"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A. and KOLACHEV, B.A.

"Aging of Copper and Gold Alloys" Tr. Mosk, Aviats. Tekhnol. in-ta, 23, 1954, 33-43

Microhardness and electric resistivity of Cu_3Au and CuAu alloys were studied at 600° hardening and at loo, 135, 170°, and 205° annealing. The hardness-time curve of CuAu Alloy at 170 and 205° exhibits two maxima, due to the difference in the speed of aging process of the middle grain face. The maximum aging effect of Cu_3Au predominates at 205° and the hardness increases 33% as compared with tempered alloy. The [redacted] hardness resistivity does not change at 135 and 170° and drops at 205° only after 9 hr duration. (RZhFiz, No 11, 1955)

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Petrov, D. A.

USSR/Chemistry - Metallurgy

Card 1/1 Pub. 147 - 21/26

Authors : Petrov, D. A., and Bukhanova, A. A.

Title : New method of obtaining variable composition samples and the possibility of its application

Periodical : Zhur. fiz. Khim. 28/1, 161-173, Jan 1954

Abstract : A new method is introduced for the derivation of variable composition samples through the extraction of the solid phase from the smelt. The theory of the process is explained and the applicability of the above mentioned new method to Al alloys containing from 2 - 4% Cu was verified. Other applications of this method are: formation of solidus lines, solubility lines in solid state, determination of the nature of invariant, study of the phase composition of complex mixtures, etc. Two USSR references (1944 and 1947). Graphs; drawing; illustrations.

Institution : Academy of Sciences USSR, Institute of Metallurgy

Submitted : July 28, 1953

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A., professor, doktor tekhnicheskikh nauk, redaktor; VILLENEVA, A.V., tekhnicheskiy redaktor

[Germanium; a collection of translations] Germanii; sbornik perevodov. Moskva, Izd-vo inostrannoi lit-ry, 1955. 254 p. (MLRA 8:7) (Germanium)

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A.

Distr: 4E2c

*Akademiya Nauk S.S.S.R. *Voprosy Teorii i Issledovaniya Poluprovodnikov i Protsessov Poluprovodnikovoi Metallurgii.* (*Problems in the Theory and Investigation of Semi-Conductors and Processes of Semi-Conductor Metallurgy.*) 20 × 13 cm. Pp. 96. illustrated. 1955. Moscow: Izdatel'stvo Akademii Nauk S.S.S.R. (3 rbl.)

[Contents: A. F. Ioffe, "Some Problems in Semi-Conductor Physics"; A. R. Regel', "The Relation Between Electron Conductivity of Liquids and Their Structure"; M. A. Gorynova, "Substitutional Solid Solutions in Compounds Having the Zinc-Blende Structure"; B. T. Kolomiets and N. A. Goryunova, "Electrical Properties and Structure of Some Ternary Semi-Conductor Systems"; D. A. Petrov, "Processes of Crystallization from Melts and Their Application in Semi-Conductor Metallurgy and Other Fields."]

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A.

4

4E2c

Utilization of the phenomena observed in the crystallization of metallic melts. D. A. Petrov and A. A. Bukhanova. *Aluminievye Splavy, Lit'e, Prokatka, Rovka, Shlampovka, Termoobrabotka* (Moscow: Gosudarst. Izdatel. Oboron. Prom.) *Sbornik* 1955, 65-83; *Referat. Zhur., Met.* 1956, No. 3433.—Samples of alternating compn. can be obtained by direct extrusion from the melt. High extrusion results in homogeneous samples. To obtain greater homogeneity of compn. it is necessary to lower the extrusion velocity, to improve intermixing in the melt, to suppress diffusion in the solid phase by quick cooling of extruded samples, and to obtain a min. of overheating in melt. The device for obtaining samples of alternating composition is described. Some applications of method are: (1) By measuring the temp. of the melt near the front of crystn. and detg. chem. compn., it is possible to construct a solidus line on the phase diagram. (2) In accordance with the distribution of admixtures, it is possible to det. the character of invariant reactions. This is very important in cases in which the admixture changes m.p. very slightly. For instance, it was found that invariant reaction in the system Al-Mn at 658° and 1.95% Mn is related to eutectic type. (3) The line of soly. in solid state can be constructed. (4) Substances of highest purity can be obtained. (5) Phase compn. of multicomponent alloys can be detd.

Alexis N. Pestoff

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

USSR/ Scientists - Metallurgy

Card 1/1 Pub. 124 - 14/40

Authors : Plaksin, I. N., Memb. Corresp., Acad. of Sc., USSR; Petrov, D. A.; Sudoplatov, A. P.; and Syskov, K. I., Dr. of Techn. Sc.

Title : Mining and metallurgy in the German Democratic Republic

Periodical : Vest. AN SSSR 1, 69-71, Jan 1955

Abstract : Briefs are presented of the special scientific meeting called by the Freiberg Mining Academy for Sept. 29 - Oct. 2, 1954. The meeting was devoted to the 50-th anniversary of the death of the famous German chemist and metallurgist, Klemens Winkler (1838-1904). A progress report of the Bergakademie (Mining Academy) for 1954 was presented. Names of personalities attending the meeting are listed.

Institution : .....

Submitted : .....

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A.

"Investigation of Crystallization Processes in Pure Metals" a paper read at the International Metallurgists' Conference, Moscow 26-30 June 56

SO: CS-3,302,240, 11 Jan 57

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A.

"A report on modern semiconductor materials was given by Prof D. A. Petrov, who discussed methods for the production of very pure germanium and silicon, new materials with a crystalline structure (i.e., a structure similar to that of germanium and silicon) which expand the region of the application of semiconductor devices in the high temperature range (at temperatures reaching up to 3500 C) and in the infrared region of the spectrum, solid solutions of germanium in silicon, etc.

given at the conference on the Techn. [illegible] of Dielectrics and Semiconductors, Leningrad Electr. tech. Inst. im. Ul'yanov. (Lenin), June 195[illegible].

Sum 1239

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A.

5445* (Russian.) Modern Semiconductor Materials. Sovremennye poluprovodnikovye materialy. D. A. Petrov. Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, no. 11, Nov. 1956, p. 82-95.

New possibilities in electronics and radio offered by the development of crystal semi-conductive rectifier and amplifier. Metals and methods used, problems.

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Petrov, D.A.

USSR/ Miscellaneous - Conferences

Card 1/1 Pub. 124 - 11/28

Authors : Petrov, D. A., Dr. of Tech. Sc.

Title : Two decades of the Hungarian Aluminum Industry

Periodical : Vest. AN SSSR 26/1, 62-64, Jan 1956

Abstract : Minutes are presented from the Congress on Light Metals held in Budapest, Hungary during September 28-30, 1955, where the achievements of the Hungarian Aluminum Industry for the past twenty years were analyzed. Countries represented at the congress are listed.

Institution : .....

Submitted : .....

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A.

USSR/ Chemistry - Metallurgy

Card 1/1 Pub. 147 - 6/35

Authors : Petrov, D. A.

Title : Actual distribution of admixtures in crystals obtained by extraction from fusions and the possibilities of developing this method

Periodical : Zhur. fiz. khim. 30/1, 50-55, Jan 1956

Abstract : The possibility of eliminating the general heterogeneity in the distribution of an admixture along the length of an ingot and the possibility of obtaining crystals of a longitudinally constant composition are discussed. Periodic heterogeneity in the admixture distribution along the length of the ingot was observed during an insufficiently slow extraction of the ingot (monocrystal) from the fusion. It was found that the method of extracting with constant feed of the melt allows ingots to be obtained with constant composition over the entire length. Three references: 2 USA and 1 USSR (1953-1954). Graphs; drawings; illustrations.

Institution : Acad. of Sc., USSR, Inst. of Metallurgy, Moscow

Submitted : April 18, 1955

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A. and KOLACHEV, B. A.

"The Use of Crystallization Processes for the Preparation of [illegible] Purified Substances," by D. A. Petrov and B. A. Kolachev, Institute of Metallurgy, Academy of Sciences USSR, Zhurnal Fizicheskoy Khimii, Vol. 30, No. 10, Oct 56, pp. [illegible]-2347

The author [illegible] considerably [illegible] the purification of substances by the method of fractional ("[illegible]") crystallization from melts and the drawing [illegible] ("pulling") of monocrystals from molten material according to Chokhral'skiy's method. They point out the importance of the methods described for the production of semiconductor materials, particularly germanium, and say that purification by the method of growing monocrystals [illegible] being applied successfully at present not only to germanium, but also to silicon, iron, [illegible], platinum, silver, selenium, tellurium, aluminum, indium, antimony, bismuth, and other elements. They furthermore say that fractional crystallization is also applicable to other semiconductor materials besides germanium and to metals in general. Experimental results which support these statements are described in the text of the article. Two references to earlier work by D. A. Petrov are given.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Page

AUTHOR: See Table of Contents

TITLE: Problems of Metallurgy and Physics of Semiconductors (Voprosy metallurgii i fiziki poluprovodnikov) Transactions of the Second Conference on Semiconducting Materials (Trudy 2-go soveshchaniya po poluprovodnikovym materialam)

PUB. DATA: Izdatel'stvo Akademii nauk SSSR, Moscow, 1957, 151 pp., 7,000 copies.

ORIG. AGENCY: Akademiya nauk SSSR, Institut metallurgii imeni A. A. Baykova

EDITORS: Ed.-in-Chief: Petrov, D. A., Professor, Doctor of Tech. Sciences; Ed. of Publishing House: Grigor'yev, Ye. N., Tech. Ed: Kashin, P. S.

PURPOSE: The book presents a collection of papers reporting on the latest results in Soviet research in this field of science.

