

5.16.00 5.1330  
5.1400  
5.1180

69091

S/120/60/000/01/035/051

E032/E314

AUTHORS: Borovik, Ye.S., Grishin, S.F. and Lazarev, B.G.

TITLE: On the Ultimate Vacuum of Condensation Pumps

PERIODICAL: Fribory i tekhnika eksperimenta, 1960, Nr 1,  
pp 115 - 118 (USSR)

ABSTRACT: The present paper is concerned with the determination of the ultimate vacuum of a hydrogen condensation pump and the possibility of using liquid helium to improve this ultimate vacuum. Since it was expected that in order to achieve the ultimate vacuum it is essential to exclude the penetration into the vacuum chamber of the oil diffusion pump vapour, a special apparatus was built in which all possible steps were taken to minimise this effect. A schematic drawing of the apparatus employed is shown in Figure 1. The apparatus was placed in a 40-litre vessel 1. The vessel was evacuated by the oil diffusion pump 2. The system was isolated from the oil-diffusion pump by the liquid nitrogen cooled vapour trap 3. On the low vacuum side, the oil-diffusion pump was evacuated by a two-stage mercury-diffusion pump incorporating a liquid nitrogen trap.

Card1/4

4

69091

S/120/60/000/01/035/051

E032/E314

On the Ultimate Vacuum of Condensation Pumps

The polished copper screen 5, which was in the form of a cylinder and surrounded the working region, was also nitrogen-cooled with the aid of the dewar 6. In addition, there was a liquid nitrogen cooled venetian-blind type trap 7. Inside the screen 5 there was a polished cylindrical screen 8, made of copper with a liquid-hydrogen filled sphere 9 attached to it. The screen 8 and the sphere 9 form a fast condensation pump. The space inside the screen 8 was thus surrounded by walls cooled down to liquid-hydrogen temperatures and the rate of pumping for nitrogen within this space was 30 000 litres/sec. The sphere 10 inside the screen had a diameter of 155 m and could be filled with liquid hydrogen or liquid helium. The calculated pumping speed for nitrogen by the sphere 10 was 8 000 litres/sec. The space inside the screen 8 was thus isolated from the remaining part of the apparatus except for apertures whose total areas was about 10 cm<sup>2</sup>. The rate of leakage of air through these

Card2/4

69091

S/120/60/000/01/035/051

E032/E314

On the Ultimate Vacuum of Condensation

Pumps

apertures was less than 100 litres/sec and hence the region inside the screen 8 could be looked upon as corresponding to the ultimate vacuum of the condensation pumps, provided the pressure outside this region was

about  $10^{-8}$  mm Hg. Two manometers were employed, namely 12 and 13. In order to reduce the evaporation of helium between the manometer 13 and the sphere 10, provision was made for a narrow copper screen 14. The low pressures were measured with standard ionization manometers, type LM2. These manometers can measure

pressures down to  $5 \times 10^{-9}$  mm Hg. An Alpert gauge (Ref 3) was used to measure the very low pressures. It was found

that a vacuum of  $10^{-10}$  mm Hg could be obtained in all experiments with liquid-hydrogen filled condensation pumps.

The lowest pressure ( $1.2 \times 10^{-10}$ ) was achieved after a 10-day pumping with liquid nitrogen in all the traps. A pressure of  $1.2 \times 10^{-11}$  mm Hg was obtained when liquid

Card3/4

✓

69091

S/120/60/000/01/035/051

E032/E314

On the Ultimate Vacuum of Condensation Pumps

helium was employed as the cooling agent.  
There are 1 figure and 4 references, 3 of which are  
Soviet and 1 is English.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR (Physico-  
engineering Institute of the Ac.Sc., Ukrainian SSR)

SUBMITTED: January 19, 1959

Card 4/4

81621

S/181/60/002/06/09/050  
B122/B063

18.8200

AUTHORS: Garber, R. I., Gindin, I. A., Lazarev, B. G., Starodubov, Ya.D.

TITLE: Low-temperature Recrystallization of Copper

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 6, pp. 1096 - 1098

TEXT: The authors of the present article studied the recrystallization of copper which was first deformed at the temperatures of liquid hydrogen and nitrogen, and was then subjected to recrystallization at room temperature. Tubular copper samples (diameter: 1.5 mm; wall thickness: 0.45 mm) were used. The samples were first annealed at 800°C for 8 hours (at  $10^{-6}$  torr). Special care was devoted to the perfect cleanliness of the inner wall of the tube. The sample was deformed in vacuo at 20 and 4.2°K perpendicular to the tube axis until the inner walls touched, and further, until the plastic deformation  $\delta = 23\%$ . The sample was then heated at low pressure, and kept at room temperature for 10 - 15 hours. Recrystallization was observed on a cut of the cross section of the tubes after deep etching, by using a metallographical microscope of the type MIM-6 (MIM-6) (Figs. 1 and 2). Small

Card 1/2

λ

81621

Low-temperature Recrystallization of Copper

S/181/60/002/06/09/050  
B122/B063

bridges of recrystallization grains were observed along the contact planes. With dropping deformation temperature the number of outgrowing grains increased. The experiments showed that copper deformed at low temperatures is well recrystallizable already at room temperature, and that the idea of temperature threshold of recrystallization is a preliminary one, i.e., when constructing the recrystallization diagram it is necessary to consider the temperature at which the plastic deformation is activated. There are 2 figures and 6 Soviet references.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR, Khar'kov (Physico-technical Institute of the AS UkrSSR, Khar'kov)

SUBMITTED: August 11, 1959

Card 2/2

X

KOGAN, V.S.; LAZAREV, B.G.; ZHDANOV, G.S.; OZEROV, R.P.

Cryostat for neutron diffraction studies at hydrogen and helium  
temperatures. Kristallografiia 5 no.2:320-321 Mr-Apr '60. (MIRA 13:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.  
(Cryostat) (Neutrons--Diffraction)

GINDIN, I.A.; LAZAREV, B.G.; STARODUBOV, Ya.D.

Characteristics of the mechanical properties of lithium connected  
with low-temperature polymorphic transitions. Fiz. met. i metalloved.  
10 no.3:472-480 S '60. (MIRA 13:10)

1. Fiziko-tekhnicheskij institut AN USSR.  
(Lithium--Testing) (Metals at low temperatures)



84427

S/056/60/039/004/045/048  
B006/B056

24.5400 also 1209

AUTHORS: Lazarev, B. G., Semenenko, Ye. Ye., Sudovtsov, A. I.

