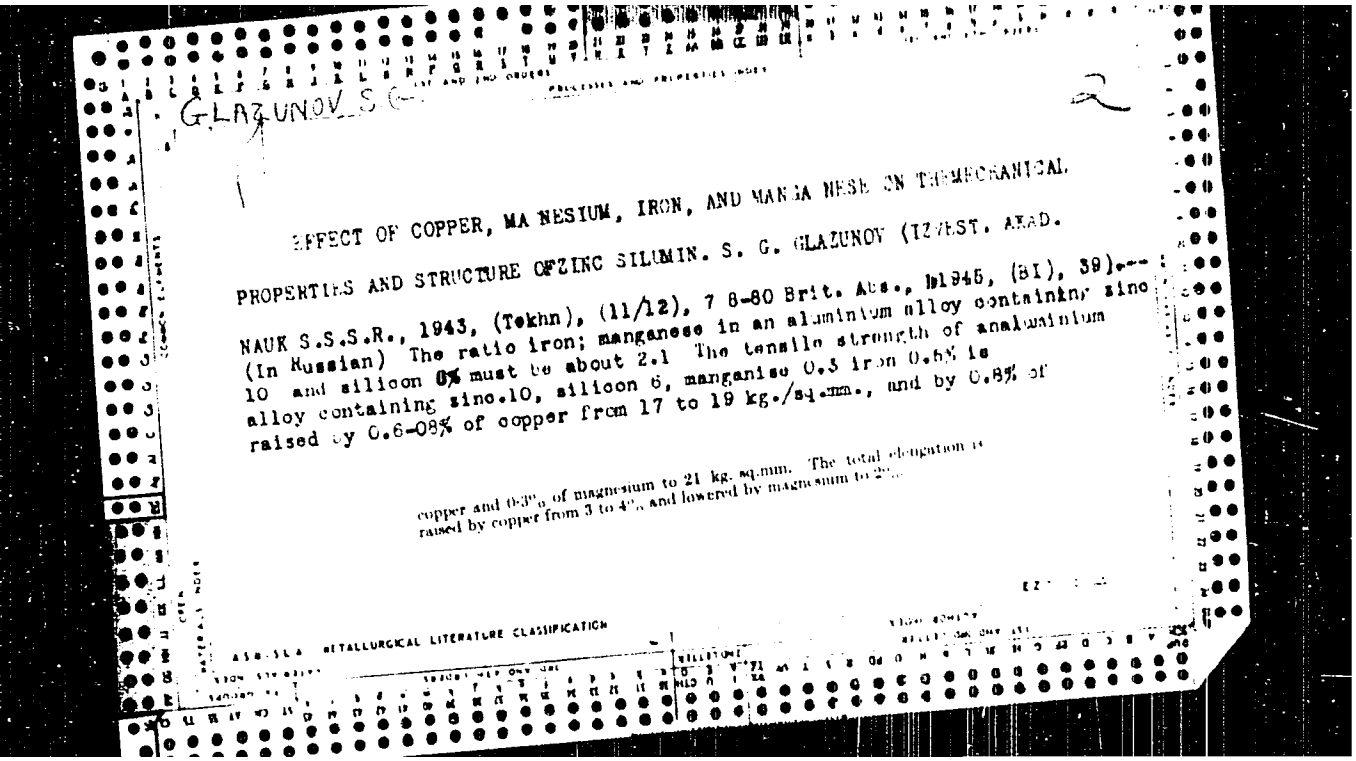
ASM SEA METALLURGICAL LITERATURE CLASSIFICATION

M GLAZUNOV, S. G.

3

Methods of Manufacture of Titanium Aluminium Alloys. S. G. Glazunov and V. V. [illegible] [illegible] 1936, (2), 45-60. (In Russian.) The aluminothermic process for producing titanium-aluminium alloys is described together with methods of [illegible] and chemical analysis of such alloys. —N. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



GLAZUNOV, S G

EFFECT OF COPPER, MAGNESIUM, IRON, AND MANGANESE ON THERMOMECHANICAL PROPERTIES AND STRUCTURE OF ZINC SILUMIN. S. G. GLAZUNOV (IZVEST. AKAD. NAUK S.S.S.R., 1943, (Tekhn), (11/12), 7 8-80 Brit. Abs., B1946, (BI), 39)--- (In Russian) The ratio iron; manganese in an aluminium alloy containing zinc 10 and silicon 6% must be about 2.1 The tensile strength of analuminium alloy containing zinc.10, silicon 6, manganese 0.5 iron 0.6% is raised by 0.6-08% of copper from 17 to 19 kg./sq.mm., and by 0.8% of copper and 0.3% of magnesium to 21 kg. sq.mm. The total elongation is raised by copper from 3 to 4% and lowered by magnesium to 2%.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

EVERHART, John L.; GLAZUNOV,S.G., [translator], redaktor; LUZHNIKOV, L.P.,[translator], redaktor; ARKHANGEL'SKAYA,M.S., redaktor; EVENSON,I.M., tekhnicheskiy redaktor

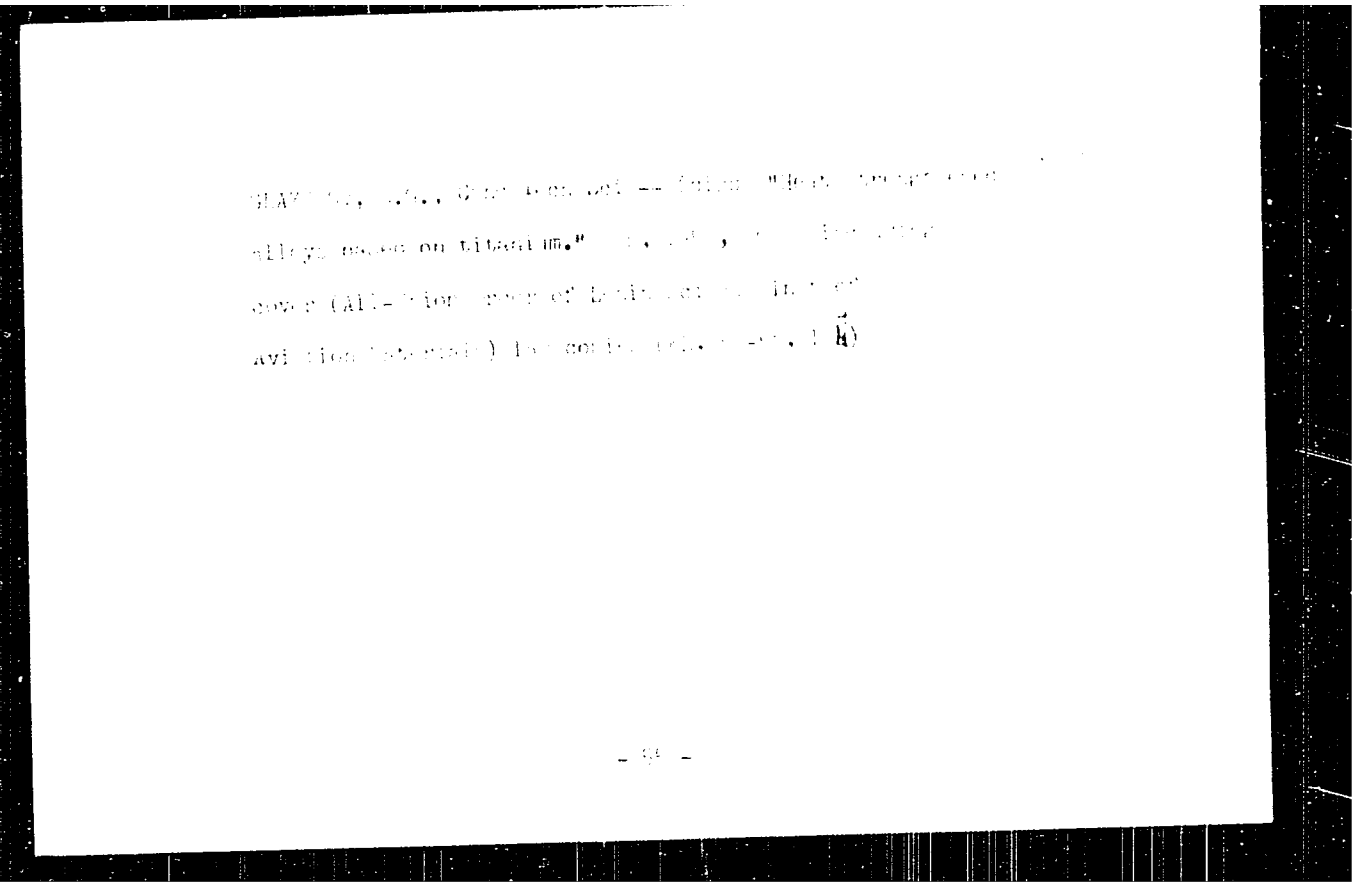
[Titanium and titanium allys. Translated from the English] Titan i ego splavy. Perevod s angliiskogo. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1956. 138 p. (MLRA 9:3)

(Titanium)

GLAZUNOV, S.G.