COVERAGE: The volume contains the principal papers read at the Second Conference on Semiconducting Materials, held at the Institute of Metallurgy im. A. A. Baykov, Academy of Sciences, in January 1956. The preface reviews the individual papers read by the contributing authors and describes briefly the content

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Problems of Metallurgy and Physics of Semiconductors (cont'd) Page

Petrov, D. A., Zhukova, L. K. Preparation of Pure Silicon by the Reduction of Silicon Chloride with Zinc. 18

Kuz'mina, V. I. and Gorin, S. N., junior scientific assistants, collaborated in the work.

There are 2 references, of which 1 is Russian, 1 English.

Mitrenin, B. P., Burdiashvili, Sh. S., Shamba, N. A., Volkov, V. P., Kovyrzin, V. K., Solov'yev, L. K. Preparation of Silicon Monocrystals by Extraction from Molten Mass. 24

The authors were helped by Professor D. A. Petrov and G. J. Shmelev. Reference is made to the bibliography in the article by Inozemtseva, I. A. (p. 17)

Mitrenin, B. P., Lalykin, S. P., Savrasov, Yu. P., Radaykin, L. K. Use of Non-Crucible Zonal Fusion to Obtain Silicon Monocrystals. 35

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Problems of Metallurgy and Physics of Semiconductors (cont'd)

There are 2 references, of which 1 is Russian, 1 Swiss.

Petrov, D. A., Kekua, M. G., Khvostikova, V. D., Shashkov, Yu. M., Suchkova, A. D. Preparation of Silicon Monocrystals. 41

There are no references.

Izergin, A. P. Growing Monocrystals of Germanium from Molten Mass. 47

There are 3 references, of which 1 is American, 1 German, 1 British.

Petrov, D. A., Kekua, M. G., Dashevskiy, M. Ya., Zemskov, V. S., Petrusevich, R. L. Development of Work on the Purification of Germanium by Crystallization Methods and Preparation of Germanium Monocrystals possessing Uniformly Longitudinal Properties. 50

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Mention is made of D. A. Petrov and A. P. Bukhanova. There are 5 references, of which 4 are American, 1 Russian.

Mitrenin, B. P., Troshin, N. Ye., Tsomaya, K. P., Vlasenko, V. A., and Gubanov, Yu. D. Investigating the Possibility of Preparing Homogenous Germanium Alloys with Silicon by Means of Zonal Fusion. 59

There are 5 references, of which 4 are American, 1 German.

Petrov, D. A., Mirgalovskaya, M. S., Strel'nikova, I. A., Komova, E. M. Preparation of AlSb Monocrystals and Study of Their Properties. 70

E. Ye. Burovaya is mentioned in connection with her data on crystallo-optical research. Matkova, L. I., Raukhman, M. R., and Danil'chuk, T. P. assisted in this report. There are 4 references, 3 of which are German, 1 American.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

There are 14 references, of which 10 are Russian, 3 German, 1 Japanese. N. S. Kurnakov is mentioned as having designed a vertical clamping pyrometer. 97

Goryunova, N. A., Kolomiyets, B. T. Glassy Semiconductors. 110

There are 4 references, all Russian. The laboratories of Professor Z. G. Pinsker and Prof. Ye. A. Poray-Koshitsa are referred to . Data was contributed by A. R. Regel' and G. I. Distler.

Boltaks, B. I. Diffusion Coefficients of Some Admixtures in Germanium. 121

Assistance was given by T. N. Dunayeva and G. S. Kulikov, T. N. Vengel', V. P. Shilo, Ye. V. Motovilova and A. S. Borshchevskiy collaborated in the experimental part of the work. I. N. Ageyeva produced the X-ray analysis; Prof. D. N. Nasledov and I. Ye. Gorshkov gave advice and assistance. There are 8 references, 6 of which are Russian.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Problems of Metallurgy and Physics of Semiconductors (cont'd)

Petrov, D. A., Shashkov, Yu. M., Akimchenko, I. P. Diffusion of Antimony and Germanium in Silicon. 130

There is 1 Russian reference.

Rzhanov, A. V. Effect of Additives on the Life of Excessive Charge Carriers in Germanium. 133

There are 10 references, of which 7 are American, 3 Russian. M. A. Selezneva and R. A. Paramonova, scientific co-workers, assisted.

Kirvalidze, I. D. Application of the Photoelectric Method in Measuring Diffusion Length of Secondary (Non-basic) Current Carriers in Silicon. 138

There are 6 references, of which 5 are American, 1 Ukrainian.

El'kin, B. I. New Etching Agents for Silicon and Germanium. 142

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

VORONOV, Savvatiy Mikhaylovich; PETROV, D.A., doktor tekhnicheskikh nauk, professor, redaktor; CHERNOV, A.N., inzhener, redaktor; PETROVA, I.A., izdatel'skiy redaktor; SAVARI, A.N., tekhnicheskiy redaktor

[Selected works on light alloys] Izbrannye trudy po legkim splavam. Pod obshchei red. D.A.Petrova. Moskva, Gos.izd-vo obor.promyshl., 1957. 544 p. (MLRA 10:8)
(Alloys)

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

[illegible]

Translation from: Referat[illegible] zhurnal Metallurgiya [illegible] SSSR

AUTHOR: Petrov, D. A

TITLE: Immediate Tasks in the Development of Semiconductor Metallurgy (Blizhayshiye zadachi razvitiya metallurgii poluprovodnikov)

PERIODICAL: V sb.: Vopr. metallurgii [illegible] poluprovodnikov. Moscow, AN SSSR, 1957, pp [illegible]

ABSTRACT: An examination of methods employed in the production of semiconductors, particularly of Ge and Si (chemical methods: tetrachloride, tetraiodode, and silicon hydride, methods in which monocrystals are produced: pulling from melt according to Chokhral'skiy method and zonal fusion). Conditions essential for the production of high-purity materials are shown: high purity of original products, airtightness of the apparatus, purity of acids and alkalies participating in the process, and extreme purity of the crucible material.

N. Sh.

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

137-58-4-[illegible]

Translation from: Referativnyy zhurnal Metallurgiya, 1958, Nr 4, [illegible] SSSR

AUTHORS: Petrov, D. A., Zhukova, L. K.

TITLE: The Manufacture of Pure Silicon by Zinc Reduction of Silicon Chloride (Polucheniye chistogo kremniya metodom [illegible] leniya khloristogo kremniya tsinkom)

PERIODICAL: V sb.: Vopr. metallurgii i t.z. poluprovodnikov, Moscow, AN SSSR, 1957, pp 18-23

ABSTRACT: The reduction of $SiCl_4$ by Zn vapors was performed in 2 types of apparatus. One variant of the apparatus consisted of an inclined quartz reaction tube containing the Zn, to which the $SiCl_4$ was brought by H_2 as carrier gas. The reaction tube was heated to 950-1050°C. In an improved apparatus, $SiCl_4$ was introduced from a vaporizer heated to appx. 60° (no carrier gas was necessary) and Zn from another vaporizer heated to 800° both into a horizontal quartz tube. The lead tubes from the Zn vaporizer to the reaction chamber were also heated (950-980°), as was the funnel used to pour the Zn into the vaporizer (500°) and the coil through which the $SiCl_4$ vapors passed (650-700°). Ground connections

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[illegible]

The Manufacture of Pure S[illegible] by Zinc Reduction [illegible]

were made between the various components. Ts V grade zinc [illegible] per cent Zn) and technical $SiCl_4$ purified by distillation in a quartz fractionating column (middle fraction) were used for the experiments. Spectrographic analysis indicated that fractional distillation diminished the Ca, Mg, Cu and B contents by one order of magnitude and that it reduced the Fe and Ti content below the sensitivity threshold of the analysis. The first apparatus made it possible to obtain crystalline Si single crystals of which, extracted by Chokhral'skiy's method, showed a resistivity ρ of up to [illegible] ohm cm. Treatment of the powder with a mixture of HF and H_2SO_4 before HCl smelting raised the ρ to 3 ohm cm. Single crystals grown from the powder obtained in the second apparatus revealed ρ of up to 10 ohm cm and more.

[illegible]

[illegible]--Production [illegible]--Application

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

SOV/137-58-[illegible]

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr [illegible]

AUTHOR: Petrov, D. A.

TITLE: Present-day Semiconductor Materials (Sovremennye poluprovodnikovyye materialy)

PERIODICAL: Tr. 1-y Mezhvuzovsk. konferentsii po sovrem. tekhn. dielektrikov i poluprovodnikov, 1956 g., Leningrad, 1958, pp. 21-30

ABSTRACT: A review of problems of semiconductor metallurgy is presented, along with a brief description of methods of producing the necessary materials as pure single crystals. There is a brief presentation of the methods of obtaining pure materials by thermal dissociation from volatile compounds thereof and by reducing compounds of these materials. Note is taken of the important practical possibilities inherent in the reduction of $SiCl_4$ by zinc to obtain pure Si. Properties of AlSb and InSb that are of practical interest are emphasized. Attention is drawn to the need for more complete and detailed study of solubility and of the nature of the influence and state of a single impurity or of several in combination. It is noted that when

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Present-day Semiconductor Materials SOV/137-58-9-18929

the curve of solubility of Cu in Ge was plotted (C.S. Fuller et al., Phys. Rev., 1953, Vol 93, p 1182, C.S. Fuller, I.A. Ditzenberg, Phys. Rev., 1953, Vol 91, p 193), no account was taken of the presence of a Ge+GeCu3 eutectic at 650°C, and that this sheds doubt on the results obtained.

1. Single crystals--Production 2. Semiconductors--USSR 3. Aluminum--Antimony alloys --Properties 4. Zinc--Performance 5. Silicon--Purification

A A

Card 2/2

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

137-58-5-9457

Translation from Referativnyy zhurnal, Metallurgiya, 1958, Nr 5, p 92, USSR

AUTHORS Petrov, D.A., Kekua, M.G., Khvostikova, V.D., Shastikov, Yu.M., Suchkova, A.D.