TITLE: The Polymorphous Transformations of <sup>✓</sup>Lithium, <sup>✓</sup>Sodium, and <sup>✓</sup>Potassium in Films Condensed on Cold Backings

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,  
Vol. 39, No. 4(10), pp. 1165 - 1166

TEXT: The authors give a report on investigations of low-temperature transformations of alkali metals by the method of low-temperature deformation in a highly undercooled state and on the R(T)-measurement of films. A plastic deformation of lithium and sodium at helium temperatures leads to a practically complete transition into a stable modification; in the deformation diagram such a transition manifests itself in the form of a break. For the purpose of observing the low-temperature polymorphism the method of R(T)-measurement is more suited and more sensitive; (R - electrical resistance of the metal film). The film is produced by allowing a metal to condense on backings having very low temperatures. In this manner, two modifications of bismuth and iron and three of beryllium and

Card 1/3

84427

The Polymorphous Transformations of Lithium,  
Sodium, and Potassium in Films Condensed on  
Cold Backings

S/056/60/039/004/045/048  
B006/B056

gallium were discovered. The writers of the present "Letter to the Editor" employed this method themselves to investigate the low-temperature polymorphism of Li, Na, and K. The films were condensed onto glass backings at  $4.2^{\circ}\text{K}$ , and  $R(T)$  was measured during heating of the films up to  $200^{\circ}\text{K}$ - $300^{\circ}\text{K}$ . The  $R(T)$ -curves have breaks that indicate the existence of three modifications. The  $R(T)$ -curve for K is given. The curve for Li from  $160^{\circ}$  to  $170^{\circ}\text{K}$  shows a sharp break (experiments carried out by plastic deformation furnished a transition temperature of about  $143^{\circ}$ - $167^{\circ}\text{K}$ ). Na has a transition at  $\sim 80^{\circ}\text{K}$  and K at  $\sim 55^{\circ}$ - $78^{\circ}\text{K}$ . For Li and Na, breaks were still found at  $80^{\circ}$  and  $40^{\circ}\text{K}$ , respectively, and for K at  $\sim 20^{\circ}\text{K}$ . These temperatures correspond to the transformation temperatures of metals. The experiments proved the existence of polymorphous transitions in Li and Na and, besides, led to the discovery of a low-temperature transition in K. Thus, it is also proved that the temperature of polymorphous transitions in these metals drops with decreasing Debye temperature. There are 1 figure and 9 references: 7 Soviet, 1 US, and 1 German. X

Card 2/3

Card 3/3

88468

S/056/60/039/006/061/063  
B006/B063

24.7100

AUTHORS: Bulatova, R. F., Kogan, V. S., Lazarev, B. G.

TITLE: Crystal Structure of Solid Deuterium

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,  
Vol. 39, No. 6(12), p. 1853

TEXT: Previous studies (Refs. 1,2) have shown that H<sub>2</sub> and D<sub>2</sub> have a tetragonal, body-centered lattice with c/a = 0.82 and c/a = 1.73, respectively. Tritium has the same structure as deuterium. The crystal structure of HD has now been studied using the same experimental arrangement as described in Ref. 1, and a brief report thereon is made in this "Letter to the Editor". Like D<sub>2</sub> and H<sub>2</sub>, HD shows one single line in the X-ray diagram. Calculations assigned HD to the space group C<sub>4</sub><sup>5</sup> (tetragonal and body-centered). a = 3.39 A, c = 5.86 A, c/a = 1.73 gave a density of 0.146 g/cm<sup>3</sup> at 4.2°K. This value is in good agreement with results obtained by other research workers. There are 6 references: 5 SOVIET

Card 1/1

AND 1 US -

SUBMITTED: OCT. 1, 1960

20799

S/181/61/003/003/025/030  
B102/B205

1143, 1160, 2807, 1418

24.1500

AUTHORS:

Gindin, I. A., Lazarev, B. G., and Starodubov, Ya. D.

TITLE:

Discontinuous character of plastic deformation at low temperatures

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 920-925

TEXT: The discontinuous character of plastic deformation of crystalline bodies has been known long (A. F. Ioffe, Ehrenfest, M. V. Klassen-Neklyudova), and the various effects of discontinuous deformation have been investigated many times. In the authors' view, however, this problem has not yet been studied in detail, which is the purpose of the present work. Elongation and compression diagrams of the following metals were recorded by a machine equipped with a sensitive, rigid dynamometer between 1.4 and 77°K and at a deformation rate of 30 μ/sec: aluminum, beryllium, bismuth, tungsten, iron, cadmium, potassium, lithium, magnesium, molybdenum, copper, sodium, nickel, tin, lead, antimony, silver, mercury, tantalum, titanium, chromium, cesium, zinc, zirconium, and uranium. In this connection, it was necessary to classify the deformation jumps and to make a detailed study of

X

Card 1/4

20799

S/181/61/003/003/025/030  
B102/B205

Discontinuous character ...

a new kind of faults which are important at 4.2°K and below this temperature. The principal results of these investigations are published here. The discontinuity of the low-temperature deformation is essentially caused by: 1) mechanical twinning, 2) polymorphous transitions, 3) peculiarities of the plastic deformation of high-purity metals (mechanical recrystallization, sliding along the grain faces, twinning), 4) relaxation processes with a regular increase of jumps. These four cases were investigated individually. Figs. 1, 2, and 3 show the diagrams of deformations on mechanical twinning (1), polymorphous transition (2), and of relative jumps (3). These diagrams were recorded by the computer machine. Ad 1: The authors studied the extension elongation of coarse-grained iron of 99.99% purity at 77°K. The jumps are only caused by twinning processes. The kind of the effect depends largely on the grain size. Fine-grained material showed no twinning jumps. Jumps of this kind can thus be prevented by an adequate thermomechanical treatment of the material. Ad 2: Jumps due to polymorphous transitions occur in the compression of Li or Na. Fig. 2 shows diagrams obtained for Li (purity of 99.93%) at 20 (1), 4.2 (2), and 1.4°K (3). The transition into the stable low-temperature modification takes place after a certain degree of deformation has been

Card 2/8

S/181/61/003/<sup>20799</sup>003/025/030  
B102/B205

Discontinuous character ...

reached, and is accompanied by the occurrence of considerable faults. These jumps occur only if the deformation takes place below the temperature of the polymorphous transition. Ad 3: High-purity metals, such as Al (99.994%) and Fe (99.99%) show mechanical recrystallization within the range of helium temperatures, i.e., grains are formed, which are larger than the initial ones. The process is somehow similar to mechanical twinning. Ad 4: Whereas the effects described above occur only under certain conditions, all the metals investigated show deformation jumps at sufficiently low temperatures and a corresponding stress strain, which are due to relaxation processes. These are characterized by a certain rule (Fig. 3 shows it for Fe (99.99% pure) at 4.2°K). They are due to the fact that elastic energy accumulates and is released at a certain value. For some of the metals examined here, a table contains the temperature and the degree of deformation at which the elongation process takes place discontinuously and regularly. In some metals, an increased elevated strain stress corresponds to an elevated temperature (e.g., in the case of Na), but there is still a temperature threshold above which no such jumps will appear any longer, not even at maximum stress, (for Na, e.g., above 20°K). The rules governing the jumps are observable both during compression and elongation. There are 7 figures,

Card 3/8

20799

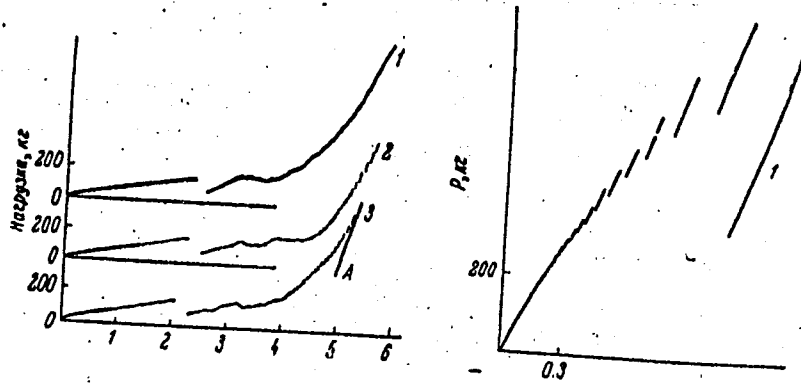
Discontinuous character ...