"Titanium," by A. D. McQuillan and M. K. McQuillan (New York 1956, 466 pp), reviewed by S. G. Glazunov, Novyye Knigi za Rubezhom, Seriya B, Tekhnika, No 3, Mar 57, pp 40-42

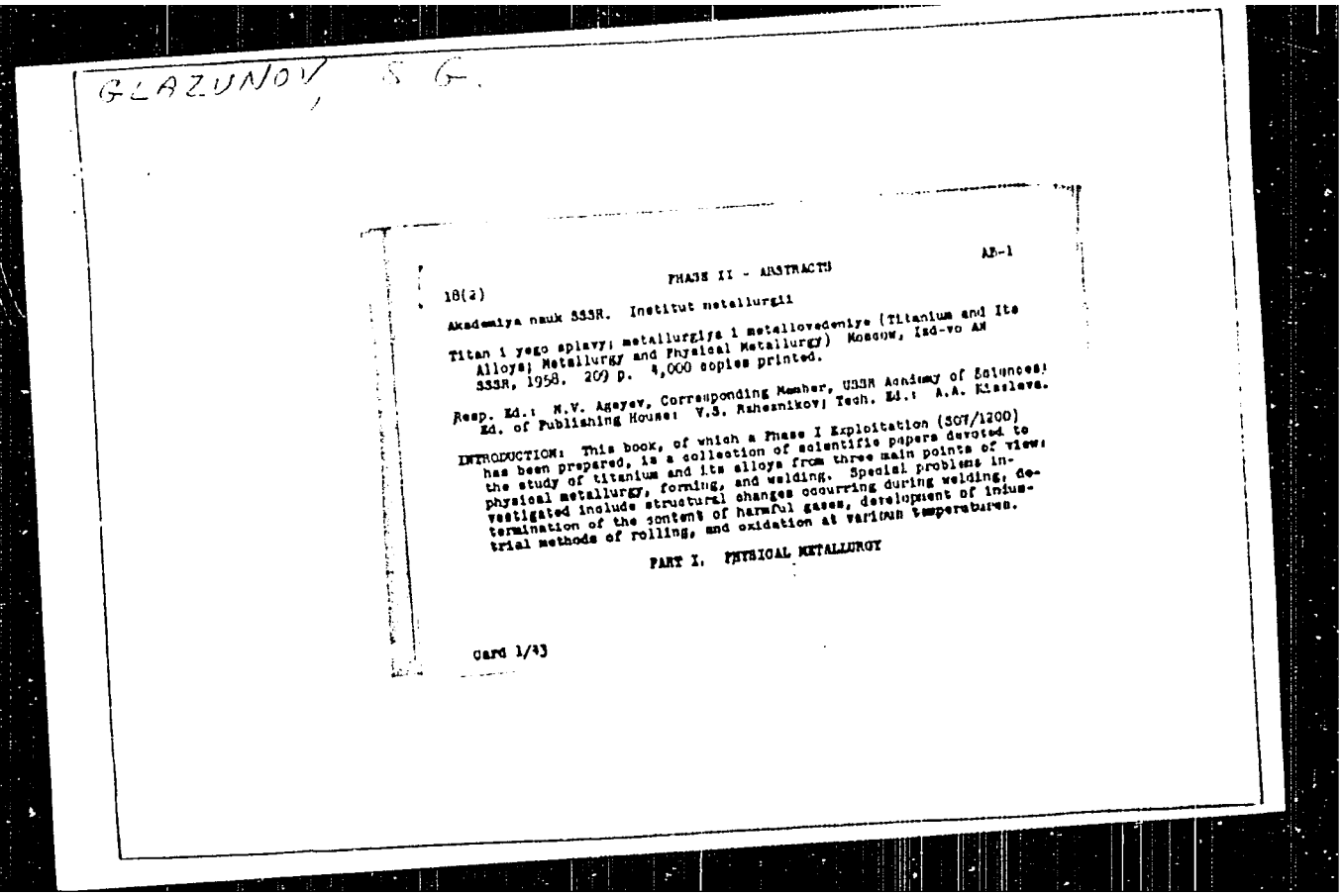
The book is the fourth edition in the series Metallurgy of Rare Metals. The chief editor is H. M. Finniston, head of the metallurgy section of the scientific research atomic center at Harwell. The book is much more complete than the short handbook by Everhard (Titanium and its Alloys) recently published by Metallurgizdat in Russian translation. The scientific level of the book is very high and the latest achievements in physics of metals are included. The translation of this book is already under way by Metallurgizdat and the action taken is much approved by the reviewer. (U)



KALUGIN, Viktor Filippovich; BARZIY, Vyacheslav Kupriyanovich; GLAZUNOV, Sergey Georgiyevich; KUZINA, Tamara Stepanovna; POPOV, Boris Nikolayevich; OGURTSOV, Aleksandr Ivanovich; OL'SHANSKAYA, I.V., inzh., ved. rdd.; PONOMAREV, V.A., tekhn. red.

[Technology of ingot forging and the continuous rolling of large-size, commercially pure, VT1D titanium sheet. Over-all mechanization of the loading and unloading of ingots from holding furnaces] Tekhnologiia kovki slitkov i nepreryvnoi prokatki krupnogabaritnogo lista iz tekhnicheski chistogo titana VT1D. Kompleksnaia mekhanizatsiia protsessov zagruzki i vygruzki zagotovok iz metodicheskoi pechi. [By] A.I. Ogurtsov. Moskva, Filial Vses.in-ta nauchn. i tekhn. informatsii, 1958. 17 p. (Peredovoi nauchno-tekhnicheskii i proizvodstvennyi opyt. Tema 5. No.M-58-22/3) (MIRA 16:3)

(Titanium) (Rolling (Metalwork))
(Materials handling--Equipment and supplies)



GLAZUNOV, S. G.

AB-1

PHASE II - ABSTRACTS

18(2)

Akademiya nauk SSSR. Institut metallurgii

Titan i yego splavy; metallurgiya i metallovedeniye (Titanium and Its Alloys; Metallurgy and Physical Metallurgy) Moscow, Izd-vo AN SSSR, 1958. 209 p. 4,000 copies printed.

Resp. Ed.: M.V. Ageyev, Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: V.S. Rabeznikov; Tech. Ed.: A.A. Kiseleva.

INTRODUCTION: This book, of which a Phase I Exploitation (SOV/1200) has been prepared, is a collection of scientific papers devoted to the study of titanium and its alloys from three main points of view: physical metallurgy, forming, and welding. Special problems investigated include structural changes occurring during welding, determination of the content of harmful gases, development of industrial methods of rolling, and oxidation at various temperatures.

PART I. PHYSICAL METALLURGY

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Titanium and Its Alloys (Cont.)

Glazunov, S.G. (Ministry of the Aircraft Industry of the USSR)
Effect of Heat Treatment on the Structure and Properties of VT-2 Alloy 99

The author makes a study of existing data on the structure and properties of VT-2 alloy as affected by normalization. (Typical composition of alloy: C - 0.61 percent; Cr - 2.31 percent; Al - 1.62 percent; Si - 0.05 percent; Fe - 0.41 percent; Ti - remainder). He shows that two critical temperature ranges exist for this alloy, corresponding to two types of transformation-viz., the 950-1010° C range, in which the alpha-plus-beta structure is converted into the beta structure, and the 450-600° range in which the solid solution decomposes with precipitation of the intermetallic compound $TiCr_2$. Conclusions. 1) The strength and hardness of VT-2 alloy are determined by the temperature of the complete beta transformation. When the content of the principal alloying elements is kept within established limits (2.3 percent Cr, 1-2 percent Al) and the nitrogen content does not exceed 0.07 percent, the transformation temperature depends on the oxygen content. 2) VT-2 alloy exhibits optimum mechanical properties after normalization when the transformation

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temperature lies between 970 and 1000° C. 3) When the transformation temperature lies below 970°, the alloy has greater ductility but less strength. In order to raise the ultimate strength to 100 kg/mm^2 (the minimum required under certain engineering conditions), the alloy must be subjected to additional heat treatment (heating for 1 hour at 750-800°, followed by cooling in air). 4) To increase the ductility of the alloy when its transformation temperature lies between 1010° and 1020° and when its elongation is a little below the minimum of 8 percent, the alloy must be heated additionally at 650-700° after normalization. 5) When the transformation temperature exceeds 1020° the ductility is so low that it cannot be increased sufficiently to meet engineering demands. 6) Tests made at 300,400,500, and 600° C for periods of 50,100,150, and 200 hr showed that VT-2 alloy undergoes aging at 500°, accompanied by a decrease in ductility. There are 4 figures, 2 tables, and 3 references (2 Soviet and 1 English).

Stroyev, A.S., Ye.N. Novikova (Ministry of the Aircraft Industry of the USSR) Increasing the Surface Hardness and Wear Resistance of Titanium Alloys by Means of Thermodiffusion Impregnation 107

Experiments were conducted in the impregnation of forged ti-

GLAZUNOV, S.G.