TITLE Producing Single Crystals of Silicon (O poluchenii [illegible] kristallov kremniya)

PERIODICAL V sb. Vopr. metallurgii i fiz. poluprovodnikov. Moscow, AN SSSR, 1957, pp 41-46

ABSTRACT The production of single crystals of Si by drawing from a melt and vertical floating-zone refining is described. Drawing was performed in an apparatus consisting of 3 parts: a vacuum circulation chamber connected with an evacuation system and equipped with electrical leads and mechanism for raising and rotating the crucible, a working chamber consisting of a metal water-cooled cylinder with viewing window, and heads with a mechanism for raising and rotating the seed crystal. The fusion of the Si in a quartz crucible mounted on a graphite base was done by a slit heater made of spectrally pure graphite with graphite screens around it. Smelting was in vacuum (10^{-4}-10^{-5} mm Hg). Si produced by the Beketov method was employed in

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137-58-5-4457

Producing Single Crystals of Si [illegible]

the drawing. After the Si was fused a thermal regime that assured crystallization of the melt from its center was chosen. The seed was immersed in the melt, and drawing began after it was fused. Single crystals were obtained after the material had been drawn [illegible] or 3 times. It is noted that the presence of a film on the melt and poor contact between the seed crystal and the melt may cause the crystal drawn to be a polycrystalline. Vertical floating-zone refining was performed in an apparatus consisting of a vacuum chamber in which a Si bar, produced by drawing, was mounted vertically. A Ta heater creating a zone of fusion within the specimen moved along the specimen at a rate of ~2 mm/min. It was found that a given degree of superheating of the zone was a condition for the production of a single crystal by this method. In a polycrystalline specimen a [illegible] crystalline portion was produced [illegible] after several passes, while this was accomplished on the first pass after [illegible] crystalline seed crystal was employed. Single crystals of Si with resistivity of 15-60 ohm·cm were produced on these apparatus.

[illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

137-58-6-12/22

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 6, p 134 (USSR)

AUTHORS: Petrov, D.A., Kekua, M.G., Dashevskiy, M.Ya., Zemskov, V.S., Petrusevich, R.I.

TITLE: Progress of Work on the Refining of Germanium by Means of Crystallization and Achievement of Germanium Single Crystals With Longitudinally Homogeneous Properties (Razvitiye rabot po ochistke germaniya metodami kristallizatsii i polucheniye monokristallov germaniya s raynomernymi svoystvami po dline)

PERIODICAL: V sb. Vopr. metallurgii i fiz. poluprovodnikov. Moscow, AN SSSR, 1957, pp 50-58

ABSTRACT: Experiments were performed in order to investigate the possibilities of producing single crystals with uniform longitudinal and cross-sectional distribution of impurities by means of pulling at a controlled rate as well as by pulling accompanied by constant feeding of pure Ge into the melt. The raw polycrystalline material with a ρ of 5-20 ohm cm was purified by means of zonal recrystallization under a vacuum of 10^{-4} mm Hg, or in a stream of H_2, until it exhibited a ρ of 50-60 ohm cm. A high-frequency heating apparatus with three

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induction units moving back and forth was employed. It was found that single Ge crystals, grown by the Chokhralskiy method from purified material with a ρ of 50-60 ohm cm in conjunction with mixing of the melt by rotating the crucible and the growing crystal, can achieve ρ and τ values of 60 ohm cm and 1000 μsec, respectively. If the rotation is omitted from the growth process, the ρ and the τ amount to 25-50 ohm cm and 200-250 μsec, respectively. The UVM-2 apparatus, employed in the process of pulling the crystal under vacuum (10^{-4} mm Hg) in accordance with scheduled variations of the rate of pulling, utilizes a hydraulic raising mechanism which provides a smooth variation of the elevation rate from 0.05 to 8 mm/min in conjunction with the rotation of the crucible and the growing crystal. The ρ value of grown crystals 50 mm in diameter and 180 mm long deviated from the mean value of ~40-60 ohm cm, at a length of 100-150 mm, by 8.4-9.5% and was within the limits of error of measurement. It is pointed out that because of variations in conditions of crystallization only macrouniformity in the distribution of impurities can be achieved by this method. The variations were eliminated in another device which was designed for a process in which the pulling is accompanied by feeding of pure Ge into the melt. Prior to immersion into the melt, the feed ingot passes through a heating unit (composed of a quartz tube wound with W wire), while the ingot being pulled passes

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SOV/58-6-12122

Progress of Work on the Refining [illegible]

through a water-cooled crucible made of stainless steel. The process of pulling was carried out in an Ar atmosphere. The fact that the feed rod and the growing crystal, which both rotate, were placed excentrically with respect to the axis of rotation of the crucible, contributed to a better mixing of the melt contained in the crucible. It was found that the longitudinal fluctuations in single crystals obtained by this method did not exceed ± 5%, whereas in the case of a crystal produced in this apparatus without the employment of pure Ge the scatter amounted to ± 24%. Studies of crystals with a diameter of 50 mm have revealed that the ρ was sufficiently uniform throughout the cross section of the crystal and that the diffusion-path length of minority current carriers did not deviate by more than 10-15%. The authors express the opinion that intensive cooling of the growing crystal, which results in the achievement of a pure crystallization front, contributes to uniform distribution of electrical properties throughout the cross section of the crystal. Grown single crystals which exhibited nonuniform cross-sectional distribution of ρ were subjected to heat treatment in order to bring about a redistribution of ρ values. In the process the mean value of resistivity remained unaltered, while the diffusion-path length of the minority current carriers increased somewhat. [illegible] IS.

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[illegible]

Translation from: Referat[illegible] Metal[illegible] SSSR

AUTHORS: ~~Petrov, D. A.~~ Mirgalovskaya, E. M. Strel[illegible] A. Komova, E. M.

TITLE: Producing Single Crystals of AlSb and Study of Their Properties (Poluchenie monokristallov AlSb [illegible])

PERIODICAL: Vsb. Vopr. metallurgii [illegible] AN SSSR [illegible]

ABSTRACT: The conditions for producing single crystals of AlSb and the electrical properties thereof were studied. Special features of the synthesis of this compound are described. [illegible] that single phase bars may be obtained [illegible] per cent excess Al be used (18.4 weight percent). The starting materials Sb, Si[illegible]0 and Al AB 000 were purified by floating-zone recrystallization, subsequent to which the content of Fe, Cu, B, Pb, Al, Ca and Sn in the Sb diminished to about [illegible] percent [illegible] of As diminished [illegible] percent and the [illegible] in the Al diminished [illegible] percent. Single crystals of AlSb derived by extraction from the melt in an atmosphere [illegible] Al were [illegible] excess of Sb and Al [illegible]

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Producing S[illegible]

type of conductivity. [illegible] type. Se or Te was added [illegible] for the [illegible] and p-type [illegible] of the specimens [illegible] 16,000 [illegible] the Ha[illegible] rar 1.2x10^{-8} cm [illegible] inverse voltage [illegible] quantity of [illegible] Zone recrystallization [illegible] heater [illegible] An atmosphere [illegible] ficat[illegible] Multi[illegible] with resistivities [illegible] When resistivity was [illegible] 178 cm^2/v sec and [illegible] made to obtain a p-n [illegible] and also by the fusing together [illegible] and Pb, Cd and Te, Sn and [illegible] sults were p-n junct[illegible] verse voltage of 4-8 [illegible] Specimens [illegible] ρ [illegible] 0.1 ohm cm were used [illegible] factors of 70-200 [illegible] A [illegible] Card 2/3

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

[illegible]

Producing Single Crystals of AlSb and Study of Their Properties

its temperature dependence is presented. When heated from [illegible] [illegible] nitude of A [illegible] inverse p [illegible] for U [illegible] inverse p [illegible] varied from [illegible] [illegible]

[illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

[illegible]

Translation from: Referat[illegible] Metal[illegible]

AUTHORS: Petrov, D. A., Shashkov, Yu. M., Akimchenko, I. P.

TITLE: Diffusion of Antimony and Germanium in Silicon. Diffusion of [illegible] germanium [illegible]

PERIODICAL: Vsb.: Vopr. metallurgii i fiz. poluprovodnikov. M[illegible] AN SSSR 1957, pp. 130-13[illegible].

ABSTRACT: The radioactive isotopes Sb^{124} and Ge^{71} were used to determine the coefficient of diffusion D of Sb and Ge in Si. Diffusion was performed in large crystalline specimens [illegible] ties of tenths of an ohm-cm. These were of the [illegible] versely from bars obtained by extraction from the [illegible] Chokhral'skiy method. A thin layer of Sb^{124} and Ge^{71} was sprayed on the specimens in vacuum. Annealing was performed in quartz ampoules filled with Ar, these in turn being housed in evacuated ampoules. The temperature of annealing was maintained [illegible] in ±5°. Distribution of the concentrations of the diffused elements through the specimen was determined by the radioactivity of the abraded layer and the radioactivity of the specimen. It was found that the D_{Sb} at 940-1300° could be described by the equation

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137-58-4-6982

Diffusion of Antimony and Germanium in Silicon

0.112 exp(-66,000 RT) cm^2/sec and the D_{Ge} at [illegible] by the equation [illegible] $6.26 \cdot 10^5$ exp(-121,820 RT) cm^2/sec.

[illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

137-58-4-8032

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 4, p 236, USSR

AUTHORS: Petrov, D. A., Kolachev, B. A.