S/181/61/003/003/025/030  
B102/B205

1 table, and 18 references: 16 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION:.. Fiziko-tehnicheskiy institut AN USSR Khar'kov (Institute of Physics and Technology, AS UkrSSR, Khar'kov)

SUBMITTED: August 10, 1960



Figs. 2 and 3

Card 4/8

YESEL'SON, B.N.; LAZAREV, B.G.; SHVETS, A.D.

Obtaining lower than  $1^{\circ}$  K. temperatures by pumping-off liquid  
helium vapors with an adsorption pump. Prib.i tekhn.eksp. 6  
no.5:160-162 S-0 '61. (MIRA 14:10)

1. Fiziko-tekhnicheskii institut AN USSR.  
(Low temperature engineering)



S/126/61/011/001/005/019  
E111/E452

AUTHORS: Gindin, I.A., Lazarev, B.G. and Starodubov, Ya.D.

TITLE: Low-Temperature Metallography of Lithium

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.1,  
pp.46-51

TEXT: The authors point out that no information is yet available on microstructural changes during martensitic transformation of alkali metals, in cooling to low-temperatures and heating or after "deformational" polymorphic transformation; or on the mutual effect of transformations on microstructure. In their present investigation, which is a continuation of their work in this field, the authors have studied by low-temperature metallography the microstructure of lithium and its changes in the polymorphic-transformation temperature region. Polished sections were prepared as previously described (Ref.1). For preliminary low temperature investigations, previously prepared lithium specimens (Ref.1) were used; these had been stored in liquid nitrogen and photomicrographs corresponding to this temperature could then be obtained directly. For other temperatures, a special cryostatic apparatus was constructed in which the required specimen temperature

Card 1/3

S/126/61/011/001/005/019  
E111/E452

Low-Temperature Metallography of Lithium

was obtained by suitable selection of thermal resistance between it and a massive copper heat conductor whose other end was immersed in cooling liquid. The temperature of the 7 x 7 x 2 mm specimen, which could be microscopically observed, was measured with a copper-constantan thermocouple or, for below 20°K, with an indium resistance thermometer. The whole was inside a vacuum jacket connected to a separate pump and containing activated charcoal. The optical system was part of a type PMT-3 (PMT-3) apparatus with a photographic attachment. Microphotos show the original room temperature microstructure and also needles of the hexagonal modification and a chain of martensitic needles with a grain-boundary fracture. The extent of martensitic transformations does not exceed 25 to 30% and volume changes produce shear deformation. A further figure shows the changes from the original microstructure at a given point on the section during repeated cooling and warming. Preliminary plastic deformation at 78°K was found to impede formation of the hexagonal modification on subsequent cooling below the martensitic point: on the microstructure, wavy slip lines are visible which represent regions of localized face-centred cubic

Card 2/3

S/126/61/011/001/005/019  
E111/E452

Low-Temperature Metallography of Lithium

structure. This effect is similar to that in body-centred cubic metals (Ref.11). The work provides some confirmation for the authors' previous conclusions (Ref.1) on the behaviour of lithium. The low-temperature improvement of the mechanical properties of this metal is attributable to the fine dispersion of the two-phase structure produced through "deformational" polymorphous change. There are 6 figures and 11 references: 8 Soviet and 3 non-Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR  
(Physicotechnical Institute AS UkrSSR)

SUBMITTED: June 28, 1960

Card 3/5

S/126/61/012/006/007/023  
E193/E383

AUTHORS: Gindin, I.A., Lazarev, B.G., Starodubov, Ya.D. and  
Lazareva, M.B.

TITLE: Mechanical properties of sodium in the range of low-  
temperature polymorphic transformations

PERIODICAL: Fizika metallov i metallovedeniye, v. 12, no. 6,  
1961, 846 - 852

TEXT: As is the case with Li, the body-centred cubic  
crystal structure of Na undergoes a partial change to close-  
packed hexagonal on cooling below 35° K. A so-called  
"deformation" modification of this metal can be obtained by  
straining it plastically at temperatures below 80° K and the  
object of the present investigation was to check whether the  
effect of low-temperature polymorphism of Na on its mechanical  
properties is similar to that observed earlier by the authors  
(Ref. 1: FMM, 1960, 10, 472) in Li. To this end, tensile  
tests were carried out at 1.6 - 290° K on polished and etched  
test pieces of 99.8% pure Na and the following properties were

Card 1/4

Mechanical properties of .....

S/126/61/C 3/006/007/023  
E193/E383

determined: 0.2% proof stress; UTS; true tensile strength; elongation; reduction in area and the strain-hardening coefficient. In addition, the microhardness of each fractured specimen was measured at 77 °K, side-by-side with that of a pilot (i.e. untested) specimen. Typical results are reproduced graphically. In Fig. 2, the elongation ( $\delta$ , % - lefthand scale) and reduction in area ( $\psi$ , % - righthand scale) are plotted against the test temperature (°K). The temperature-dependence of 0.2% proof stress ( $\sigma_{0.2}$ ), UTS ( $\sigma_b$ ) and true tensile strength ( $\sigma_u$ ) is reproduced in Fig. 3. Finally, in Fig. 4 the microhardness ( $H$ , kg/mm<sup>2</sup>) measured at 77 °K is plotted against the temperature (°K) to which the test piece had been cooled prior to hardness test; the lower curve relates to pilot specimens, the upper curve representing results obtained near the neck of fractured tensile-test pieces. Several conclusions were reached.

Card 2/0 4

S/126/61/012/006/007/023  
E193/E383

Mechanical properties of .....