Effect of heat treatment on the structure and properties of the BT2 alloy. Titan i ego splavy no. 1:99-106 '58. (MIRA 14:5)

1. Ministerstvo aviatsionnoy promyshlennosti SSSR.
(Titanium alloys--Metallography) (Phase rule and equilibrium)

The Effect of Hydrogen on the Structure and Properties of Titanium and its Alloys

alloys with the β or $(\alpha+\beta)$ structure and little is known about the mechanism of embrittlement in alloys of this type. The presence of hydrogen in the $(\alpha+\beta)$ alloys is revealed by low ductility of materials tested for tensile strength at slow rates of loading, and by premature brittle fracture in creep at room temperature. Alloys with the β structure are not sensitive to hydrogen even when it is present in quantities that markedly affect the properties of the α and $(\alpha+\beta)$ alloys. The original properties of titanium alloys, which are adversely affected by the presence of hydrogen, can be restored by a suitable vacuum heat treatment.
There are 28 references (21 English, 3 Soviet, 3 German and 1 French)

Submitted: July 8, 1957

SOV/24-58-6-5/35

AUTHORS: S.G. Glazunov, I.I. Kornilov and A.M. Yakimova

TITLE: The Effect of Hydrogen on the Structure and Properties of Titanium and its Alloys (Vliyaniye vodoroda na strukturu i svoystva titana i yego splavov)

PERIODICAL: Izvestiya akademii nauk SSSR, otdeleniye tekhnicheskikh nauk, 1958, Nr 6, pp 30-36 (USSR)

ABSTRACT: On the basis of data published by various investigators up to 1956 the authors of this paper constructed a more accurate equilibrium diagram of the system titanium-hydrogen showing the region of low temperature transformations. They arrived at the conclusion that the mechanism of hydrogen embrittlement of titanium is determined by the type of the structure of the alloy, namely: a) In technical titanium and in alloys with the α structure embrittlement is due to the presence of the hydride phase formed as the result of the eutectoid transformation. The main manifestation of the hydrogen embrittlement of the alloys with the α structure is their increased notch sensitivity. b) There is no evidence of the formation of the hydride phase in the

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SOV/24-58-9-3/31

AUTHORS: Glazunov, S.G., Kornilov, I.I. and Yakimova, A.M. (Moscow)

TITLE: The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1 (Vliyaniye vodoroda na strukturu i svoystva promyshlennykh splavov VT2, VT3, VT3-1)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 9, pp 17 - 24 (USSR)

ABSTRACT: The experimental specimens were prepared from commercial quality, Ti-based alloys of the $(\alpha + \beta)$ type, the main alloying elements being Cr and Al (alloys VT2 and VT3) or Cr, Al and Mo (alloy VT3-1). The complete chemical analysis of the alloys is given in a table on p 17. An industrial h.f. induction furnace was used for the preparation of the VT2 alloys which were melted in a graphite crucible, in a neutral atmosphere. The VT3 and VT3-1 alloys, melted in a vacuum-arc furnace with a water-cooled copper hearth using a consumable electrode, were characterised by a much lower C, H and N content. To ensure that the effect of H on the properties of the VT2 alloys would not be obscured by the effect of other

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The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

metallurgical factors, the following procedure was adopted. Two melts with a maximum H content were selected and one half of this material was vacuum annealed (96 hours at 700 °C). After this treatment which reduced the H content of the alloy from 0.06 to 0.009 wt%, both the treated and untreated materials were normalised (30 minutes at 1 050 °C followed by air cooling). To obtain specimens of the VT3 and VT3-1 alloys with the H content varying between 0.005 and 0.12 wt%, the alloys placed in evacuated quartz ampules together with a quantity of titanium hydride were held for 10 hours at 700 °C and cooled in water. The H content was calculated from the increase of weight of the alloy specimens, the accuracy of this method having been confirmed by the results of the vacuum-fusion and spectrographic analysis. To ensure that all the materials were in the same structural condition, they were heat-treated in the following manner: alloy VT3 - air cooled after 3 hours at 750 °C; alloy VT3-1 - air cooled after 30 min at 870 °C and 1 hour at 650 °C.

The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

For the tensile tests of the VT2 and VT3-1 alloys, both the standard and notched test pieces were used (V-notch, 60° angle, 0.5 mm root diameter), the rate of strain being 14.5 mm/min. The tensile strength of the standard and notched specimens ($\sigma_B^{(1)}$ and $\sigma_B^{(2)}$ respectively), elongation, δ, and reduction of area, ψ, of the VT2 alloy with a low and high H content tested at various temperatures (-70 to + 400 °C) are given in Table 1. The effect of the rate of strain, v, on σ_B, δ and ψ of the VT2 and VT3-1 (Table 2) was studied at room temperatures on standard test pieces at v = 0.16, 14.5 and 56.5 mm/min. The impact strength (a), of these two alloys in relation to their H content, q, was determined in the +20 to -70 °C temperature range and the results are reproduced graphically in Figure 1. The thermal stability of the VT3 and VT3-1 alloys was studied by means of room temperature tensile tests (v = 14.5 mm/min) carried out on test pieces heat-treated at 400 and 450 °C

The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

for 100 hours. Figures 2 and 3 show how σ_B, δ and ψ of these two alloys (in the untreated state and after treatment at 400 and 450 °C) are affected by their hydrogen content. The fatigue limit and creep resistance of the VT2 alloy with a high and low H content was also tentatively investigated. The analysis of the results of the mechanical tests and examination of the microstructure of the investigated alloys led to the following conclusions: 1) Although the notch sensitivity of the VT2 and VT3-1 alloys at room temperature increases rapidly with increasing H content, the mechanical properties of these alloys as measured by the standard tensile test on unnotched test pieces are not affected by the presence of 0.005 to 0.08%.H. 2) Since the tensile strength of the VT2 and VT3-1 alloys increases with increasing rate of strain, the testing procedures for Ti alloys should be standardised. 3) Variation of the H content in the 0.005 - 0.08% range does not affect the low temperature (-40 to -70 °C) impact strength of the VT2 and VT3-1 alloys. 4) When the H content of the VT3 alloy reaches 0.015%,

The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

the alloy becomes brittle after 100 hours at 400 or 450 °C. This critical value of the H content can be considerably increased by addition of 1-2% molybdenum. 5) The eutectoid decomposition of the β-phase in the VT3 alloy resulting in the precipitation of an intermetallic compound $TiCr_2$ is accelerated by the presence of 0.015 - 0.035% H. On the other hand, no eutectoid decomposition of the β-phase was observed in the VT3-1 alloy (VT3 alloy with 1.5% Mo) containing up to 0.12% H (Figure 4). 6) A considerable reduction of the H content of the commercial Ti alloys can be attained by the application of the more modern melting technique of vacuum-arc fusion instead of h.f. melting in a neutral atmosphere. 7) If necessary, the H content of VT2 alloys can be considerably reduced by a 12-hour annealing treatment at 700 °C in vacuum of the order:

$$3 = 10^{-3} - 1 \times 10^{-4} \text{ mm Hg.}$$

This treatment increases the ductility of the alloy without

The Effect of Hydrogen on the Structure and Properties of Industrial Alloys VT2, VT3 and VT3-1

lowering its tensile strength, improves the creep resistance but does not affect the fatigue limit of the alloy.
There are 4 figures and 4 tables.

SUBMITTED: July 8, 1957

Card 6/6

GLAZUNOV, S.G.

Kolugin, V.F., V.K. Baraly, S.G. Glazunov, T.S. [illegible], and S.N. Zopov (State Committee on Aircraft Engineering, Council of Ministers of the USSR). Production of Large-Sized Cold-Rolled Sheet From VT-1D Alloy, p. 139. Titan i yego splavy. vyp. II: Metallurgiya titana (Titanium and Its Alloys. No. 2: Metallurgy of Titanium) Moscow, Izd-vo AN SSSR, 1959. 174 p.

This collection of papers deals with sources of titanium; production of titanium dioxide, metallic titanium, and titanium sheet; slag composition; determination of titanium content in slags; and other related matters. The sources of titanium discussed are the complex sillimanite ores of the Arakhtinskoye Deposit (Buryatskaya ASSR) and certain aluminum ores of Eastern Siberia. One paper explains the advantages of using ilmenite titanium slags for the production of titanium dioxide by the sulfuric acid method. Production of metallic titanium by thermal reduction processes (hydrogen, magnesium, and sodium reduction) is the subject of several papers, while other papers are concerned with the electrolytic production of titanium. Other subjects dealt with are interaction of titanium with water vapor and with hydrogen and the determination of titanium in slags.

GLAZUNOV S G.

Spravochnik po mashinostroitel'nym materialam v chetyrekh tomakh, tom 2: Tsvetnyye metally i ikh splavy (Handbook on Machine-Building Materials in 4 Volumes, V. 2, Nonferrous Metals and Alloys) Moscow, Mashgiz, 1959, 639pp

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Handbook on Machine-Building (Cont.)