TITLE: Redistribution of Impurities During Crystallization and Forms Taken by This Process in Crystal Structure (Pereraspredelenive primesey pri kristallizatsii i formy proyavleniya etoy protsessa v strukture kristalla)

PERIODICAL: V sb. Rost kristallov. Moscow, AN SSSR, 1957, pp 159-169

ABSTRACT: The alloys Al+4% Cu and Sn+5% Sb are used to show that the distribution of impurities along single crystals grown by the Chokhral skiy method depends upon the rate at which the crystal is drawn out. At high rates the impurities undergo virtually uniform distribution, but as the speed decreases the non-uniformity increases. Impurities are distributed in specimens in the form of layers that may be identified by X-ray or deep etching. The stratified distribution of the impurities results in a periodic change in their properties and, specifically, in the [illegible] hardness. The stratified structure (SS) is accompanied by a fibrous one or a substructure. The width of the fibers diminishes with rate of drawing out and disappears completely at very [illegible]

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137-58-4-8032

Redistribution of impurities [illegible]

rates. A substructure [illegible] surface of castings [illegible] structures are seen [illegible] in molds and also [illegible] ing impurities. The [illegible] of SS is a general phenomenon possessed by all substances [illegible] SS results from the periodic entrainment by the growing solid phase of the impurities accumulating at the plane of crystallization [illegible] of the liquid phase.

D. O.

[illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A.

137-58-5-9454

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 5, p 92 USSR

AUTHORS: Petrov, D.A., Zemskov, V.S.

TITLE: Equipment and Methods of Growing Single Crystals of Semiconductors (Apparatura i metody vyrashchivaniya monokristallov poluprovodnikov)

PERIODICAL: V sb. Rost kristallov [illegible] AN SSSR [illegible] 272

ABSTRACT: An examination is made of the equipment and the results obtained in growing single crystals of Ge by the Chokhral [illegible] method and by drawing with feeding of additional [illegible] Drawing was performed by means of an apparatus [illegible] 3 parts. At the bottom there was mounted a vacuum [illegible] chamber connected with a system for evacuation. Water-cooled electrodes, to which were mounted a graphite slit heater and screens, were introduced into the chamber. Into the chamber [illegible] beneath there was introduced a motor-rotated rod carrying [illegible] base. A quartz beaker with a viewing tap was placed [illegible] chamber on rubber gaskets. The beaker was [illegible] by a water-cooled cover, to which was mounted

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137-58-[illegible]

Equipment and Methods of Growing Single Crystals of Semi[illegible]

a mechanism for raising and rotating the seed-crystal-carrying holder [illegible] through the cover into the chamber. The apparatus provided a vacuum [illegible] mm Hg. The cover and lower chamber were connected by bolts for operation in a gas atmosphere. It is noted that in order for a single crystal to [illegible] the temperature of the melt should increase from its center toward the [illegible] and the walls of the [illegible] degree of overheating of the melt to [illegible] increase the reliability of single crystal formation. To produce a single crystal, the seed crystal has to be raised along the [illegible] interface between seed crystal and melt. Rotation of the crucible and the growing crystal [illegible] to symmetrical growth of the crystal, but when the rate of crystal rotation [illegible] ~350 rpm, formation of a screw-shaped crystal is observed. There is [illegible] examination of the distribution of impurities in the drawing process. Changes in the apparatus to permit feeding of additional substance are described. The crystal being fed is passed through the heater, while the crystal being drawn passes through a cooler. This apparatus made it possible to obtain uniform longitudinal distribution of In^{114} along the single crystal drawn when a melt of pure Ge was fed in. This was verified by autoradiograph photometry and resistance measurement (resistance variations of ± 5%). The importance of good mixing of the melt on drawing with feeding of additional substance is noted. [illegible]

Card 2/2 [illegible] Y. S.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

SOV/137-57-11-22227

Translation from Referativnyy zhurnal. Metallurgiya, 1957, Nr 11, p 223 (USSR)

AUTHORS Petrov, D.A., Mirgalovskaya, M.S., Strel'nikova, I.A., Komova, E.M.

TITLE Phase Diagram of the Mg-Mn System (Diagramma sostoyaniya sistemy Mg-Mn)

PERIODICAL Tr. In-ta metallurgii AN SSSR, 1957, Nr 1, pp 142-143

ABSTRACT Alloys containing up to 5% Mn were investigated. The solubility of Mn in liquid Mg was determined by thermal analysis and by the thermostatic method, at 850, 790, 760, 710, and 670°C it is equal to 4.95, 3.83, 3.11, 2.58, and 2.10% Mn, respectively. The solubility of Mn in solid Mg was determined by the methods of microstructural analysis and the measurement of microhardness, at 300, 400, 500, 550, 600, and 630° it is equal to 0.1, 0.24, 0.7, 0.9, 1.6, and 2.0% Mn, respectively. The nonvariant three-phase reaction at 653° was established to be a peritectic one. The point of nonvariance is placed at 2.0% Mn. The solubility of Mn in Mg at 653° amounts to 2.3%. I. V.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Translation from: Referat[illegible] Zhurnal Meta[illegible]

AUTHORS: Petrov, D. A., Mirga[illegible] M. S., [illegible] A., Komova, E. M.

TITLE: Phase Diagram of the Magnesium Area [illegible] Mg-Mn-Ce Sy[illegible] (Diagramma sost[illegible] Mg-Mn [illegible]

PERIODICAL: Tr. In-ta metallurgii AN SSSR [illegible] pp. [illegible]

ABSTRACT: Corundum crucibles were used in the [illegible] of Mg [illegible] which were composed of [illegible] Al 0.009, [illegible] and Ce [illegible] metals and Mn [illegible] Alloys from the area of primary separation [illegible] annealed at [illegible] investigated by means of thermal structure methods. In alloys from the zone of primary [illegible] zation of Mn, the solubility of Mn in the presence [illegible] function of temperature was determined by [illegible] monovariant curve [illegible] was introduced into the molten Mg at a temperature [illegible]

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Phase Diagram of the Magnesium Area [illegible]

[illegible]
and the [illegible] was stirred and permitted [illegible]
upper section of the [illegible] was subjected [illegible]
as a thermal analysis. The Mg area of the system [illegible]
three mono-variant curves of the following three phase [illegible]
briums: $I + Mg + Mn$, $I + Mg + CeMg_{12}$, $I + Mn + CeMg_{12}$ [illegible]
I stands for the liquid phase. Transition [illegible]
content is changed from [illegible]
is reduced from [illegible] 8 per [illegible]
with 12 percent Ce the [illegible] Mn [illegible] 4 per [illegible]
presence of Mn the [illegible] Ce [illegible] Mg [illegible]
duced, whereas the [illegible] Mn [illegible] Mg [illegible]
of Ce remains [illegible]
[illegible] α
and 1.4% [illegible]
originates at 2 percent Mn [illegible] Mg-Mn [illegible]
the Mg-Ce side terminating at the point [illegible]
percent Mn, and 585 [illegible] Up to the point [illegible] percent Mg [illegible]
percent Mn, and [illegible] percent Ce the line describes the [illegible]
process $I + Mn \rightleftharpoons Mg$, whereas [illegible]
the eutectic process $I \rightleftharpoons Mn + Mg$ [illegible] $I \rightleftharpoons Mg + CeMg_{12}$

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Phase Diagram of the Magnesium Area in the Mg-Mn-Si System

originates in the point which corresponds to [illegible] 590°. The curve terminates in the [illegible]

1. Magnesium alloys-Chemical analysis [illegible] Magnesium alloys-Thermal analysis [illegible] Magnesium alloys-Phase studies

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

AUTHORS: Petrov, D.A. and Shashkov, Yu. M. (Moscow). 24-5-12/25

TITLE: Device for growing crystals of high activity metals directly from powder without [illegible]. [illegible] bestigel[illegible] vyrashchivaniya kristallov [illegible] metallov neposredstvenno iz [illegible].

PERIODICAL "Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk" (Bulletin of the Ac.Sc., Technical Sciences Section), [illegible], No.5, [illegible] (U.S.S.R.)

ABSTRACT: This paper was presented [illegible] the First All Union Conference [illegible] apparatus [illegible] held at the Institute of [illegible] A.S. [illegible] S.S.R. (Institut Metallurgii AN SSSR). [illegible] proposed by Verneuil, M.A. [illegible] precious stones by feeding [illegible] molten end of a seeding, lowering the [illegible] heating zone at a speed corresponding [illegible] new material. A [illegible] The melting of the [illegible] directly by means of a [illegible] heating excludes [illegible] heating substance [illegible] device [illegible] A photo of the device [illegible] photo of a specimen

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24-5-12/25

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137-58-4-8136

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p. 153, USSR

AUTHORS: Petrov, D.A., Potemkin, A.Ya.

TITLE: An Investigation of the Silver-manganese-aluminum Phase Diagram (Issledovaniye diagrammy sostoyaniya sistemy serebro-marganets-alyuminiy)

PERIODICAL: Tr. Gos. n.-i. i proyektn. in-ta po obrabotke tsvetn. met., 1957, Nr 16, pp 47-68

ABSTRACT: The alloys were prepared of 99.98% pure Ag, electrolyt. ME1 Mn and AV1 Al (99.9% Al) by smelting in corundum crucibles under a layer of $BaCl_2$. The Al and Mn were introduced into the Ag as alloying elements of the Ag with 15% Al and with 20% Mn. Thermal analysis was on a recording Kurnakov pyrometer. Microstructure, hardness, and resistivity were studied in the molten state and after quenching from 800, 700, 600, 400 and 200°C, and also after annealing and thermal analysis. In the presence of other phases, the α phase was revealed by the following reagents: 1) a dilute mixture of sulfuric and chromic acids and 2) a 1% solution of potassium permanganate, acidified by concentrated H_2SO_4. The Mn-Al alloys were etched by dilute HF

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

137-58-4-8136

An Investigation of the S[illegible] Manganese-Aluminum Phase Diagram

Hardness was measured on an Amsler press and a Vickers apparatus. Resistivity was measured at 20° by means of a Thomson bridge. Cross sections were plotted for 95, 92, and 90% Ag, and isothermic cross sections of the Ag corner for 700, 600, 400, 200, and 20°. A phase diagram for the Ag corner for up to 10% Al and up to 30% Mn was plotted. The liquidus plane consists of 3 fields of primary crystallization of the α, β, and Mn phases. Three invariant equilibria exist in the Ag corner: liquid Mn, α ⇌ β at about 800°, α + Mn + β ⇌ γ at about 640° and α + Mn + γ ⇌ β at about 451°. Typical limits of saturation of the ternary solid Ag based α solutions were determined, and the distribution of the phase regions is given. The temperature of formation of Ag_3Al in the Al-Ag system was found to be equal to 455°. Bibliography: 18 references.