- 1) Anomalous variation of mechanical properties of Na in the sub-zero temperature range is associated with polymorphic transformations taking place at these temperatures.
- 2) The martensitic transformation which on cooling takes place in Na at about 35 °K is reflected in a sharp increase in its yield strength, UTS and microhardness.
- 3) A minimum in the elongation versus temperature curve is situated in the temperature range within which the deformation-induced polymorphic transformation takes place. The rapid increase in elongation on cooling from 70 to 1.6 °K can be attributed to the deformation-induced change from body-centred cubic to close-packed hexagonal crystal structure.
- 4) The low-temperature polymorphic transformations (particularly the martensitic transformation) bring about an increase in the degree of strain-hardening and uniformity of the plastic flow of Na. There are 4 figures, 1 table and 12 references: 6 Soviet-bloc and 6 non-Soviet-bloc. The four latest English-language references mentioned are:

Card 3/4

S/126/61/012/006/007/023  
E193/E383

Mechanical properties of ....

Ref. 2: C.S. Barrett - Phys.Rev.; 1947, 72, 245; Acta  
crystallog., 1956, 9, 671; Ref. 8: D. Hull, H.M. Rosenberg;  
Phys.Rev.Let., 1959, 2, 5; Ref. 10: D. Hull, H.M. Rosenberg -  
Phil.Mag., 1959, 4, 303; Ref. 12: D. Guban, J.S. Dugdall,  
J. Can: Phys. Rev., 1958, 36, 1248.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR  
(Physicotechnical Institute of the AS UkrSSR)

SUBMITTED: May 3, 1961

Card 4/8 \

25034  
S/057/61/031/007/017/021  
B104/B206

26.2358

AUTHORS: Lazarev, B. G., and Fedorova, M. F.  
TITLE: High-vacuum adsorption pump for hydrogen evacuation  
PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 7, 1961, 864-866

TEXT: Activated charcoal cooled to liquid hydrogen temperature adsorbs large amounts of gaseous hydrogen. This fact is utilized for the adsorption pumps described here. Two types of these pumps are shown in Figs. 1 and 2, identical parts being designated analogously. The adsorbing elements are cooled by liquid hydrogen flowing in two coaxial cylinders (2). The activated charcoal is placed on the inner walls of the hollow cylinders. In order to prevent too fast hydrogen evaporation, this part is cooled by liquid nitrogen which is inside the hollow space (1). Parts (1) and (2) are made of highly polished copper and the inner side of part (3) is also polished. The valve (4) is connected to the vessel to be evacuated, valve (5) serves for pre-evacuation. The pumps described are started in the following way: The preliminary vacuum pump is switched off after pre-evacuation to  $10^{-2}$  mm Hg, liquid nitrogen is conducted into the  
Card 1/4

X



25034

S/057/61/031/007/017/021  
B104/B206

+

High-vacuum adsorption ...

initial stage and subsequently, liquid hydrogen into the final stage. The vacuum thus obtained lies at  $\ll 10^{-7}$  mm Hg. The pumping rate amounts to 400 l/sec at  $8 \cdot 10^{-8}$  mm Hg and up to 900 l/sec at  $10^{-5}$  mm Hg. The efficiency of a pump of type no. 2 as a function of the pressure is graphically shown in Fig. 3 for combined operation (hydrogen and nitrogen) and for operation with nitrogen alone. The pumps described were also successfully used for helium evacuation. For further development of these pumps and determination of their characteristics, it is necessary to study the adsorption isotherms of a number of gases over a wide temperature range at pressures from  $10^{-5}$  to  $10^{-8}$  mm Hg. A report on these studies will be given shortly. The authors thank V. V. Zolotarev for the construction of the pumps. There are 3 figures, 1 table, and 4 Soviet-bloc references.

ASSOCIATION: Fiziko-tehnicheskii institut AN USSR Khar'kov (Physico-technical Institute, AS UkrSSR, Khar'kov)

SUBMITTED: September 10, 1960

Card 2/4

89199

S/056/61/040/001/004/037  
B102/B204

24,7100

AUTHORS:

Kogan, V. S., Lazarev, B. G., Bulatova, R. F.

TITLE:

Differences in the lattice constants of neon isotopes

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40,  
no. 1, 1961, 29-31

TEXT: The authors know of only one single case in which the attempt had been made to find differences in the lattice parameters of elements heavier than helium. On  $Li^6$  and  $Li^7$  a difference of 0.0015 A was found to exist, a value which is near the limit of measuring accuracy. Theoretically, the differences of the lattice parameters of the isotopes of noble gases, i.e. the differences of the molar volumina in the solid phase have repeatedly been investigated; for neon, one obtained the following at  $0^{\circ}K$ :  $\Delta V/V = 0.6\%$ . An experimental study was the purpose of the present paper. By means of X-ray analysis, the structures of  $Ne^{20}$  (99% pure) and of  $Ne^{22}$  (98% pure) were examined. The specimens freed from air and helium impurities, were obtained in form of polycrystalline layers, viz., the neon isotope was precipitated from the gaseous phase onto a copper capillary

Card 1/4  
3

89199

Differences in the lattice ...

S/056/61/040/001/004/037  
B102/B204

tube, which was cooled from the inside by means of liquid helium. The experimental arrangement for the X-ray examination of such a specimen is described in Ref. 5. A typical X-ray diagram recorded by means of this device, on which also the Cu lines are visible, is shown in the figure. The X-ray diagrams were photometrized, the distances between the maxima of the interference lines were measured with an accuracy of  $\pm 0.03$ - $\pm 0.05$  mm. The corrections for sample thickness were carried out according to Kurdyumov. The results of the studies are shown in the table; the data of the lattice parameters are accurate up to  $\pm 0.004$  A. Both isotopes have face-centered cubic lattices; for the light isotope,  $a = 4.471$  A, and for the heavy one,  $a = 4.455$  A;  $\Delta V/V = (1.1 \pm 0.5)\%$ . The line intensities found in the X-ray diagrams deviated considerably from the calculated values. Thus, in Cu -  $K_{\alpha}$  and Fe -  $K_{\alpha}$  radiations, the intensity of the (200) lines compared with those of the (111) lines were considerably lower than calculated, the intensity of the (222) line of the Fe -  $K_{\alpha}$ -radiation was higher. This is explained by the fact that the neon precipitated from the gaseous phase upon the capillary tube has a texture, in which the [111] axis is radially orientated toward the capillary tube. The intensity ratios of the same interference lines -  $I_{hkl}(\text{Ne}^{22})/I_{hkl}(\text{Ne}^{20})$  is higher and grows more

Card 2/a

3

89.77

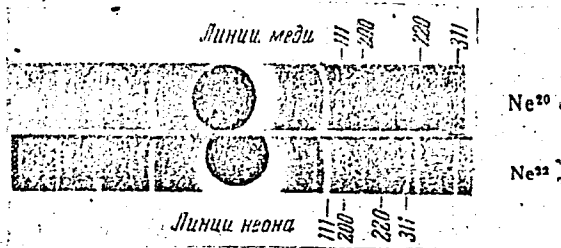
S/056/61/040/001/004/037  
B102/B204

Differences in the lattice ...

quickly with increasing scattering angle than would have been theoretically expected. By way of a summary it is said that the  $\Delta V/V$ -value obtained shows good agreement with theoretical results considering the energy differences of zero vibrations. By far greater differences of the molar volumes of the Ne isotope - compared to the Li isotopes - are ascribed to the difference in the binding forces in the neon and lithium lattices. B. Ya. Pines is mentioned in the paper. There are 1 figure, 1 table, and 8 references: 2 Soviet-bloc and 6 non-Soviet-bloc.