18. 1285

66225
SOV/126-8-3-8/33

AUTHORS: Kornilov, I.I., Glazunov, S.G. and Yakimova, A.K.

TITLE: Influence of Hydrogen on the Properties of a Nigher Creep Limit VT-8 Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 3, pp 370-377 (USSR)

ABSTRACT: The present paper is a continuation of a series of papers dealing with the study of the influence of hydrogen on the properties of commercial titanium alloys of α + β-structure. The aim of the present investigation was to study the influence of different hydrogen contents on the properties of the VT-8 alloy (residual deformation not more than 0.2% after 100 hours at a stress of 24 kg/mm^2 at 500°C). The following melts of the VT-8 alloy were studied: (1) melt 7: 6.3% Al, 3.9% Mo, 0.12% Fe, 0.08% Si, 0.1% O_2 at the following hydrogen contents: 0.005, 0.015, 0.025, 0.05 and 0.06%; (2) melt 8: 6.3% Al, 3.25% Mo, 0.20% Fe, 0.07% Si and 0.2% O_2 at the same hydrogen contents; (3) melt 10-1: 6.6% Al, 3.0% Mo, 0.05% Fe, 0.04% Si and 0.1% O_2 at the following hydrogen contents: 0.005, 0.015, 0.025%; (4) melt 10-3: 6.6% Al, 3.0% Mo, 0.05% Fe, 0.04% Si and 0.3% O_2 at the same hydrogen content as (3).

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SOV/126-6-3-6/33

Influence of Hydrogen on the Properties of a Higher Creep Limit VT-6 Alloy

The alloys were saturated with hydrogen in a specially constructed universal instrument for the saturation of metals with gases and for the analysis of gaseous. Extremely pure hydrogen was obtained by thermal dissociation of titanium hydride; the saturation temperature was 700°C. Melts of the VT-6 alloy with different oxygen contents were obtained by alloying titanium dioxide. An identical initial state of the billets after saturation was ensured by subsequent heat treatment which was carried out in electric furnaces in air atmosphere. The heat treatment of the VT-6 alloy consisted in annealing at 880°C for 1 hour, followed by cooling in air. The mechanical properties were investigated by using Gagarin-type specimens at a straining rate of 2.5 mm/min (Fig 1). The properties were investigated of specimens in the original condition (600°C - 1 hour), of specimens aged at 500°C for 100 hours and specimens aged under a stress of 11 kg/mm² at 500°C for 100 hours. The UTS was found to have increased from ageing from 112 to 125 kg/mm² and to have [illegible]

Card 2/6

...fluence of hydrogen on the properties of a titanium alloy VT-8 alloy

with increase in hydrogen content.
dependence of the mechanical properties
on the hydrogen content and the rate of
lines - annealed at 650°C for 1 hour;
annealed at 60°C for 1 hour follow
Fig 5 shows the dependence of impact
VT-8 alloy on the hydrogen content
temperature. Metallographic investigation
alloy with various hydrogen contents
At room temperature, the alloy has
β-structure. The effect of hydrogen
the alloy consists in coarsening
as the hydrogen content increases
apparently also in increasing the
β-phase. Fig 6 and 7 show the results
of two VT-8 alloys containing 0.1
respectively, in relation to the
Fig 8 and 9 show photomicrographs
an oxygen content of 0.1 and 0.3%
contents. An investigation of the

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SOV/126-6-3-8/33

Influence of Hydrogen on the Properties of a Higher Creep Limit VT-8 Alloy

on the creep of the alloy VT-8 was carried out. Two VT-8 alloys of 0.1 and 0.2% oxygen and 0.005, 0.015 and 0.025% hydrogen were investigated for creep properties at 500°C, after 100 hours at a stress of [illegible] kg/mm². As the hydrogen content increased from 0.005 to 0.025% an increase in the residual deformation was observed (see Table 1). The influence of hydrogen on the stabilization of the residual β-phase in the VT-8 alloy under various heat treatments is shown in Table 2. The authors arrive at the following conclusions: (1) Investigation of the influence of hydrogen within the limits 0.005 and 0.05% on the mechanical properties of the VT-8 alloy has shown that a considerable lowering of plastic properties occurs at a hydrogen content of 0.015% which is associated with the instability of the β-phase in the structure and its decomposition. (2) The investigation of the influence of hydrogen on the properties of the above alloy at various straining rates has shown that the plasticity of the alloy decreases considerably at low testing rates, particularly when the hydrogen content is increased. The UTS of the

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Influence of Hydrogen on the Properties of a Higher Creep Limit VT-8 Alloy

alloy increases from 109 to 117 kg/mm² on increasing the testing rate from 0.17 to 48.2 mm/min respectively (at a hydrogen content of 0.005%). (3) The impact resistance of the alloy at room temperature and [illegible] (-78 to -196°C) changes relatively little in the hydrogen content range of 0.005 to 0.06%. The test temperature exerts a considerably greater influence on the hydrogen content up to 0.08%. (4) As the hydrogen content increases, the hydrogen exerts an ever greater unfavourable influence on the properties of the alloy (5) In the investigation of the influence of hydrogen on the creep of the alloy at 500°C in 200 hours it was found that as the hydrogen content increases the extent of residual deformation increases. Oxygen increases the creep resistance of the alloy. (6) The phase analysis of VT-8 alloys with different hydrogen contents has confirmed the presence of residual β-phase in the structure. At low hydrogen contents (up to 0.015%) the residual β-phase is unstable and during ageing a redistribution of molybdenum between the α and β-phases takes place. As the

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Influence of Hydrogen on the Properties of a Higher Creep Limit VT-8 Alloy

hydrogen content increases, the α-phase [illegible] and its unit cell parameter increases. There are 9 figures, 2 tables and 9 references, 2 of which are Soviet and 7 English.

SUBMITTED: June 21, 1958

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PHASE I BOOK EXPLOITATION SOV/4508

Akademiya nauk SSSR. Institut metallurgii

Titan i yego splavy, vyp. 3: Metallovedeniye titana (Titanium and Its Alloys, No. 3: Metal Science of Titanium) Moscow, Izd-vo AN SSSR, 1960. 161 p. Errata slip inserted. 2,700 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii imeni A.A. Baykova.

Resp. Ed.: N.V. Ageyev, Corresponding Member, Academy of Sciences USSR; Ed. of Publishing House: N.L. Podgoyetskiy; Tech. Ed.: Ye. V. Makuni.

PURPOSE: This collection of articles is intended for scientific research workers and metallurgical engineers.

COVERAGE: The articles summarize results of experimental studies of titanium-base alloys. The microstructure and mechanical properties of titanium-base alloys containing aluminum, chromium or other metals are analyzed along with the effect of oxygen, hydrogen and heat treatment on alloy structure and properties. The tendency of titanium alloys to embrittlement as a result of strain aging is explained, and the nitriding of titanium, carried out to increase the surface strength and wear resistance of titanium alloys, is described. Transformations occurring in commercial titanium under conditions of electric heating are examined. Attempts to develop titanium-base alloys capable of withstanding temperatures over 400°C are discussed as are problems of titanium-powder metallurgy and weldability of certain titanium-base alloys. No personalities are mentioned. Most of the articles have bibliographic references, the majority of which are Soviet.

TABLE OF CONTENTS:

GLAZUNOV, S.G., kand.tekhn.nauk, red.; RABINOVICH, A.M., red.izd-va; ROZHIN, V.P., tekhn.red.

[Titanium in industry] Titan v promyshlennosti; sbornik statei. Moskva, Gos.nauchno-tekhn.izd-vo Oborongiz, 1961. 327 p. (MIRA 15:2)

(Titanium alloys)

GLAZUNOV, S.G.

Modern titanium alloys. Metalloved. i term. obr. met. no.2:2-7 F '63. (MIRA 16:3)
(Titanium alloys)

TARASENKO, G.N.; GLAZUNOV, S.G.