A. [illegible] A. F.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

137-58-4-8095

Translation from: Referat[illegible] Zhurnal, Metallurgiya, 1958, No 4, p 247, USSR

AUTHORS: Petr[illegible] D[illegible], P[illegible] A[illegible]

TITLE: An Investigation of the Physicochemical Nature of Silmanal and the Reasons for its Ferromagnetic Properties Issued [illegible] [illegible]

PERIODICAL: Tr. G[illegible] [illegible] po obrabotke [illegible] 195[illegible] No [illegible] pp [illegible]

ABSTRACT: A study of the physicochemical nature of Silmanal (Si 86.[illegible] Ag 8.8[illegible] Mn and 4.[illegible] Al) was made and the reasons for its ferromagnetic properties were determined. Specimens were magnetized in saturation by an electromagnet yield [illegible] about 20,000 [illegible] steps in its 40-mm gap. The residual [illegible] B_r and coercive force H_c were measured. It was established that two phases constitute structural constituents of S[illegible] the solid state (a ternary solid solution of Mn and Al in Ag, the α phase) and a solid solution of Al in Mn. Crystals of the second phase were visible in all the microphotographs against the background of the α phase. This contradicts Potter's data. Potter

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An Investigation of the Physicochemical Cont

H. Phil. Mag. 1931, Vol. 12, p. 255, on the homogeneous structure of S, although the X rays failed to reveal the second phase, as had also been Potter's experience. A study of the stability of the α phase and of its mechanical and electrical properties resulted in S being classified as an aging alloy. The effect of aging on the magnetic properties of S was studied by means of specimens quenched in water from 800° and aged at 250° for from 1 to 140 hours. Maximums for hardness, H, and B_r are attained at different times during aging. It is assumed that the aging of S is accompanied by decomposition of the α phase with precipitation of very fine crystals of a ferromagnetic phase constituting a solid solution of Al in Mn. It is most probable that the second phase is precipitated from the nonmagnetic base metal of S in the form of single-domain ferromagnetic particles. The effect of various heat treatment regimes upon the magnetic properties of S was studied. It was established that the alloy is nonmagnetic in the quenched condition, but weakly magnetic in the annealed. The maximum magnetic properties are attained as the result of quenching from 800° and subsequent aging at about 250°. H attains [illegible] oersteds after 40 hours of tempering at 250°.

Bibliography: 9 references.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D. A.

12

1-4E2e

Problems of research on new light metal alloys. D. A. Petrow (Akad. Wissenschaften U.S.S.R., Moscow). *Acta Tech. Acad. Sci. Hung.* 16, 121-9(1957)(in German).—A review on the history and production of pure Al crystals, in ingots, influence of impurities, and its effect on microhardness. The development of Al-Cu, Al-Cu-Mg, Al-Cu-Mg-Mn, Al-Mg-Zr and superdural alloys is discussed and their further use in jet aircraft is contrasted with the Ti alloys. The future of Al-Mg alloys and their potential applications are pointed out. Frederick C. Nachod

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PETROV, D.A.

USSR/Solid State Physics - Structure of Alloys and Other Systems E-4

Abs Jour : Ref Zhur - Fizika, No 1, 1958, 951

Author : Petrov, D.A., Potemkin, A.Ya.

Inst :

Title : Investigation of Alloys of the System Ag-Mn-Al.

Orig Pub : Zh. neorgan. khimii, 1957, 2, No 7, 1552-1565

Abstract : Using physico-chemical analysis methods, the diagram of state was plotted for the Ag-corner of the system Ag-Mn-Al up to 10% Al and up to 30% Mn. The liquidus surface consists of three fields of primary crystallization of phases α, β, and Mn. There exists three nonvariant equilibriums in the Ag-corner of the Ag-Mn-Al system. The saturation limits of the α-solid solution in a silver base are determined approximately, and the distribution of the phase regions at temperatures of 700, 600, 400, 200 and 20° is given. The properties of the alloys of silver with

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

AUTHOR: Petrov, D. A., Professor

TITLE: The Development of Research in the Domain of Semiconductor Substances (Razvitiye issledovaniy v oblasti poluprovodnikovykh materialov).

PERIODICAL: Vestnik AN SSSR, 1[illegible], Vol. [illegible], Nr [illegible], pp. [illegible] (USSR)

ABSTRACT: At the end of May the 3rd All-Union Conference on the semiconductor material took place in Moscow, in which more than 500 representatives of various scientific institutions and numerous guests from abroad participated. Problems of general nature als well as special problems were treated, such as: "The investigation of special substances, above all of silicon, germanium, compounds of the elements of group III with elements of group V". Modern technology makes greater and greater demands on the semiconductor-devices, especially with regard to the increase in interval of the acting temperatures and the increase in the capacity of the devices. Duklovskiy brought interesting material on the spiral growth of the crystals which is connected with the screw-like dislocations. Much room was occupied by the papers on the problem of the production of silicon. Pure

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The Development of Research in the Domain of Semiconductor-Substances

'0-[illegible]-'7/4[illegible]

silic n can be produced by means of thermal decomposition of silane. The consultation devoted much attention ot the research results on new semiconductor-compounds. Possible compounds of AlAs, InSb, $CoSb_3$, As_2Fe_4 must be more closely investigated.

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Petrov, D.A

Soviets and US Personalities Attending Radio and Electronic Conferences

The following list of Soviet and US personalities attending radio and electronic conferences within and outside of the USSR during 1955-57 was compiled on the basis of a survey of 1956 and 1957 issues of leading Soviet periodicals in radio engineering, electronics, and communications.

[illegible] CIA, [illegible], 6 December 1957, For Official Use Only.

First Inter-vax Conference on Dielectrics and Semiconductors (June 1956 in Leningrad) (Radio, No 10, Oct 56, p. 53)

[redacted]

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Petrov V.A.

Soviets and US Personalities Attending Radio and Electronic Conferences

The following list of Soviet and US personalities attending radio and electronic conferences within and outside of the USSR during 1955-57 was compiled on the basis of a survey of 1956 and 1957 issues of leading Soviet periodicals in radio engineering, electronics, and communications.

[illegible]

Conference on Dielectric and Semiconductor Materials ([illegible] June 56 in Leningrad)
([illegible] 19 June 56)

[redacted]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

S/564/57/000/000/010/029
D258/D307

AUTHORS: Petrov, D. A., and Kolachev, B. A.

TITLE: Distribution of admixtures during crystallization and forms in which this is manifested in the crystal structure

SOURCE: Rost kristallov; doklady na Pervom soveshchanii po rostu kristallov, 1956 g. Moscow, Izd-vo AN SSSR, 1957, 159-169

TEXT: Although the distribution of an admixture between melt and a growing 2-component crystal should be uniform under ideal conditions, macro- and micro-inhomogeneities generally appear in the crystal structure in practice. Such macro-inhomogeneities are due to incomplete diffusion in the solid phase and appear during gradual enrichment of the crystallising melt with admixtures which depress the solidification temperature of the alloy. These effects are illustrated by experimental work, consisting

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of pulling growing crystals out of binary melts at various velocities, followed by radiography and similar tests of the resultant, e.g., bimetallic, crystals. Micro-inhomogeneities are in the form of layers, parallel to the front of crystallisation and are caused by periodic take-up by the crystal of the admixture concentrating near the front of crystallisation as a result of incomplete diffusion in the melt, or as a substructure, shown by fibrous crystals oriented in the direction of growth. The substructure presents a honeycomb appearance in transverse sections. This is illustrated by several examples. These inhomogeneities, which are important in various thermal processes to which the alloys are subjected, may be almost totally eliminated by very slow cooling. There are 16 figures.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

S/564/57/000/000/018/029
D258/D307

AUTHORS: Petrov, D. A., and Zemskov, V. S.

TITLE: Apparatus and methods of growing crystals of semiconductors

SOURCE: Rost kristallov; doklady na Pervom soveshchanii po rostu kristallov, 1956 g. Moscow, Izd-vo AN SSSR, 1957, 262-272

TEXT: A description is given of an apparatus for growing germanium monocrystals by Chokhral'skiy's method. The apparatus consists essentially of (1) a cylindrical transition chamber evacuated by a diffusion pump to $\sim 10^{-4}$ torr, containing a mechanism for rotating the crucible, (2) a working chamber, and (3) a lid, with devices for spinning and pulling out the crystal. The process may also be carried out under an inert gas. Temperature distribution in the crucible, necessary for the production of monocrystals, is illustrated. Good contact of the primer

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crystal with the melt is necessary. The crystal should be withdrawn from the melt at a constant rate and at constant temperature regime; growth of monocrystals is favored by a certain amount of superheat of the melt. Symmetric growth is aided by opposite rotations of crystal and crucible; the effects of rotarate are described and illustrated. Uniform distribution of admixtures along the monocrystal may be achieved by continuously feeding in melt of the same composition as the growing crystal so that the amount of melt remains constant, or by fusing a bar of the same composition as the monocrystal and at the same rate as the latter is withdrawn. A suitable apparatus is shown for the second procedure. Monocrystals of Ge alloyed with In^{114} were prepared to illustrate the efficacy of this method. There are 16 figures.