ASSOCIATION: Fiziko-tehnicheskij institut Akademii nauk Ukrainsoy SSR  
(Institute of Physics and Technology of the Academy of Sciences Ukrainskaya SSR)

SUBMITTED: July 6, 1960



Card 3/A  
3

89205

24-5600 (1137 only)  
24-2140 (1072, 1055, 1395)

S/O56/61/040/001/011/037  
B102/B204

AUTHORS: Lazarev, B. G., Semenenko, Ye. Ye., Sudovtsov, A. I.

TITLE: Modifications of beryllium and iron in films, condensed on a cold backing

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 1, 1961, 105-108

TEXT: It is well known that some metals, at least bismuth and beryllium, do not become superconductive in massive form down to  $10^{-2}$  °K. In form of thin films condensed at low temperatures - and that at relatively high temperatures (Bi ~ 6°K, Be ~ 8°K) - they become, however, superconductive. The superconductivity of beryllium films and their temperature dependence were investigated in order to find out whether the occurrence of new modifications might be responsible for this effect. As e.g. in the case of iron a low-temperature polymorphism is known; also the electrical conductivity of Be films was studied. In this connection, parallel studies were carried out with Cu films which had no low-temperature polymorphism. The films were measured at  $10^{-7}$  mm Hg in a helium cryostat. In the same device,

Card 1/3

89205

Modifications of beryllium ...

S/056/61/040/001/011/037  
B102/B204

X

also the temperature dependence (1.23-300°K) of electrical conductivity was measured; the heating rate of the films was 2°K/min. The beryllium films showed, as had already been found in preliminary investigations (Ref. 4) at ~30°K a polymorphic transition, and at 8-9°K superconductivity. The superconductive phase remains conserved when the film is heated up to 30°K. Within this range (8.5-30°K) the temperature dependence of the electrical resistance was studied; these experiments showed that only when heated to 60°K, the superconductive phase ( $R(T) = \text{const}$ ) vanishes completely. As the nature of the film is known to depend on whether condensation occurred from the solid or from the liquid phase (in the former case the film consists mainly of diatomic molecules, and in the latter an atomic film forms) it was studied to what extent this produces any effect upon superconductive properties. Films were produced by slow evaporation (from solid Be) and by quick evaporation (from liquid Be) and  $R(T)$  was studied. The films of the first kind (condensed on N<sub>2</sub>-cooled backings) most probably had a second superconductive modification, whose critical temperature was about 6°K and less, which, however, remained conserved up to 130°K. Also heating of the film to room temperature during 360 hr did not change anything in this effect: With cooling, superconductivity again occurred at

Card 2/3

07200

Modifications of beryllium ...

S/056/61/040/001/011/037  
B102/B204

about 5°K. Fig. 4 shows the R(T)-curves of various Be films.—The film condensed onto a helium-cooled backing from the solid phase was a mixture from two superconductive modifications. The first had a critical temperature of ~8.4°K (curve 1), remained conserved up to 30°K, and was completely vanished at 60°K; the critical temperature of the other modification was about ~6°K, and with short (1-2 hr) heating to room temperature (curves 3 and 3') this modification remained conserved; it was, however, considerably less stable than in the case of condensation to a nitrogen-cooled backing, but remained superconductive also up to about 130°. The study of an iron film, condensed on a helium-cooled backing showed that at 40°K a polymorphic transition occurs. A copper film produced on the same conditions, however, showed no such transition. The existence of one- or two low-temperature modifications is today known of the following metals: gallium (2), beryllium (2), bismuth (1), iron (1), sodium (1), lithium (1), and potassium (1). There are 6 figures and 9 references: 7 Soviet-bloc.

ASSOCIATION: Fiziko-tehnicheskii institut Akademii nauk Ukrainskoy SSR  
(Institute of Physics and Technology of the Academy of Sciences Ukrainskaya SSR)

Card 3/A  
2

24.2140 (1072, 1160, 1395)

20456  
S/056/61/040/002/010/047  
B102/B202

24.7700

1055 1138, 1559 also 1418

AUTHORS:

Kan, L. S., Lazarev, B. G., Makarov, V. I.

TITLE:

Superconductivity of tin and indium under pressure

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki,  
v. 40, no. 2, 1961, 457 - 459

TEXT: In previous papers (ZhETF, 14, 463, 1944 and 18, 825, 1948), the authors described studies of the effect of pressure on the critical temperature of tin and indium at 1730 and 1370 kg/cm<sup>2</sup>. They observed shifts ( $\Delta T_c$ ) of less than 0.1°. If  $dT_c/dp$  is assumed to proceed linearly, the following shift rates are obtained:  $(-5.7 \pm 0.2) \cdot 10^{-5}$  deg/atm for tin, and  $(-4.6 \pm 0.2) \cdot 10^{-5}$  deg/atm for indium. In recent times, the correctness of these values has been doubted. For this reason, the measurements were repeated in the range of from 0 to 1330 kg/cm<sup>2</sup>. For indium,  $T_c(p)$  was linear also in this range, and it was found that  $dT_c/dp = (-4.4 \pm 0.3) \cdot 10^{-5}$  deg/atm (see solid line in Fig.2). Tin, however, showed a linear

Card 1/3



20456

S/056/61/040/002/010/047  
B102/B202

X

Superconductivity of tin ...

course of  $T_c(p)$  with  $dT_c/dp = (-4.4 \pm 0.2) \times 10^{-5}$  deg/atm in the range of from 0 - 100 atm. At higher temperatures, a deviation from linearity was observed (see Fig.2, dashed curve, obtained from two tin specimens  $\Delta$  and  $\circ$ ; the dashed line corresponds to  $dT_c/dp = (-5.7 \pm 0.2) \times 10^{-5}$  deg/atm.).

The measurements were made by the differential and the ice method (the latter in the range 500 - 1200 atm). In the range of from 800 to 1730 atm,  $dT_c/dp$  was  $(-4.6 \pm 0.2) \times 10^{-5}$  deg/atm. Since this curve runs in parallel with the indium curve, it can be assumed that between 100 and 800 atm a transition takes place from one straight line to the other. The effect of pressure on superconductivity has hitherto not been fully explained. The new theory of superconductivity gives the relation  $T_c \sim \Theta \exp(-2/gv)$ , where  $\Theta$  is the Debye temperature,  $g$  the electron-phonon interaction constant, and  $v$  the electron density. Compression on all sides of the metals leads to an increase of  $\Theta$  and, thus, to a linear increase of  $T_c$ . To explain the course of  $T_c(p)$ , the pressure-dependent change of the electro-

Card 2/3

20456

S/056/61/040/002/010/047

B102/B202

Superconductivity of tin ...

nic properties of the metal must be studied. It is of interest that In with linear  $T_c(p)$  has a most simple Fermi surface (closed, almost spherical), whereas thallium (like tin) with its complex function  $T_c(p)$  has an anisotropic Fermi surface ("corrugated" planes). There are 2 figures and 8 references: 5 Soviet-bloc and 3 non-Soviet-bloc.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR (Institute of Physics and Technology of the Academy of Sciences Ukrainskaya SSR)

SUBMITTED: September 1, 1960

Card 3/4  
3

KOGAN, V.S.; LAZAREV, B.G.; OZEROV, R.P.; ZHDANOV, G.S.