New thermally hardenable BT15 alloy. Metalloved. i term. obr. met. no.2:41-45 F '63. (MIRA 16:3)
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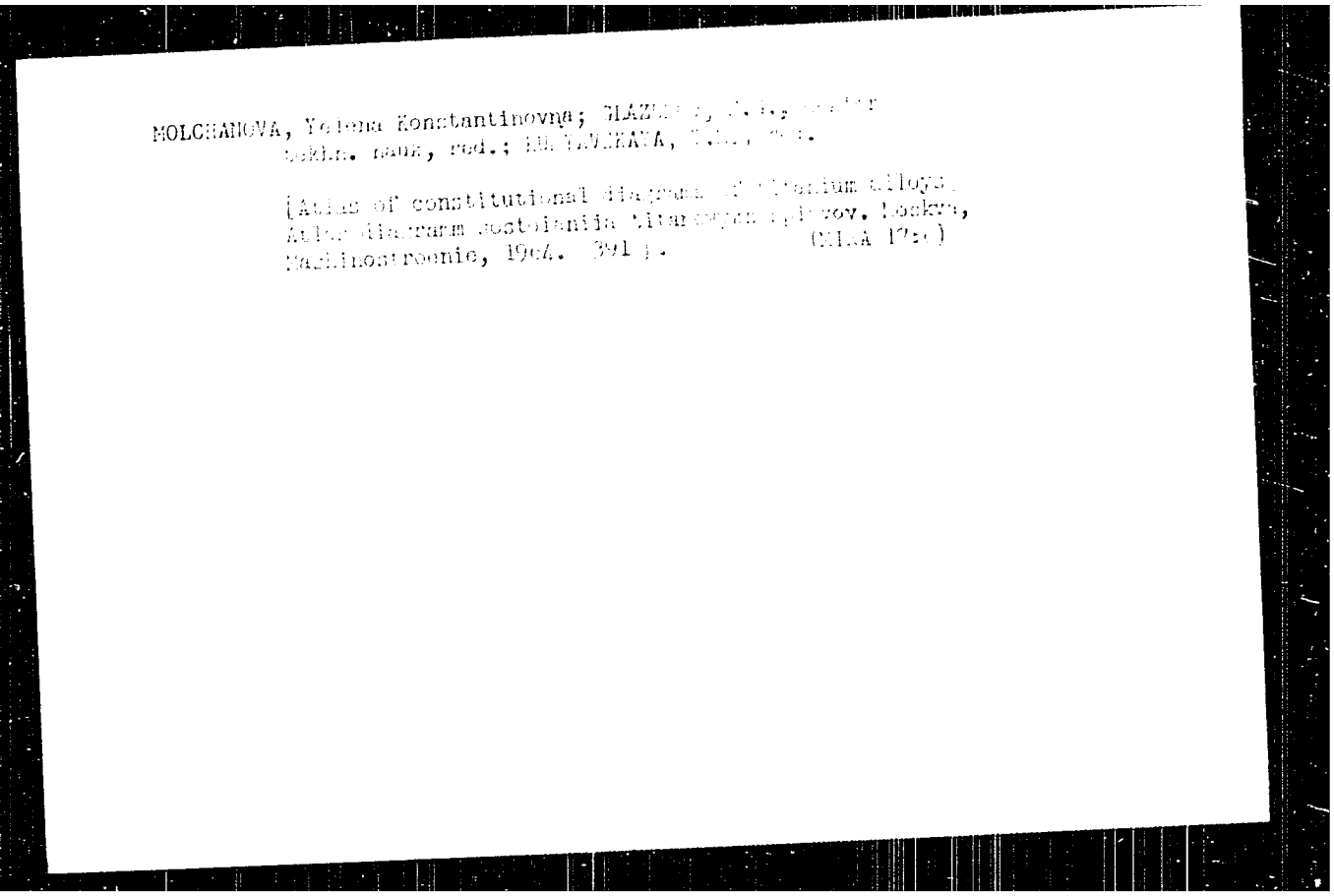

MOLCHANOVA, Yelena Konstantinovna; GLAZ[illegible]

[illegible]. nauk, red.; [illegible]

[Atlas of constitutional diagrams of titanium alloys. Atlas diagramm sostoianiia titanovykh splavov. Moskva, Mashinostroenie, 1964. 391 p. (MIRA 17:6)

S/762/61/000/000/001/029

AUTHORS: Altunin, Yu.F., Glazunov, S.G.

TITLE: Titanium-aluminum binary alloys.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S.G.Glazunov. Moscow, 1961, 5-30.

TEXT: The objective of the paper comprised the experimental compilation of a diagram of high-temperature characteristics(HTC) versus the composition of Ti-Al alloys with from 0 to 50% Al, primarily to provide a basis for the study of the influence of various alloying elements on the HTC of Ti-Al alloys. Another objective was the study of the HTC of the two-phase $\alpha_2+\gamma$ region which, so to speak, constitutes an "alloy" of Ti with the Ti-Al γ-phase (the phase containing 36% Al). A literature survey of the subject is set forth, with heavy dependence on the work by H.R.Ogden et al. (Trans.AIME, Inst.Metals Div., v.197, 1953, 267) for the 0-50% Al range, the work by W.L.Fink et al. (ibid., 1931, 1150) for a projection to the 50-100% Al range, the intermetallide work by P.Duwez et al. (ibid., v.194, 1952, 70), the peritectic-reaction work by E.S.Bumps et al. (ibid., v.194, 1952, 609), the peritectoid-α_2-reaction work by K.Sagel et al. (Z.f. Metallkunde, v.47, no.8, 1956, 529), and others. A tentative phase diagram is plotted using the latest literature

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data. It comprises 3 peritectics (P): (1) β + liquidus $\rightleftharpoons \gamma$; (2) γ + liquidus $\rightleftharpoons TiAl_3$; (3) $TiAl_3$ + liquidus $\rightleftharpoons$ solid solution (SS) of Ti in Al. The survey of the tests by Ogden (cited above) and I.I.Kornikov (Akad.n.SSSR, Trudy IMET, no.2, 1959) points to optimal HTC for alloys in the region of concentrated SS's bordering against the two-phase ($\alpha_2+\gamma$) region. Mechanical tests of alloys of the Ti-Al system were made at 20°C, 500°, and 800°. Alloys with 0 to 38% Al (at 2% intervals) were tested; alloys with greater Al % were too brittle. The mechanical properties (MP) of specimens vacuum-annealed at 900°C for 10 hrs are tabulated and graphed in contraposition to the phase diagram and the various phase transformations. In correlation therewith 70x enlarged photographs in ordinary light (L) and polarized light (PL) are shown of pure T (α-phase), pure Ti (twins), and Ti-Al alloys with up to 38% Al at 2% intervals (in L and PL). Generalized findings at 20°C: (1) Region of α-phase: Strength and hardness increases, ductility decreases, with increasing Al content. Rotation required to obtain discoloration in PL: 73° for pure Ti, 93° for 6% Al alloy. (2) Region of ($\alpha+\alpha_2$), α_2 phases: Small additions of α_2 increase the strength of the alloy further; greater additions, up to replacement of the α phase, decrease both strength and hardness. α_2 phase is clearly distinguishable from α phase under PL. (3) Region of ϵ phase distinguished by reduced strength and hardness (minimum) and two-phase structure. (4) Region of α_2 phase (23 - 24.5% Al) manifests sharp reduction in strength and a Hv minimum. (5) Region of ($\alpha_2+\gamma$) phase. Increased strength and

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hardness, but complex behavior due to SS transformations and non-equilibrium states. PL permits distinction between γ phase formed by α_2-phase decomposition and γ phase formed by peritectic reaction. (6) Region of γ phase: Minimal strength and hardness. With 38% Al, liquational nonuniformities appear. The mechanical properties at 500 and 800°C are discussed in some detail. Summary: (1) The HTC of alloys rich in Al (α_2 + γ region) are significantly better than the HTC of Ti-rich alloys; best are the HTC of 32% Al alloy in the two-phase region: 67 kg/mm^2 at 20°, 62 kg/mm^2 at 500°, 71 kg/mm^2 at 800°C. (2) Alloys in the ε-phase region have low strength at all temperatures; however, the 22% Al alloy has 63 kg/mm^2 at 800°C. There are 29 figures, 2 tables, and 15 references (3 Russian-language Soviet, 8 English-language U.S., including one Russian translation, and 4 German-language).

ASSOCIATION: None given.

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S/762/61/000/000/003/029

AUTHORS: Glazunov, S.G., Yelagina, L.A., Kotova, V.I.

TITLE: Alloys of the titanium-silicon and titanium-aluminum-silicon system.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S.G.Glazunov. Moscow, 1961, 41-72.

TEXT: This experimental report adduces the results of an investigation of the mechanical properties at 20-800°C, the phase composition, and the structure of Ti-Si alloys with up to 4.5% Si and Ti-6Al alloys with up to 2.5%Si. The objective of the investigation was a determination of possible means for increasing the strength of Ti-Si and Ti-Al-Si alloys through heat treatment and, ultimately, to find high-strength and high-temperature alloys with acceptable ductility. The basic problem is to reconcile the presence of the hardening intermetallic compounds with adequate ductility. This has already been achieved in Ti-13Sn-2.5Al alloys. Reference is made to D.A.Sutcliffe's findings (Revue de Metallurgie, no.3, 1954, 524) on the desirable effect of Si-Ti intermetallic compounds on the high-temperature (HT) strength and fusion resistance of Ti. Sutcliffe and M.Hansen et al. (Trans. ASM, v.44, 1952, 518) have commented on the hardenability of Ti-Si alloys by heat treatment which, according to P.D.Frost (J. of Metals, v.8, no.1, 1956,