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PHASE I BOOK EXPLOITATION 1017

Vsesoyuznaya konferentsiya po legkim splavam. 2d, Moscow, 1955

Legkiye splavy, [vyp. I] Metallovedeniye, termicheskaya obrabotka, lit'ye i obrabotka davleniyem; [osnovnyye doklady konferentsii] (Light Alloys. no. 1: Physical Metallurgy, Heat Treatment, Casting, and Forming; Principal Reports of the Conference), Moscow, Izd-vo AN SSSR, 1958. 497 p. 3,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii, USSR. Ministerstvo aviatsionnoy promyshlennosti.

Resp. Ed.: Fridlyander, I.N., Candidate of Technical Sciences; Eds. of Publishing House: Rzheznikov, V.S. and Chernov, A.N.; Editorial Board of set: Petrov, D.A., Doctor of Technical Sciences, Professor, Belov, A.F.; Drits, M.Ye., Candidate of Technical Sciences; Livanov, V.A., Candidate of Technical Sciences; Sharov, M.V., Candidate of Technical Sciences; Korneyev, N.I., Doctor of Technical Sciences, Professor.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

Light Alloys. no. 1: (Cont.) [illegible]

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Light Alloys. no. 1: (Cont.) 1957

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A.

LEONIDOV N K

85(5) PHASE I BOOK EXPLOITATION SOV/1497

Akademiya nauk SSSR. Institut nauchnoy i tekhnicheskoy informatsii

Metallurgiya SSSR, 1917-1957, t. 1 (Metallurgy of the USSR, 1917 - 1957, Vol. 1) Moscow, Metallurgizdat, 1958. 745 p. 3,000 copies printed.

Ed. (Title page): I. P. Bardin, Academician; Ed (Inside book): G V Popova, Tech. Ed : O. G Bakher.

PURPOSE: The book is intended for scientific workers and engineers in metallurgical plants and in the machine-building industry It may also be used by students in advanced courses in metallurgical vuzes

COVERAGE: This collection of articles covers extensively practical and theoretical developments in Soviet metallurgy during the last 40 years The material deals with the discovery and development of the major ore deposits and the growth of the metal industry in various parts of European and Asiatic USSR Research institutes, laboratories, their location and the names of the scientists and engineers involved are listed Many papers contain so many references and names of various personalities that it was considered beyond the scope of the coverage of each article to list them The authors claim that the processes, methods and theories described in this book reflect the most recent developments in Soviet metallurgy.

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Metallurgy of the USSR (Cont.) SOV/1497

litically high purity metallic titanium comparable to that produced by the thermic method. There is 1 Soviet reference.

Petrov, D.A. Metallurgy of Semiconductors 658

Germanium and silicon are regarded as the two most important semiconductor materials. As the properties of semiconductors are related to impurities, new methods had to be developed to obtain high-purity crystals of Si and Ge. One method used was to break up by thermal processes the less stable compounds of these elements, in this case SiJ_2 and SiH_2, the latter being easier to split at lower temperatures. Another method involves the reduction of the compound by an active element such as hydrogen. Other approaches such as crystallization are mentioned A method of obtaining monocrystals proposed by Chokhral'skiy in Poland is explained as is its application in the construction of a composition diagram. In conclusion it is pointed out that further experiments in this field are necessary to discover the properties of new materials, their compounds and solid solutions. There are 15 references, 13 Soviet, 1 English, and 1 French.

Svyagintsev, O.Ye. The Metallurgy of Noble Metals 656

The article deals with the extraction and processing of gold, platinum and several other rare metals Experimental work of this nature is

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SOV 137-58-11 22254

Translation from: Referativnyy zhurnal Metallurgiya, 1958, Nr 11, p 59 (USSR)

AUTHOR: Petrov, D. A.

TITLE: Certain Problems in the Field of Light alloy Development (Nekoto rysye voprosy v obiasti razvitiya legkikh splavov)

PERIODICAL: V sb.: Legkiye splavy Nr 1 Moscow, 1958, pp 5-16

ABSTRACT: A review of the development of Al base alloys The systems now chiefly in use are Al Cu Mg Mn and Al Mg Zn Cu The possibility of improving the properties of the alloys by changing their composition, aging, and cladding is demonstrated The development of Al-Mg alloys of elevated Mg content and the utilization of products of sintered Al powder is seen to offer good prospects The importance of employing pure metal (Me) for alloy manufacture is emphasized, and brief descriptions are offered of methods of pulling crystals and of floating-zone refining to provide the required Me purity Improvement in ingot quality by continuous casting with intensive cooling of the solidifying Me is noted, as well as a shortcoming of the method, namely, the uneven distribution of the alloy The history of the development of Mg alloys and the procedures

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Certain Problems in the Field of Light alloy Development

followed in developing them is described: Production of Mg Al alloys with added Zn, and doping of Mg alloys with Zr, Ce, Th Nd and Mg Li alloys

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

SOV/137-58-9-19806

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 242 (USSR)

AUTHORS Petrov, D.A., Nagorskaya, N.D.

TITLE An Investigation of a Section of a Phase Diagram of the Al-Cu-Mg-Zn System (Issledovaniye chasti diagrammy sostoyaniya sistemy Al-Cu-Mg-Zn)

PERIODICAL V sb. Legkiye splavy. Nr 1. Moscow, 1958, pp 86-87

ABSTRACT: A section of the phase diagram of the Al-Cu-Mg-Zn system was investigated by thermal analysis methods and by microstructural studies. The section investigated included a region of primary crystallization (RPC) of a solid solution of Al, as well as of phases which crystallize concurrently with it, and was limited by a plane cutting the Al-Cu-Mg-Zn tetrahedron and extending from the Al-Cu-Mg face at a constant Al content of 60% to the Cu-Mg-Zn face at a constant Zn content of 90%. Adjacent to the RPC of a solid Al-base solution are the RPC of the following phases θ_{Al-Cu}, $S_{Al-Cu-Hg}$, $T_{Al-Cu-Mg}$, β_{Al-Mg}, η_{Mg-Zn}, θ_{Mg-Zn}, ϵ_{Cu-Zn}, $T_{Al-Cu-Zn}$, and η_{Zn}, i.e., only the phases of corresponding binary and

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SOV 137-58-9-19860

An Investigation of a Section of a Phase Diagram (cont.)

ternary systems and quaternary solid solutions based on these phases are undergoing crystallization concurrently with the Al solid solution. A continuous series of solid solutions exists between the phases $T_{Al-Cu-Mg}$ and $T_{Al-Cu-Zn}$. The Al corner of the system may be subdivided into eight partial tetrahedrons. At temperatures of 462, 398, 366, 360, and 350°C, respectively, the following reactions take place

$$L \rightleftharpoons \alpha_{Al} + \theta_{Al-Cu} + S_{Al-Cu-Mg} + \eta_{Mg-Zn}$$

$$L + \eta_{Mg-Zn} + \theta_{Al-Cu} \rightleftharpoons \theta_{Mg-Zn} + \alpha_{Al}$$

$$L + \theta_{Al-Cu} \rightleftharpoons T_{Al-Cu-Zn} + \theta_{Mg-Zn} + \alpha_{Al}$$

$$L + T_{Al-Cu-Zn} \rightleftharpoons \epsilon_{Cu-Zn} + \theta_{Mg-Zn} + \alpha_{Al}, \text{ and}$$

$$L + \epsilon_{Cu-Zn} \rightleftharpoons \eta_{Zn} + \theta_{Mg-Zn} + \alpha_{Al}$$

1. Aluminum-copper-[illegible]-zinc systems--Phase studies 2. Aluminum-copper-magnesium-zinc systems--Microstructure 3. Aluminum-copper-magnesium-zinc systems--Crystallization

L. B.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

AUTHORS: Glazov, V. M. and Petrov, D.A. (M[illegible]

TITLE: Investigation of the temper[illegible] viscosity of [illegible]. (In [illegible] zavisimosti vyazk[illegible]).

PERIODICAL: Izvestiya Akademii Nauk SSSR, [illegible] Nauk, 1956, No. [illegible], pp. [illegible] (USSR).

ABSTRACT: This paper is devoted to inve[illegible] dependence of [illegible] heating and [illegible]. As f[illegible] this proble[illegible] hitherto bee[illegible] experiments were [illegible] which is shown in F[illegible]. The [illegible] investi[illegible] in earlier [illegible] The vi[illegible] determined [illegible] mm H_g using [illegible] of about 55 Ohm[illegible] which was [illegible] preliminarily annealed at 1000°C [illegible] weight. The [illegible] of the [illegible] 1.1 cm; the wei[illegible] of [illegible] and the ratio of [illegible] with germ[illegible]

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Investigation of [illegible]
germanium.

[illegible]

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Investigation of [illegible]
germanium.

[illegible]
Fig. 5 the [illegible]
is graphed [illegible]
be seen [illegible]
known equation:

[illegible]

The dependence of the fluidity [illegible]
density is graphed in Fig. [illegible]
free activation energy of the viscous flow
temperature is graphed in Fig. [illegible]. During [illegible]
crystallization period a reconstruction [illegible]
range order structure takes place in liquid [illegible]
in a way similar to that taking place in water. [illegible]
is attributed to the reconstruction [illegible]
order structure of liquid germanium [illegible]
closely the structure [illegible]
germanium. It is likely [illegible]
be made also for silicon and other [illegible]
which are similar to germanium as [illegible]

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Investigation of [illegible]
germanium.

and the character [illegible].
There are 7 f[illegible].
1 Ger[illegible].

SUBMITTED: October [illegible], [illegible]

AVAILABLE: Library of Congress.