Neutron diffraction study of the crystalline structure of solid hydrogen and deuterium. Zhur. eksp. i teor. fiz. 40 no.4:1022-1026 Ap '61. (MIRA 14:?)

1. Fiziko-tekhnicheskiy institut AN Ukrainskoy SSR i Fiziko-khimicheskiy institut imeni L.Ya. Karpova.

(Neutrons--Diffraction) (Low temperature research)  
(Hydrogen crystals) (Deuterium crystals)

9.5110

S/120/62/000/<sup>39171</sup>003/048/048  
E032/E114

AUTHORS: Yesel'son, B.N., Lazarev, B.G., and Shvets, A.D.

TITLE: A simple He<sup>3</sup> cryostatPERIODICAL: Pribory i tekhnika eksperimenta, <sup>7</sup>no.3, 1962, 198-199

TEXT: It is pointed out that existing He<sup>3</sup> cryostats capable of producing temperatures down to 0.3 °K are rather complicated because they incorporate diffusion pumps and/or rotary pumps to pump the vapour above liquid helium and thereby reduce the temperature. The present authors have used a charcoal adsorption pump to remove the vapour and thereby have simplified the construction and succeeded in producing temperatures down to 0.34 °K. The device is shown in the figure, in which:

1 - charcoal pump; 2 - thin-walled stainless steel tube;  
3 - reservoir containing He<sup>3</sup>; 4, 10 - cylinders for storing helium gas; 5 - vacuum jacket; 6 - valve connecting the charcoal pump 1 to the reservoir 3; 7 - dewar with liquid helium at 1.3 °K; 8 - container filled either with He<sup>3</sup> - He<sup>4</sup> solution (7.4% He<sup>3</sup>) or pure He<sup>4</sup>; 9 - not given; 11 - tube for removing helium gas.

Card 1/2

A simple He<sup>3</sup> cryostat

S/120/62/000/003/048/048  
E032/E114

The charcoal pump is in the form of a brass cylinder containing about 30 g of activated charcoal which is held in position by a pair of brass grids. The temperature of 0.34 °K is reached after about 30 minutes. The heat leak of the system is about 600 erg/sec.

There is 1 figure.

ASSOCIATION: Fiziko-tehnicheskii institut, AN USSR .  
(Physicotechnical Institute, AS Ukr.SSR)

SUBMITTED: November 29, 1961

Card 2/1 2

12019

S/185/62/007/007/003/010  
I048/I248

#3110  
AUTHORS:

Kogan, V.S., Lazarev, B.G., and Bulatova, R.F.

TITLE:

The phase diagram of the system liquid-solid formed by the hydrogen isotopes.

PERIODICAL:

Ukrains'kyy fizychnyy zhurnal, v.7, no.7, 1962,  
732-736

TEXT:

The phase diagram of the system H<sub>2</sub>-D<sub>2</sub> at temperatures from 4 to 20°K was obtained using X-ray analysis of the polycrystalline specimen (at  $\leq 4.2^\circ\text{K}$ ) thermal analysis of the mixture (at 14-20°K). Both H and D have a tetragonal lattice but the axis ratio  $c/a$  is  $< 1$  in the case of H and  $> 1$  in the case of D. The solubility of H in the D lattice at 4.2°K is 20% by vol., that of

X

Card 1/2

S/185/62/007/007/003/010  
I048/I248

The phase diagram of...

D in the H lattice is 15% by vol. A horizontal peritectic section on the solidus curve, for the crystallization of mixtures containing 26-52% H<sub>2</sub> (by vol.) was confirmed experimentally. The existence of the large two-phase region extending from about 10% to 80% D<sub>2</sub> (by vol.) is an experimental confirmation of the theory of N.M. Lifshits and G.N. Stepanova (ZhETF 33, 485, 1957). In the case of the H<sub>2</sub>-D<sub>2</sub> system, the critical temperature is so low that this breakdown occurs simultaneously with the crystallization. Preliminary experiments for the determination of the mutual solubility in the system D<sub>2</sub>-HD at 4.2°K, lead to the assumption that H<sub>2</sub> and HD form no continuous solid solution at any temperature. There are 4 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR (The Physico-Technical Institute of the AS UkrSSR, Kharkov)

Card 2/2

44245

S/056/62/043/006/059/067  
B141/B102

2/11/80

AUTHORS: Lazarev, B. G., Lazareva, L. S., Ovcharenko, O. N.,  
Matsakova, A. A.

TITLE: Effect of universal compression on the temperature of the  
superconducting transition of Nb<sub>3</sub>Sn

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43,  
no. 6(12), 1962, 2309-2310

TEXT: Nb<sub>3</sub>Sn shows a very small isotopic effect, in which the critical  
temperature T<sub>cr</sub> is not proportional to M<sup>-1/2</sup> but to M<sup>-1/12</sup>. The pressure  
applied was 1730 kg/cm<sup>2</sup>, which resulted in a decrease of T<sub>cr</sub> by  
(4.5 ± 0.5)10<sup>-2</sup> deg; i.e.  $\partial T_{cr} / \partial p = -(2.5 \pm 0.3) \cdot 10^{-5}$  deg/atm. The  
pressure effect is of the same sign as in the majority of superconductors  
and of the same amount as in good superconductors, wherein T<sub>cr</sub> is almost  
proportional to M<sup>-1/2</sup>.  $(\partial H_{cr} / \partial T)_{T_{cr}} = -15.5 \cdot 10^3$  gauss/deg. Thus Nb<sub>3</sub>Sn

Card 1/2



Effect of universal compression...