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35-42) can be attributed to intermetallic segregations. In addition to the alloys Ti-(0.03-4.5)Si and Ti-6Al-(0.02-2.5)Si, tests were made of Ti-6Al-2.5Si-(0.5-1.0)Cu and Ti-6Al-2.5Si-2Sn alloys (composition detailed in two full-page tables). The reason for the great number of binary alloys in the region near 0.5% Si is the need for an accurate determination of the effect of Si on the notch-toughness which, according to Sutcliffe, drops most sharply in that particular concentration interval. The invariable Al concentration in the ternary Ti-Al-Sn alloys was selected as great as possible without incurring the formation of the ductility-reducing α_2 phase. The introduction of the Cu and Sn into the most HT-resistant of the ternary alloys, Ti-6Al-2.5Si, was motivated by a hope to improve its HT characteristics without any impairment in ductility. The preparation of the base materials is described in detail. 4-6 specimens of each composition were tested, and the mean result is reported. Hardness tests were performed with a 5-mm diam. ball and a 750-kg load after removal of a 3-4-mm thick, possibly oxidized, surface layer. Phase composition was determined by X-ray spectroscopy; Debyegrams were taken. Results: (1) Binary Ti alloys with more than 0.5% Si and ternary alloys with more than 1% Si can be hardened by quenching and aging. The maximum attainable through heat treatment of Ti-Si alloys (2.5% Si) is 30-31 kg/mm^2 and of Ti-6Al-Si (2.5% Si) 15-18 kg/mm^2. (2) Quench-hardened alloys of the Ti-6Al-Si system with an elevated (2 to 2.5%) Si content are equal in HT characteristics to the BT10 (VT-10) and BT9

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(VT9) alloys; however, the alloys investigated are less ductile and do not excel in the stability of their properties. (3) The hardening achieved by quenching appears to be a result of the formation of a Si-supersaturated solid α' solution (attributed to a suppression of the eutectoid transformation) and the inception of its decomposition, whereas the sharp increase in brittleness upon tempering is a result of the further segregation of the intermetallic compound Ti_5Si_3 and the unfavorable disposition of its particles predetermined by the oriented β→α transformation. (4) The silicon increases the temperature of recrystallization of the titanium. The good HT characteristics, the relatively low specific gravity, and the ample availability of the alloying elements of Ti-Al-Si alloys justify the conclusion that alloys of this system will become suitable for casting, provided that their properties are sufficiently stabilized. There are 18 figures, 8 tables, and 3 English-language references.

ASSOCIATION: None given.

APPROVED FOR RELEASE: 09/24/2001 CIA-RDP86-00513R000500020010-3"

S/724/61/000/000/008/020

AUTHORS: Glazunov, S.G., Lotareva, O.B.

TITLE: The effect of high temperatures on the properties of AL8 (AL8) alloy parts.

SOURCE: Liteynyye alyuminiyevyye splavy; svoystva, tekhnologiya plavki, lit'ya i termicheskoy obrabotki. Sbornik statey. Ed. by I.N. Fridlyander and M.B. Al'tman. Moscow, Oborongiz, 1961, 70-74.

TEXT: The paper reports the results of an experimental investigation of possible heat-treatment procedures of AL8 alloy and the problem of the instability of the quenched AL8 alloy upon exposure to temperatures above 100°C. Much is to be gained by a suitable heat treatment of the cast alloy which, after casting alone, has a tensile strength of 15-17 kg/mm^2 and an elongation of 0-1%, whereas, after tempering at 430°, holding for 10-20 hrs, and water cooling, the tensile strength increases to 28-35 kg/mm^2 and the elongation to 9-20%. It is theorized that a brittle phase, β (Al_8Mg_5) or, possibly, Mg_2Al_3, to which the brittleness of the cast state is attributed, is transferred into the solid solution during the tempering heating, and the brittle network on the grain boundaries, disappears, so that the alloy attains the structure of the solid solution (SS), except for a sparsely

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The effect of high temperatures on the ....

encountered Mg_2Si phase, which is regarded as an impurity. In view of the instability of the improved SS, however, the tempered AL8 alloy suffers from the ready precipitation of the quenched solid solution and a sharp deterioration of its mechanical properties. In particular, the loss in ductility occurring thereby is so great that the alloy becomes totally unsuitable for its ordinary applications (use in stressed parts exposed to the action of impacts). Therefore, any heating of the quenched alloys above 100°C is completely inadmissible. For example, a 5-hr heating to 125°C results in a small increase in the tensile strength, an appreciable increase in the hardness (some 10%), and an appreciable drop in the elongation (from 20-14%). At yet higher temperatures (150-225°), the mechanical properties are severely impaired and approach the properties of the non-heat-treated alloy. The precipitation of the solid solution can be distinctly observed on microsections (at magnifications of the order of 1,500x) after 30 min heating at 180° (several microphotographs are shown). There are 7 figures only; no references.

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S/762/61/000/000/004/029

AUTHORS: Glazunov, S.G., Solonina, O.P.

TITLE: Alloys of the titanium-zirconium-aluminum system.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S.G.Glazunov. Moscow, 1961, 73-78.

TEXT: The paper reports the results of an experimental investigation, performed in 1957, of the Ti-Zr-Al system. The objective of the project was the development of a Ti alloy with an increased high-temperature (HT) creep limit (30 kg/mm^2 for 50 hrs at 475-500°C) than is currently available with the HT alloys BT8 (VT8) and BT10 (VT10). Inasmuch as α-type Ti alloys have the highest creep limit, Zr and Al, which form the largest regions of α solid solutions (SS), were selected as alloying elements for the new alloys, using 6-14% Zr and 2-10% Al. 100-g ingots were cast from alloys consisting of sponge Ti (tensile strength: 45 kg/mm^2) and pure metallic Zr and Al. The test specimens consisted of 11x11-mm forged and tempered rods. Tensile tests were performed at 20 and 500°C, creep tests at 500°C. To save time, the specimens were held for 25 hours at 500°C under a load of 30 kg/mm^2, whereupon the residual elongation was measured. The mechanical properties obtained are plotted against the Al and Zr content. The

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Alloys of the titanium-zirconium-aluminum system. S/762/61/000/000/004/029

strengthening effect of Al is found to be significantly greater than that of Zr. For example, an alloy with 6% Al had a tensile strength of 95 kg/mm^2, whereas an alloy with 6% Zr attained only 62 kg/mm^2 with nearly identical ductility. However, the elongation with 8 and 10% Zr is more than 20%, whereas specimens with a like Al content are completely brittle. In the ternary Ti-Zr-Al alloys the principal strengthening element is the Al, both at 20 and at 500°C. Optimal creep resistance is attained by alloys containing more than 8% Zr and more than 4% Al. Alloys with 4-8% Al and 6-14% Zr, which manifested the smallest residual elongation (0.12 - 0.25% after 25 hrs at 500° under a 30 kg/mm^2 load), were tested more extensively. Tests on the effect of stepwise quenching and isothermal tempering on the mechanical properties and thermal stability showed increased tensile strength and decreased ductility after quenching than after tempering. Temperature stability was tested by 50-hr soaking at 500°C and mechanical testing at room temperature. Alloys with up to 6% Al were more stable after tempering; alloys with more than 6% Al were more stable after quenching. Ductility was somewhat reduced after aging in all instances. Ductility is improved (although strength is not affected) upon reduction of the forging temperature from 1150° to 900° (test results tabulated). After completion of the subject tests in 1957 the authors became aware of the analogous tests of the U.S. firm Mallory-Sharon (Iron Age, v. 182, no. 17, 1958) on a very similar alloy (881), except that 1% (Nb+Ta) was also present. Additional tests were made

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with an ad-hoc prepared 881 alloy, and it was found that its tensile strength is equal to that of the previously tested alloy 1125, but that its room-temperature ductility is significantly higher. Thus, the (Nb+Ta) addition improves the ductility of the Ti-Al-Zr alloy without impairing its HT characteristics. It is suggested that alloys with 6-8% Al and 8-12% Zr may serve as a basis for HT alloys for operation at 600-700°C temperature. There are 4 figures, 2 tables, 4 references (1 Russian-language Soviet, 2 English-language - of which one in Russian translation, and 1 German).

ASSOCIATION: None given.

S/762/61/000/000/014/029

AUTHORS: Glazunov, S.G., Solonina, O.P.

TITLE: Mechanical properties and structure of the BT3 (VT3) and BT3-1 (VT3-1) alloys as functions of their content of alloying elements.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S. G. Glazunov. Moscow, 1961, 142-159.

TEXT: The paper describes 3 test series relative to the effect of (1) O, (2) Ni, and (3) a variety of other alloying elements on the VT3 and VT3-1 Ti alloys. Effect of O: The subject experimental investigation was prompted by the observed lowering in strength of various Ti alloys, for example, VT3-1, upon introduction into the alloy of high-grade sponge Ti which, because of its lower content in Fe, Si, and O, exhibits a tensile strength of 38-50 kg/mm^2 as against 48-60 kg/mm^2 of the less pure Ti employed previously. Earlier tests had shown that in VT3-1 (Ti-5Al-2Cr-1.5Mo) O serves as a stabilizer of α-phase Ti, but that its effect on the plasticity and thermal stability of the alloy beyond 0.2% becomes adverse, primarily through its accelerating effect on the decomposition of the residual β phase. Al, on the other hand, stabilizes the β phase which acting as an α stabilizer (cf. Blok, N.I., et al., pp. 112-120, of the present compendium, Abstract S/762/61/000/000/010/029). The Al enters into the β phase in small quantities (hundredths of a percent) and increases its quantity and, hence, the α-solid-solution solubility of the elements forming the β phase, namely, Cr and Mo, and, ultimately, improves its stability.