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

SOV/24-58-4-29/32

AUTHORS Glazov, V.M. and Petrov, D.A. (Moscow)

TITLE Thermal Stability of the Antimonides of Aluminium, Gallium and Indium in Liquid State (O termicheskoy ustoychivosti antimonidov alyuminiya, galliya i indiya v zhidkom sostoyanii)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958 Nr 4, pp 125 - 129 (USSR)

ABSTRACT: AlSb, GaSb and InSb have excellent semiconducting properties and can be used in a variety of instruments. Knowledge concerning their thermal stability is therefore valuable for determining the optimum conditions of their synthesis, of the production of their single crystals, of their purification by zonal recrystallisation etc. In view of the lack of agreement in the data available in the literature, the present investigation was undertaken to determine the liquidus parts of the phase diagrams of the systems Al-Sb, Ga-Sb and In-Sb for a range of compositions around those corresponding to the compounds AlSb, GaSb and InSb and to study the thermal stability of these compounds.

The liquidus temperatures were determined from the

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Thermal Stability of the Antimonides of Aluminium, Gallium and Indium in Liquid State

cooling curves (Figure 1) obtained with a differential pyrometer. A standard of reference was provided by pure silicon and the instrument was calibrated by reference to melting points of zinc, aluminium and silver. 7 alloys in each system were investigated, containing between 40 and 60% Sb. The liquidus of each system (Figure 2) was found to consist of two straight lines sloping upwards towards the middle of the diagram and intersecting at the point of the composition of the compound (AlSb, GaSb or InSb).
The thermal stability of the compounds, AlSb, GaSb and InSb, was investigated by determining and analysing the curves of kinematic viscosity vs. temperature. The curves (Figures 3-5) were obtained by means of a viscometer described in an earlier paper (Ref 11).
In discussing the results, it is stated that the presence of a single sharp maximum on the liquidus curves indicates that there is no dissociation of AlSb, GaSb and InSb at their melting points. On the other hand, the curves of kinematic viscosity, checked repeatedly, invariably show

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Thermal Stability of the Actom[illegible] of Aluminium, Gallium and Indium in Liquid State

a divergence from the normal shape of such curves. This divergence is first observed at a temperature of some 150 °C above the melting point and gradually increases at higher temperatures. Although no data are given, it is said that the same characteristic is displayed by the curves of dynamic viscosity and the curves of attenuation of oscillations of cylinders filled with the molten compounds. No such divergence of the viscosity curves were observed by the authors in their earlier investigation of germanium and it is concluded that in the present case they can only indicate the beginning of a dissociation of the compounds at higher temperatures.

Further confirmation of the irregular behaviour of the stability characteristics of the compounds was obtained by comparing the experimental and the theoretical curves of dynamic viscosity vs. temperature and by plotting Bachinskiy's theoretical relationship (Ref 12) between fluidity and density and comparing it with the experimental curves (Figures [illegible] and [illegible] GaSb and InSb, respectively). The discrepancy between the latter curves indicates a

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SOV/24-[illegible]-4-[illegible]/[illegible]

Thermal Stability of the Ant[illegible] of Aluminium, Gallium and Indium in Liquid State

change in the nature of the intermolecular interaction in GaSb and InSb at high temperatures which also point to dissociation. Similar considerations probably hold in the case of AlSb, for which fluidity/density curve could not be [illegible] density in molten state was not known. Acknowledgments are made to M.S. Mirgalovskaya, [illegible] Matkova, E.M. Kimova and I.A. Strel[illegible] [illegible] of the compounds. There are [illegible] table and 14 references, [illegible] which are Soviet and [illegible] German.

SUBMITTED: November [illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

HUNGARY Solid State Physics - Crystallization. E

Abs Jour : Ref Zhur Fizika, No 11, 1959, 24986

Author : Petrov, D.A.

Inst : ---

Title : Certain Interesting Problems Connected with the Growing, Structure, and Properties of Semiconductor Crystals.

Orig Pub : Magyar Fiz. Folyirat, 1958, 6, No 6, 599-609

Abstract : No abstract.

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

AUTHORS: [illegible]

TITLE: An Apparatus and a Method for the Investigation of [illegible] Chemical Properties of Substances in the Solid and [illegible] (Apparatura i metodika dlya izucheniya fiziko-khimi[illegible] svoystv veshchestva v tverdom i zhidkom sostoyani[illegible]

PERIODICAL: Za[illegible] Laboratoriya, [illegible], Vol. [illegible], Nr [illegible], pp. [illegible]

ABSTRACT: In this paper a new construction of an apparatus [illegible] of the electric conductivity and viscosity of melts [illegible] temperatures. At the same time recording the curve [illegible] or cooling of [illegible] Kurnakov's pyrometer. [illegible] carrying out of thermal analysis [illegible] added to this apparatus also makes it possible to determine the dependence of the density of melts on temperature. The [illegible] tion was based on the works by Meyer [Ref. [illegible]] and A.N. Regel [Ref. 3]. As shown by figure [illegible] the [illegible] sists of a double-walled quartz bell-shaped part [illegible] cooled, in the upper part, which has a piece of [illegible] a conical connecting piece. In this tube, which [illegible] has a stopper of the same material, a suspended [illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

An Apparatus and a Method for the Investigation of the Physical-Chemical Properties of Substances in the Solid and Liquid State

is fitted. It consists of a tungsten wire of 30-[illegible] 350 mm length, which, when oscillating, is subjected to [illegible] of 30-100 g. The oscillation frequency is determined by the [illegible] tion of exchangeable disks which are fixed on this wire. The [illegible] shaped part rests upon a flanges which are insulated by [illegible] to which the current is fed. In the interior of the bell-shaped part there is a cylinder made from refractory steel in which [illegible] closed electric furnace is fitted, which is adapted to attain [illegible] peratures of up to 2000°C. The furnace is equipped in such a manner that reflection of heat towards the outside is avoided. The [illegible] is suspended on a tungsten wire in a refractory ampule in the center of the furnace. Two thermocouples are connected with the ampule: one, the soldered joints of which are fastened in the [illegible] ple, is led outwards at the bottom, the other, which leads from the sample in the ampule to the exterior, is made to pass along the suspending tungsten wire to the exterior in an upward direction. In the interior of the bell-shaped part conditions for a vacuum have been provided. A magnetic device is fastened to the outer wall of the bell-shaped part which serves the purpose of [illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

An Apparatus and a Method for the Investigation of the Physical-Chemical Properties of Substances in the Solid and Liquid State

sample with the sample round its axis. The aforementioned additional device is characterized by the fact that, instead of the suspending device, a crucible with the sample is placed on to the solid baseplate of the furnace, and that a rod, also connected with the electric circuit, is brought into contact with the surface of the melt produced therein, so that everychange of the level of the melt is recorded on the outside of the apparatus. The paper mentions numerous theories and examples concerning the application of the apparatus described. There are 3 figures, 4 tables, and 7 references, 4 of which are Slavic.

ASSOCIATION: Institute for Metallurgy Imeni Baykov AN USSR (Metallurgicheskiy institut im. Baykova Akademii nauk SSSR).

AVAILABLE: Library of Congress

Card 3/3 1. Electrical conductance-Measurement 2. Viscosity-Determination 3. Thermal analysis 4. Pyrometers

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A., doktor tekhn.nauk; YELAGIN, V.I., kand.tekhn.nauk

Effect of pressure at high temperatures. Trudy MATI no.31:143-160 '58. (MIRA 11:7)
(Aluminum) (Sheet-metal work) (Metals at high temperatures)

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PETROV, D.A., doktor tekhn.nauk, prof.; BUKHANOVA, A.A., kand.tekhn.nauk

Change of form and redistribution of crystals during dissolution and growth in the solid state. Trudy MATI no.31:1[illegible]1-171 '58. (MIRA 11:[illegible])

(Metal crystals) (Solutions, Solid) (Alloys--Heat treatment)

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

On Variations [illegible]
During Precry [illegible]
Type Lattice

[illegible]

Card 2 [illegible]

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

7 Soviet references

ASSOCIATION

SUBMITTED

1. Intermetallic compounds--Structural analysis 2. Intermetallic compounds--Lattices 3. Intermetallic compounds--Temperature factors 4. Mathematics--Applications

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

PHASE I BOOK EXPLOITATION SOV/4[illegible]

Soveshchaniye po poluprovodnikovym materialam. Moscow, 19[illegible]7

Voprosy metallurgii i fiziki poluprovodnikov; trudy 3-go soveshchaniya. (Problems in the Metallurgy and Physics of Semiconductors; Transactions of the Third Conference) Moscow, Izd-vo AN SSSR, 19[illegible]9. 129 p. Errata slip inserted. 3,200 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii imeni A. A. Baykova. Resp. Ed.: N. Kh. Abrikosov, Doctor of Chemical Sciences; Ed. of Publishing House: P. F. Zolotov.

PURPOSE: This collection is intended for technical and scientific personnel concerned with the investigation and production of semiconductor materials. It may also be used by students in schools of metallurgy.

COVERAGE: The collection contains reports submitted at the Third Conference on Semiconductor Materials, held at the Institute of Metallurgy imeni A. A. Baykov, AS USSR, Moscow, in May 195[illegible]7. The reports deal with problems of obtaining and investigating germanium, silicon, and semiconductor compounds. The collection was first edited by D. A. Petrov, Doctor of

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

24(8) PHASE I BOOK EXPLOITATION SOV/2117

Soveshchaniye po eksperimental'noy tekhnike i metodam vysokotemperaturnykh issledovaniy, 1956

Eksperimental'naya tekhnika i metody issledovaniy pri vysokikh temperaturakh; trudy soveshchaniya (Experimental Techniques and Methods of Investigation at High Temperatures; Transactions of the Conference on Experimental Techniques and Methods of Investigation at High Temperatures) Moscow, AN SSSR, 1959. 789 p. (Series: Akademiya nauk SSSR. Institut metallurgii. Komissiya po fiziko-khimicheskim osnovam proizvodstva stali) 2,200 copies printed.

Resp. Ed.: A.M. Samarin, Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: A.L. Bankvitser

PURPOSE: This book is intended for metallurgists and metallurgical engineers.