S/056/62/043/006/059/067  
B141/B102

belongs to the alloyed type superconductors. When  $dT_{cr}/dp$  and  $dH_{cr}/dT$  are known, the jump of the thermal expansion coefficient and of specific heat during transition can be estimated. The values obtained, however, are too high so it is concluded that  $dT_{cr}/dp$  and  $dH_{cr}/dT$  hold only for very small  $Nb_3Sn$  volumes. The same applies to the other properties of this superconductor. For  $Nb_3Sn$  and similar superconductors the magnetic field must have very great depth of penetration. There is 1 figure. ✓

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR  
(Physicotechnical Institute of the Academy of Sciences  
Ukrainskaya SSR)

SUBMITTED: September 12, 1962

Card 2/2

44246

S/056/62/043/006/061/067  
B141/B102

24 2140

AUTHORS: Lazarev, B. G., Lazareva, L. S., Sudovstov, A. I.,  
~~Aliyev, F. Yu.~~

TITLE: Jump of the heat expansion coefficient of  $Nb_3Sn$  for  
superconducting transition

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43,  
no. 6(12), 1962, 2312-2313 ;

TEXT: For measuring  $\Delta V/V$  at  $T_{cr}$  ( $\approx 18^\circ K$ ), a highly accurate apparatus was designed whose sensitive part is a coil of bimetal strip 55 cm long. One end of this is stationary, and the other can turn when the volume of one metal changes with respect to the other, the torsion corresponding to the quantity to be measured. In this case the coil consisted of niobium coated with  $Nb_3Sn$  (0.05 mm). The jump of the expansion coefficient of  $Nb_3Sn$  at  $1.5 \cdot 10^{-7} (\pm 10\%) \text{ deg}^{-1}$  was apparently as large as that of tin and lead. The theoretical value, determined thermodynamically, would appear to be higher by three powers of ten than that measured. This indicates that for  $Nb_3Sn$

Card 1/2

Jump of the heat expansion...

S/056/62/043/006/061/067  
B141/B102

and similar superconductors the magnetic field has great depth of penetration. The coefficients of expansion and compression of  $Nb_3Sn$  and  $Nb$  also were measured in the temperature range  $300^\circ$  to  $2^\circ K$ . The expansion coefficient of  $Nb_3Sn$  was found to be only slightly larger than that of  $Nb$ , e.g. by  $3 \cdot 10^{-6}$  at  $300^\circ K$  and by  $2 \cdot 10^{-7}$  at  $2-4^\circ K$ , i.e., the thermal and elastic properties of  $Nb_3Sn$  and  $Nb$  are very similar. There is 1 figure. ✓

ASSOCIATION: Fiziko-tekhnicheskii institut Akademii nauk Ukrainskoy SSR  
(Physicotechnical Institute of the Academy of Sciences  
Ukrainskaya SSR)

SUBMITTED: September 12, 1962

Card 2/2

KOGAN, V.S.; KRIVKO, A.I.; LAZAREV, B.G.; LAZAREVA, L.S.; MATSAKOVA, A.A.;  
OVCHARENKO, O.N.

Constitutional diagram of the system Nb - Sn. Fiz.met.1 metalloved.  
15 no.1:143-145 Ja '63. (MIRA 16:2)

1. Khar'kovskiy fiziko-tekhnicheskii institut AN UkrSSR.  
(Diffusion coatings) (Niobium-tin alloys)  
(Phase rule and equilibrium)

GINDIN, I.A.; LAZAREV, B.G.; KHVEDCHUK, I.R.

Dilatometric investigation of the low-temperature deformation  
transition to lithium. Fiz. met. i metalloved. 16 no.5:793-794  
N '63. (MIRA 17:2)

1. Fiziko-tehnicheskii institut AN UkrSSR.

S/056/63/044/002/015/065  
B102/B186

AUTHORS: Lazarev, B. G., Lazareva, L. S., Makarov, V. I.

TITLE: Features of the pressure dependence of the critical temperature of thallium

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 2, 1963, 481-482

TEXT: The pressure dependence of  $T_{cr}$  was measured for annealed single crystals of pure thallium ( $R_{4.20K}/R_{cr} \sim 2 \cdot 10^{-4}$ ) in the range from zero to 1730 kg/cm<sup>2</sup>, and the curve obtained was completed with the help of data by Jennings and Swenson (Phys. Rev. 112, 31, 1958) and Bowen and Jones (Proc. Roy. Soc., 254, 522, 1960). The following were noted: linear increase of  $T_{cr}$  with  $p$  in the range 0 - 1500 kg/cm<sup>2</sup> ( $dT_{cr}/dp \approx (0.4 \pm 0.1) \cdot 10^{-5}$  deg/atm; rapid increase between 1500 and 1730 kg/cm<sup>2</sup>; decrease at  $p > 1730$  kg/cm<sup>2</sup>. This complex behavior is possibly connected with electron transitions in the conduction electron spectrum and could

Card 1/2

Features of the pressure ...

S/056/63/044/002/015/065  
B102/B186

be explained by changes of the Fermi surface topology. Taking into consideration the difference in electron-group state densities at the Fermi surface, where the lower state density corresponds to the higher electron-phonon interaction constant  $g \sim m^{-1/2}$ , the contribution of the small group ( $m_{\text{eff}} = m_1$ ) is estimated. With  $\epsilon_1/\epsilon_2 = m_1/m_2$ , it is found that  $\epsilon_1$  could amount to  $\sim 10\%$  of  $\epsilon_2$ . There is 1 figure.

ASSOCIATION: Fiziko-tekhnicheskii institut Akademii nauk Ukrainiskoy SSR  
(Physicotechnical Institute of the Academy of Sciences  
Ukrainskaya SSR)

SUBMITTED: September 12, 1962

Card 2/2

L 13836-63

GG/WN/IJP(C)

ACCESSION NR: AP3003159

EPF(c)/EWT(1)/EPF(n)-2/BDS

AFFTC/ASD/SSD Pr-4/Pu-4

S/0056/63044/006/2187/2189

70  
68

AUTHOR: Yesel'son, B. N.; Kovdrya, Yu. Z.; Lazarev, B. G.

TITLE: Direct measurements of the linear flow velocity of a film of He II

SOURCE: Zhurnal eksper. i teor. fiziki, v. 44, no. 6, 1963, 2187-2189

TOPIC TAGS: liquid helium, flow rate, low temperatures

ABSTRACT: Experiments were set up for obtaining detailed information on the linear flow velocity and the formation of He II films. The experiments consisted essentially of measuring the temperature at two different points along the flow and determining the time dependence of the potential difference between the two resistance thermometers. The experiments were carried out in the temperature interval 1.50 to 2.13K. The temperature was maintained constant within 0.00001 °K. The resultant flow rate increased with temperature reaching 100 cm/sec at 1.5°K. Since this exceeds the critical velocity as obtained in some investigations, some explanation is advanced for this high rate. In particular, it is suggested that the vortices do not have time to form during the time of flow of the film, which is about 0.2 sec at 1.5°K. "We take the opportunity to thank V. D. Krasnikov for preparing the amplifier and N. N. Mikhaylov for providing the wire of lead brass."

Cord 1/4/



L 17219-63 EWT(1)/EWP(a)/EWT(m)/BDS/EEC(b)-2/ES(s)-2 AFFTC/ASD/ESD-3/  
 ACCESSION NR: AP3005302 IJP(C) Pt-1 GG/ S/0056/63/045/002/0391/0392 77  
 JD/JG/K 76

AUTHORS: Lazarev, B. G.; Semenenko, Ye. Ye.; Sudovtsov, A. I.