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Mechanical properties and structure of the BT3 (VT3).. S/762/61/000/000/014/029

The specific objective of the present project was an investigation of the effect of 0.1, 0.2, 0.3, 0.4, and 0.5% O on the mechanical properties and thermal stability of a VT3-1 alloy with 4, 5, and 6% Al content and a fixed 2% Cr and 1.5% Mo content. 4-kg melts were fused in an arc electrofurnace. Sponge Ti (39 kg/mm^2) was supplied with Al-Cr-Mo ligature and TiO_2. Tension specimens 5 mm diam and Mesnager impact specimens were produced. Standard VT3-1 heat treatment was applied: Heating to 870°C, cooling to 650°, and air-cooling. This procedure ensures optimal plasticity after 100-hr aging at 450°. Short-duration tensile tests were made at 20, 350, 400, 450, and 500°; thermal stability entailed 100-hr soaking of finished specimens at 350-500°, followed by mechanical testing at room temperature (RT). The RT tests (graphed) indicate that a 1% increase in Al is equivalent to a 0.1% increase in O. A gain of 6-8 kg/mm^2 in tensile strength is accompanied by a reduction in plasticity and notch toughness, most noticeably so with 0.5, 0.4, and 0.2% O and 4, 5, and 6% Al. Thermal-stability tests indicate that with increasing Al content the embrittling O limit decreases; for example, 0.4, 0.3, 0.2% O_2 with 4, 5, and 6% Al, respectively, lead to brittle failure. Uniform thermal stability was obtained with 0.2% O_2 and 5% Al and with 0.3% O_2 and 4% Al (after 100 hrs at 500°); any further increase in %O reduced the embrittlement temperature (450° at 0.4% O_2, 350° at 0.5% O_2). Thus, Al should be regarded as the primary strengthening agent. For example, at 450° a 1% increase in Al content increases the tensile strength by 8-10 kg/mm^2, whereas a 0.1% increase in O_2 content has no appreciable effect.

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Mechanical properties and structure of the BT3 (VT3).. S/782/61/000/009/014/027

Stress-rupture tests, made at 450°C and at ~ 55 kg/mm² stress level at which, according to Specs, VT3-1 should last through 100 hrs, yielded a failure time of 15 and 31 hrs with 4% Al without O_2 and 95 hrs with 0.1% O_2; 0.2% O_2 was required to achieve 100 hrs. 5% Al achieved 100 hrs regardless of O_2 content at 55 kg/mm², 6% Al the same minimum at 60 kg/mm². Inasmuch as O accelerates the decomposition of the β phase and increases the quantity of embrittling dispersive α phase, Al, and not O, will henceforth be regarded as the primary strengthening element. The Al content of VT3-1 has therefore been increased from 5.2 to 6.2%, and a corresponding change has been effected in the Technical Specs. [illegible] of Ni in VT3 and VT3-1 alloys. The basic contribution of Ni to the rapid eutectoid decomposition of the β solid solution is briefly summarized (cf. Jaffee, R.I., J. of Metals, v.7, no.2, 1955, 247-252; and Glazunov, S.G., Molchanova, Ye.K., Diagrammy sostoyaniya splavov titana //Phase diagrams of Ti alloys//, Oborongiz, 1954). Anticipating that Ni might improve the high-temperature strength and creep limit of the Ti alloys as favorably as do Cu and Si, tests were made for the mechanical properties and thermal stability of Ti alloys VT3 (Ti-5Al-2.5Cr) and VT3-1 (Ti-5Al-2Cr-1.5Mo) with 0.03, 0.05, 0.075, 0.1, 0.3, and 0.5% Ni. Specimens were prepared by the method employed for the O tests. Sponge Ti with a strength of 41 kg/mm² and Al-Cr, Al-Cr-Mo, and Al-Ni ligatures were used. The specimens were annealed by heating to 870°, cooling to 650°, and subsequent air cooling. Thermal stability was tested by room-temperature (RT) tests after 100-hr aging at 300°, 350, 400, 450, and 500°.

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Mechanical properties and structure of the BT3 (VT3)..S/762/61/000/000/014/02

RT tests showed increased strength up to 0.1%Ni, with some decrease in ductility and impact strength. RT tests of HT-aged specimens revealed a decrease in thermal stability with increasing aging temperature. In VT3 the thermal stability (ThSt) is preserved up to 350° regardless of Ni content; at higher T the ThSt decreases, but even at 450° VT3 does not undergo brittle fracture even with 0.5%Ni. VT3-1, however, loses ThSt at 450° with more than 0.1%Ni and suffers brittle fracture with 0.5%Ni. Thus Ni cannot serve as a useful alloying element for VT3 and VT3-1. Microstructural considerations, however, lead to the conclusion that up to 0.03%Ni may be employed as an inoculating addition to achieve a finer microstructure of the two alloys. Effect of V, Cu, Mn, Zr, Sn, and B on the mechanical properties of the VT3-1 alloy. Tests were made with a large number of melts comprising 0.5, 1.0, 1.5, and 3% Mn, 0.5, 1.0, and 1.5% Sn, 0.5, 1.0, and 1.5%Zr, and 0.3, 0.6, 1.0, and 2.0% V, 0.3, 0.6, 1.0, and 2.0% Cu, and inoculating additions of 0.01, 0.05, and 0.1% B. Details of the test procedure are set forth, and test results are graphed. It is concluded that the tensile strength of the VT3-1 alloy at 20°C and 450° is increased most effectively by 0.5 to 1.0% of each of the above-listed elements and up to 0.01% B, with conservation of the ThSt. Conclusion: VT3-1 can be strenghthened most effectively by the addition of Al, which reduces the specific gravity and increases the HT strength of the alloy while conserving its ThSt. The O_2 content should not exceed 0.2%. It is established that up to 0.03% Ni and 0.01% B can be used as structure-refining inoculating additions for VT3 and VT3-1. Up to 0.5% each of

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Mechanical properties and structure of the BT3 (VT3).. S/762/61/000/000/014/029

Mn, Cu, Sn, Zr, and V exert a favorable effect on the strength of the VT3-1 alloy without impairing its thermal stability. There are 10 figures, 2 tables, and 3 references (2 Russian-language Soviet and 1 English-language U.S.). The participation of G.F.Karelina in the work is acknowledged.

ASSOCIATION: None given.

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S/762/61/000/000/020/029

AUTHORS: Glazunov, S.G., Kurayeva, V.P.

TITLE: The titanium alloy BT10 (VT10) with elevated creep limit.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S. G. Glazunov. Moscow, 1961, 216-226.

TEXT: The paper summarizes the current state of the metallurgy of Ti-Al-Cu-Sn alloys (refs. to Bunshah, R. F., Margolin, H., Trans. ASM, v. 51, 1959; Holden, F.C., et al., J. Metals, no. 7, 1955, 117; Frost, P. D., Metal Progress, v. 75, no. 4, 1959, 91-96), which have been found to be highly creep-resistant, and describes an experimental investigation of alloys containing 4.8-6% Al, 2-3.7% Cu, and 2-3% Sn, intended to attain a high-strength Ti alloy with a maximal creep limit at 500°C. ТГ0 (TG0) sponge Ti was used with the addition of pure metallic Al, Cu, and Sn and binary Al-Cu and ternary Al-Cu-Sn ligatures. The melts were fused in a vacuum arc furnace. Forging preheat to 1,030-1,050° was performed in an electric furnace. Following 1-hr anneal at 800° and air-cooling, tests were performed at room T and elevated T. Thermal stability was tested by room-T tests after 50-100-hr aging at 500° with and without stress. Both Cu and Al are strengthening additions. Yet, they diminish the plasticity in equal measure. 500° aging strengthens the alloy and reduces its plasticity. This consideration limits the Cu content to 3.5% and the Al content to 6%. The microstructure of the alloy comprises an α phase and an intermetallic Ti_3Cu compound. Aging does not effect any appreciable

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structural change. High-temperature (HT) tests at 500°C indicate improved short-duration strength with increasing Cu and Al content. 100-hr stress-rupture tests indicated that a strength of 48-52 kg/mm^2 requires no less than 5% Al and 2.8% Cu. Such alloys exhibit stress-rupture strengths of 30 kg/mm^2 at 550° and 18 kg/mm^2 at 600°. Cu and Al improve the creep resistance of the alloy, with an optimal creep strength with 6% Al and 3.7% Cu, but at a sacrifice in plasticity. Sn, also, exerts a favorable effect on creep strength. The residual-creep-strain data exhibited some scatter. Optimal overall mechanical properties at 20 and 500° with satisfactory thermal stability are thus attained by an alloy with 5-6% Al, 2.8-3.5% Cu, and 2-3 % Sn. Edurance-test data are reported as entered on the specification sheet for the VT10 alloy, together with data for the determination of a scale factor to account for the diameter of the test specimen. At RT the 10^{-7}-cycle endurance limit for a smooth specimen 5-mm diam is appx. 50 kg/mm^2. Compression, torsion, and shear-test data are tabulated. Ultra-short-duration tensile tests at 600, 700, and 800° are reported and compared with similar data on the BT8 (VT8) alloy. Low-T test results obtained at -40, -70, and -196°C are reported. A complete full-page tabulation of the physical properties of the VT10 alloy is provided. Inasmuch as Cu is a eutectoid β stabilizer, tests were made to explore the effect of quench, tempering, rate of cooling during quench, etc., on the properties of VT10. The results were totally negative; quench cannot fix the β phase (cf. Blok, N.I., et al., same