COVERAGE: This collection of scientific papers is divided into six parts: 1) thermodynamic activity and kinetics of high-temperature processes 2) constitution diagram studies 3) physical properties of liquid metals and slags 4) new analytical methods and production of pure metals 5) pyrometry, and 6) general questions For more specific coverage, see Table of Contents

Experimental Techniques and Methods (Cont.) SOV/2117

Petrov, D.A., and B.A. Kolachev Investigation of Crystallization Processes in Pure Metals 513

During the crystallization of a nearly pure metal, such impurities as are present are forced by the growing crystals into the liquid phase owing to the lower solubility of the impurities in the crystal Thus the impurities will be gathered mainly in those crystals which form last This phenomenon may be observed in various forms of crystallization, i.e., intracrystalline liquation in solidifying ingots, unequal distribution of impurities along the length of the ingot during the growth of monocrystals, etc Unequal distribution of impurities in a nearly pure substance may be variously manifested in its structure and properties as in periodic distribution of impurities in the crystals, in the form of the substructure, in the periodicity of changes in the properties of the substance, etc. The application of special measures makes it possible to prevent nonuniform distribution of impurities during crystallization and to assure unvarying properties throughout the substance

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

SOV/[illegible]

AUTHORS: Belokurova, I N., Kekua, M G., Petrov, D.A. and Suchkova, A D. (Moscow)

TITLE: Production of Single Crystals of Alloys of Germanium with Silicon (O poluchenii monokristallov splavov germaniya s kremniyem)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 1, pp 9-12, + 1 plate, (USSR)

ABSTRACT: The production of single crystals of solid solutions of germanium with silicon is important in the semiconductor field since they can combine the advantages of both elements. The authors describe their experiments with two methods of production. In the first, similar to that of Davis (Ref 4), a melt of the required composition was produced in an evacuated quartz ampoule in a silit furnace. The melt was held at 20-25°C above the liquidus temperature for four hours and then cooled at 1.5°C per hour. Single crystals with 0.5 - 5 at. % Si were obtained but it was found (Table 1) that they were heterogeneous in composition having a gradient of silicon content and conductivity. The Laue patterns

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SOV/[illegible]

Production of Single Crystals of Alloys of Germanium with Silicon

(Fig 4) indicate that growth occurs with a [100] orientation. The second method is based on drawing a crystal with continuous feed of melt as described by D A Petrov and V S Zemskov (Ref 6). For this a special apparatus was developed shown open in Fig 2 and in operation in Fig [illegible]. A quartz crucible is heated by a graphite heater and a vacuum of 10^{-4} mm Hg is maintained while a crystal is drawn, a polycrystalline ingot of the same composition being added to the crucible at the same rate. Temperature is controlled manually and is chosen to give a single-crystal diameter equal to that of the feed ingot, the rate of feed and drawing then being the same and equal to [illegible] mm/min. Both crucible and crystal are rotated. Specimens were obtained (Table 2) with 0.70, 0.75, 1.0 and [illegible] at % Si with homogeneous composition and electrical properties. Fig 8 shows resistivities as functions of length along specimens for several specimens. Specimens with [111] orientated

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SOV/180-59-1-3/22

Production of Single Crystals of Alloys of Germanium with Silicon

growth axes are shown in Fig 5, while Figs 6 and 7 show Laue patterns from the seeding crystal and the single crystal respectively.

Card 3/3 There are 8 figures, 2 tables, and 6 references, 3 of which are English, 2 Soviet and 1 German.

SUBMITTED: August 8, 1958

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

63292

5.4110
5.2610

SOV/160-59-4-23/40

AUTHORS: Glazov, V.M., Petrov, D.A. and Chizhevskaya, S.N. (Moscow)

TITLE: The Joint Solubility of Elements of Groups Three and Five in Germanium

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, 1959, Nr 4, pp 153-155 (USSR)

ABSTRACT: Pure germanium, AlSb, GaSb and InSb were used. Ge-GaSb and Ge-InSb alloys were prepared in an evacuated quartz flask at 1000°C and Ge-AlSb at 1250°C. They were held for one hour with periodic stirring and then the flask was immersed in cold water. Examinations under the microscope showed that alloys of Ge with up to 3 wt % AlSb, 2.5 wt % GaSb or 0.5 wt % InSb were single-phased. Microhardness measurements were also taken to determine the limiting solubility in the solid state. Results are given in Table 2 and phase diagrams constructed in Fig 1, 2 and 3. Maximum solubility by this method was 3% for AlSb, 2.5% for GaSb and 0.7% for InSb. The results show that the antimonides are more soluble in germanium than the pure elements aluminium, gallium and indium. This is explained by the fact that donor and acceptor elements

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67297

SOV/[illegible]

The Joint Solubility of Elements of Groups Three and Five in Germanium

are more soluble together than separately. There are 3 figures, 2 tables and 7 references, [illegible] which are Soviet and 4 English.

SUBMITTED: April 24, 1959

Card 2/2

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

24.7700

67293

AUTHORS: Zhurkin, B.G., Zemskov, V.S., Petrov, D.A., and Suchkova, A.D. (Moscow)

TITLE: The Nature of the Quasi-Binary Germanium Indium Antimony System

PERIODICAL: Izvestiya Akademii nauk SSSR (Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 195[illegible] Nr 4 [illegible] (USSR)

ABSTRACT: Germanium with electron-type conduction [illegible] resistance 25 to 30 ohm/cm was used together with zone refined antimony [illegible] indium. Crystals were pulled from the melt. Results are given in Table 1. All the samples had electron-type conductivity and samples with high InSb content had a higher concentration of electrons than those with low InSb content. The number of [illegible] varied from [illegible] x 10^{18} to [illegible] x 10^{19}/cm^3. [illegible] fully compensated [illegible] x 10^{17}/cm^3. Thus there was an excess of Sb atoms. Experiments were carried out using the same Ge:Sb ratio and increasing the In content. Results are given in Table 2. With a ratio of In:Sb = 2.5 there is still electronic conduction very near to the compensated alloy. With In:Sb = 4.4 there is hole-type conduction. Microstructures were examined along the

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67293

The Nature of the Quasi Binary Germanium Indium Antimony System

length of the [illegible] pulled from a melt. A second phase appears (see Fig) which from microhardness test corresponds to InSb. It does not appear, however, at temperatures greater than [illegible] the temperature of dissociation of InSb. The authors conclude that [illegible] of dissociation of InSb in fused [illegible] the system does not possess the properties of a quasi binary system. There are 1 figure, 2 tables and [illegible] references [illegible] which are Soviet and 2 English.

SUBMITTED: March 16, 1959

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7"

"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

5(2)

AUTHORS: Petrov, D. A., Bitov, V. A., Gil'yalova, N. G. SOV/78-4-9-2/44

TITLE: New Chemical Methods for the Preparation of Antimony of High Purity

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 9, pp 1970-1973 (USSR)

ABSTRACT: Antimony of high purity is required for the preparation of antimony compounds with good semiconductor properties. The usual chemical method of purification with subsequent reduction (Refs 1, 2) has the disadvantage, that impurities from side-reactions and apparatus are always contained in the product owing to the many operations to be performed. In this paper the preparation of antimony by thermal decomposition of stibene is described. The thermal decomposition of tributyl stibine is to be reported in a later paper. SbH_3 was obtained by reduction of a HCl solution of $SbCl_3$ by means of magnesium. Synthesis of stibine, purification, and thermal decomposition were effected in one apparatus. This apparatus is shown in figure 1. The most favorable conditions for the reaction were found to be the following: a rate of flow

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SOV/78-4-9-6/44

New Chemical Methods for the Preparation of Antimony of High Purity

14 ml/min.cm^2 for the antimony trichloride solution to pass thru the ice cooled reaction vessel, which was filled with magnesium, and a thermal reaction zone (quartz tube in an electric resistance furnace) of 90 mm length. The grain of the magnesium metal is of no consequence, must not, however, be too fine, as Mg powder is carried over in this case. In figure 2 the yield in SbH_3 and the Mg requirement are given as a function of the concentration of the $SbCl_3$ solution, and figure 3 shows the dependence of these values on the HCl concentration. Under the above conditions a 26% yield was attained. The metallic antimony thus obtained consisted of variously formed crystals (dendrites and face crystals) and fused grains. Spectroscopic analysis revealed the absence of Cu, Al, and Ag and a content of Fe, Si, and Mg of the magnitude of 10^{-4}%. These impurities probably are formed by drops of the reaction mixture carried over with the gas current and the quartz tube. They could be avoided by a second purification of SbH_3 involving condensation and subsequent vaporization in a pure hydrogen current, as well as an additional purification of the initial substances together with the application

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SOV/78-4-9-6/44

New Chemical Methods for the Preparation of Antimony of High Purity

of high quality quartz glass. The tendency of SbH_3 to explode in presence of oxygen is pointed out. There are 3 figures and 8 references, 3 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

SUBMITTED: May 18, 1958

Card 3/3

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"APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R001240420010-7

5(2) 05863

AUTHORS: Petrov, D.A., Vlasova, I.V., Zimina, G.V. SOV/78-4-11-16/50

TITLE: The Solubility of Iron- and Calcium Chlorides in Trichlorosilane

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 11, pp 2500-2501 (USSR)

ABSTRACT: The trichlorosilane $SiHCl_3$ produced by chlorinating commercial silicon serves as initial product of semiconductor silicon. The impurities (Ca,Mg,Al,Fe,Cu,Ti,B, etc.) are included in the chlorination. In order to make sure whether it is possible to remove the impurities from the trichlorosilane, the authors investigate the solubility of $FeCl_3$ and $CaCl_2$ in trichlorosilane by means of the radioactive isotopes Fe^{59} and Ca^{45}. Figure 1 shows that $FeCl_3$ is very slowly dissolved in trichlorosilane. Saturation at 18° is attained only after 4 h. The increasing solubility of $FeCl_3$ in trichlorosilane at rising temperature is shown in figure 2

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