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compendium, pp. 227-231, Abstract S/762/61/000/000/021/029). VT10 is not an $\alpha+\beta$ Ti alloy, but an α alloy with an intermetallic-compound strengthener. The present study essentially is an investigation of the relaxation and recrystallization process following forging deformation and reheating. Ti is characterized by a less than normal (for metals) uniformity in the rate of recrystallization and the grain size resulting from it. Reheating of VT10 after deformation leads to relaxation at 700°, as indicated by sharply defined X-ray interference rings with a distinct doublet. Recrystallization sets in at 800°, with individual reflections on the rings. The number of individual points increases with increasing T. Texture is preserved up to 950°. Beyond 950° the rings are transformed into individual spots, which suggests completion of the recrystallization at a T which coincides with the phase-recrystallization T. The end product of this investigation is a V_2T10 alloy of the Ti-Al-Cu-Sn system with an elevated creep strength (28-30 kg/mm^2 with 0.2% residual strain after 100 hrs at 500°C). The alloy is currently being operationally tested on parts operating at 500°. There are 11 figures (including an over-page-size fold-out with X-ray photos), 4 tables, and 4 references (1 Russian-language Soviet and 3 English-language U.S., all cited in the text). The participation of lab assistant Zh.D.Afanas'yeva in the experimentation and that of M.I.Yermolova in the recrystallization X-ray study is acknowledged.

ASSOCIATION: None given.

S/762/61/000/000/022/029

AUTHORS: Glazunov, S.G., Moiseyev, V.N.

TITLE: Heat treatment, structure, and properties of the BT14 (VT14) alloy.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S. G. Glazunov. Moscow, 1961, 232-244.

TEXT: The paper describes an experimental investigation intended to establish an optimal heat-treatment procedure for the Ti-Al-Mo-V alloy VT14. The principal function of the alloying elements is the stabilization of the β phase in the titanium; the alloy may, therefore, be termed a martensitic alloy. The alloy contains 3.5-4.5% Al, 2.5-3.5% Mo, 0.7-1.5% V, with admixture not to exceed 0.4% Fe, 0.15% Si, 0.1% C, 0.15% O, 0.05% N, 0.015% H. In the absence of eutectoid-forming admixtures the equilibrium state consists of an α phase with a hexagonal lattice and a small quantity of cubic β phase. A step-by-step discussion explores the effects of various quenching and anneal processes having their inception below and above the boundary of martensitic transformation, respectively. The mechanical properties of VT14 alloy with the metastable phases β and α' in the structure are significantly affected by low-temperature aging as a result of dispersive hardening. The aging reaction leads from the primary Mo-poor β phase to an enriched β phase with separation of Mo-poor α phase and, finally, to the equilibrium β phase for the given tempering temperature and α phase. Thus, following aging, the VT14 alloy

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consists of fairly large particles of primary α phase, residual β phase, and the dispersive α phase (which affords strength and hardness to the alloy) formed as a result of the decomposition of the β phase. An investigation of a VT14 alloy containing 4.22% Al, 3.05% Mo., 0.85% V, 0.03% Fe, 0.07% Si, and 0.007% C indicates that the optimal anneal procedure for this alloy, affording an elevated plasticity (elongation 15-16% and a necking of 40-50%) and a satisfactory strength (σ_b = 90-95 kg/mm^2), consists of heating to 750-850°C for 40-60 min with subsequent air-cooling. The quench-and age-treated VT14 has a tensile strength of 120-140 kg/mm^2 and an elongation of 7-12%. Optimal quench is in water from 860-880°, with aging at 480-500° for 12-16 hrs. The heating time of rod material at pre-quench temperature may be limited to approximately 15 min. The VT14 alloy is extremely sensitive to overheating during plastic hot deformation and heat treatment. A heating of the alloy to above 920-930° leads to a sharp impairment of the mechanical properties of the alloy after hardening heat treatment. Hence, hot working should be performed at T not to exceed 920-930°, with a reduction in area of the metal at that temperature of not less than 50%. There are 22 figures and 1 (unnumbered) table; no references.

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AUTHORS: Altunin, Yu.F., Glazunov, S.G.

TITLE: High-strength high-temperature titanium alloys.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S.G. Glazunov. Moscow, 1961, 245-253.

TEXT: The paper describes an investigation of the high-temperature (HT) mechanical properties of the so-called γ Ti alloy with 36% Al, which has been described by J.B.McAndrew and H.D.Kessler (J. of Metals, v.8, no.10, Section 2, 1956). The so-called γ phase constitutes an intermetallic TiAl compound of variable composition, with a specific gravity of 3.5. Mechanical testing of the γ alloy at T from 20 to 1,100°C manifests a tensile-strength peak of appx.43 kg/mm^2 at 800°. The tensile strength of the unalloyed γ alloy at 1,000° is 26 kg/mm^2. The 100-hr stress-rupture strength of the γ alloy is 17 kg/mm^2 at 800°, 9 kg/mm^2 at 900°, and 5 kg/mm^2 at 1,000°. An investigation of the effects of β-phase-stabilizing alloying elements, such as Nb, Mo, Ta, and V, shows that all of them, except V, enhance the strength of the alloy. Of the alloys tested, the most promising appears to be the γ alloy with 5% Mo; its tensile strength at 20° is 49 kg/mm^2, at 1,000° 38 kg/mm^2. An attempt to increase the strength and plasticity of the γ alloy by means of a refinement of its structure by means of additions of 0.1, 0.5, and 1.0% B failed; brittle fracture, without measurable elongation or necking.

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was observed. Hence, B cannot be regarded as a useful plasticizing additive. Casting tests manifested good fluidity and, hence, suitability of the alloy for the casting of irregularly shaped parts. Addition of up to 10% Nb, Ta, and Mo did not appear to impair the casting qualities of the γ alloy. A photograph reproduces a highly branched, antler-shaped, casting of γ alloy with 7% Nb, comprising two compressor blades and two rows of tensile-strength and notch-toughness specimen blanks. The casting was performed in a special furnace for the carbonless casting of Ti; the surfaces of the castings were entirely free of any pores. Attempts to forge cast γ-alloy billets at T up to 1,200°C were unsuccessful. Attempts were also made to obtain a deformed structure in the γ alloy by means of HT pressing. Blanks 48-mm diam and 60-70 mm high were employed; the results of tests at 1,200, 1250, 1,290, 1,350, and 1,390° indicated best deformation at 1,390° with a reduction in area of appx. 65%, but not without formation of fissures. In summary, the investigation of the γ alloy indicated optimal possibilities for its use at 800-1,000° and opened up still more promising avenues for the development of HT alloys based on it. In addition, the excellent casting characteristics of the γ alloys are encouraging for the production of odd-shaped parts. There are 10 figures, 7 tables, and 2 references (1 Russian-language Soviet and 1 English-language U.S.). The participation of technician A.K.Gavrilov in the investigative work and of S.B.Pevzner in the hot-pressing operations is acknowledged.

S/762/61/000/000/024/029

AUTHORS: Morozov, Ye.I., Glazunov, S.G., Khromov, A.M.

TITLE: The shape casting of titanium alloys.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S. G. Glazunov. Moscow, 1961, 254-265.

TEXT: The paper describes the development of equipment and methods for the making of shaped castings of Ti and its alloys. The immediate objective is to overcome the difficulties occasioned by the chemical activity of molten Ti and its embrittlement upon reaction with O, N, and H and even with ordinary refractory mold materials. Mold materials: Crystalline quartz, electrocorundum, ZrO_2, MgO, BeO, and CaO molds, bound with ethylsilicate and Zr nitrate, were tested; the molds were made by the lost-wax pattern method. The Ti was heated to >2,000°C and fused in an induction furnace with a graphite crucible; the suitability of the mold material was judged by its interaction with the liquid Ti as manifested by its sticking to the mold, the surface smoothness of the casting, and the presence of cavities in it. SiO_2 and fused electrocorundum were found to be the most accessible and least costly materials, but SiO_2 interacted objectionably with the Ti. White electrocorundum performed better, but left some of the casting with surficial pores. The reaction of the metal with the mold was inhibited by a 0.015-0.02-mm graphite or TiC layer applied in the form of a colloidal alcohol suspension poured into the mold, drained, and firmed up by 2-3-hr baking at 850-900° in a neutral-gas atmosphere.

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