TITLE: Critical magnetic fields of superconducting beryllium films 21

SOURCE: Zhur. eksper. i teoret. fiz., v. 45, no. 2, 1963, 391-392 27 18

TOPIC TAGS: superconductivity, beryllium film, critical magnetic field

ABSTRACT: Preliminary results are reported on the destruction of superconductivity in beryllium films obtained by condensation on a substrate cooled with liquid helium. The film plane was parallel to the magnetic field. The measuring current in the film was perpendicular to the field. The destruction fields were found to be very large, with  $dH_c/dT$  close to 33000 Oersted/degree ( $H_c$  -- critical magnetic field, T -- temperature). It is tentatively concluded

Card 1/2

L 17219-63  
ACCESSION NR: AP3005302

that in the beryllium film the metal is in the maximally disordered state, meaning that the smallest parameter, such as the mean free path of the electrons, is smaller than the film thickness. Orig. art. has 1 figure.

ASSOCIATION: Fiziko-tehnicheskii institut Akademii nauk Ukrainiskoy SSR (Physicotechnical Institute, Academy of Sciences, Ukrainian SSR)

SUBMITTED: 17May63

DATE ACQ: 06Sep63

ENCL: 00

SUB CODE: PH

NO REF SOV: 007

OTHER: 002

Card 2/2

ACCESSION NR: AP4009135

S/0056/63/045/006/2068/2069

AUTHOR: Lazarev, B. G.; Khorenko, V. K.; Korniyenko, L. A.; Krivko, A. I.; Matsakova, A. A.; Ovcharenko, O. N.

TITLE: On the layered and filamentlike structure of the superconducting alloys Nb-Zr and Nb-Ti

SOURCE: Zhurnal eksper. i teoret. fiziki, v. 45, no. 6, 1963, 2068-2069

TOPIC TAGS: superconducting alloy, niobium zirconium alloy, niobium titanium alloy, layered structure, filament structure, electron microscopic investigation, plastic deformation, critical magnetic field, solid solution, saturated solid solution, critical current density

ABSTRACT: Data are presented on electron-microscopic observations of thin films and filamentary systems of tracks in alloys of Nb with 25 at. % Zr and of Nb with 66 at. % Ti. Samples of the original alloy were compared with samples reduced in thickness by rolling from 2-5 mm to 0.05-0.5 mm at room temperature. When observed by

Card 1/2

ACCESSION NR: AP4009135

cathode etching, only a few undeformed samples showed a thin filamentlike precipitate structure, but the deformed samples showed the presence of a developed system of layers even at a magnification of 450. Under the electron microscope, sections cut at a very small angle ( $\leq 3^\circ$  for Nb-Zr) showed more and more fine elements with increasing magnification. The alloy contains a whole set of layer thicknesses from several times ten Angstrom up, which are not uniformly distributed but come in packets. The conductivity drops to its initial value after annealing at 100°C. This demonstrates experimentally that the increase in the current density of the superconducting current (from 100-1000 to 20000-40000 A/sq.cm.) in the critical magnetic field is due to the developed system of precipitated layers and filaments.

ASSOCIATION: Fiziko.-tekhnicheskij institut AN UkrSSR (Physicotechnical Institute, AN UkrSSR)

SUBMITTED: 27Aug63

DATE ACQ: 02Feb64

ENCL: 00

SUB CODE: PH, MA

NO REF SOV: 007

OTHER: 003

Card 2/2

L 19581-63 EPR/EPF(c)/EWP(q)/EWT(m)/EWP(B)/BDS AFFTC/ASD Pr-4/  
Ps-4 WW/JD/WH/JG/K/MLK(a)  
ACCESSION NR: AP3007610 S/0286/63/000/010/0072/0072

AUTHOR: Vasyutinskiy, B. M.; Kogan, V. S.; Lazarev, B. G.; 2/63  
Lazareva, L. S.

TITLE: Tinplating of graphite.<sup>15</sup> Class 48, No. 154752<sup>15</sup>

SOURCE: Byul. izobret. i tovarny\*kh znakov, no. 10, 1963, 72

TOPIC TAGS: graphite tinning, graphite tinplating, vacuum tinning,  
vacuum tinplating, carbide forming additives, tin coat

ABSTRACT: A patent has been issued for a method of tinning graph-  
ite parts by immersing them in molten tin. To obtain a high-  
quality tin coat, the tinning process is carried out in vacuum at  
1000C with a maximum of 0.01% tungsten, molybdenum, titanium,  
zirconium, or other carbide-forming metals added to the tin bath.

ASSOCIATION: none

SUBMITTED: 21Jun62

DATE ACQ: 14Oct63

ENCL: 00

SUB CODE: ML

NO REF SOV: 000

OTHER: 000

ACCESSION NR: AP4025913

S/0056/64/046/003/0829/0830

AUTHORS: Lazarev, B. G.; Lazareva, L. S.; Makarov, V. I.; Ignat'yeva, T. A.

TITLE: Effect of impurities on the superconducting transition temperature in thallium

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 46, no. 3, 1964, 829-830

TOPIC TAGS: thallium, superconductivity, superconducting transition, superconducting transition temperature, impurity effect, impurity valence, impurity atomic radius, electron mean free path, thallium superconductivity, thallium superconductivity pressure variation

ABSTRACT: The effect of impurities having various valences and atomic radii on the superconducting transition temperature ( $T_c$ ) of thallium is investigated, in view of the established marked dif-

Card

1/32

ACCESSION NR: AP4025913

ference in pressure variation between thallium and other superconductors such as lead, indium, and aluminum. An impurity with valence lower than thallium (Hg, Cd) lowers  $T_c$ , while one with higher valence (Bi, Sb) raises it. Differences in the atomic radius likewise have a different effect on  $T_c$ . In this respect thallium is no different from other superconductors, and the impurities affect  $T_c$  in accordance with the differences in their electron free paths, valences, and atomic radii. Orig. art. has: 1 figure.

ASSOCIATION: Fiziko-tehnicheskiiy institut AN UkrSSR (Physicotechnical Institute, AN UkrSSR)

SUBMITTED: 27Aug63

DATE ACQ: 16Apr64

ENCL: 01

SUB CODE: PH

NO REF SOV: 001

OTHER: 004

Card

2/72

ACCESSION NR: AP4025914

S/0056/64/046/003/0831/0832

AUTHORS: D'yakov, I. G.; Lazarev, B. G.; Matsakova, A. A.; Ovcharenko, O. N.

TITLE: Critical magnetic fields of superconducting niobium films

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 46, no. 3, 1964, 831-832

TOPIC TAGS: niobium, superconducting niobium, superconductivity, critical magnetic field, field depth of penetration, niobium film, superconducting niobium film, superconducting bulk niobium, critical superconducting temperature

ABSTRACT: Thin (20 and 50 micron) superconducting niobium films were produced by condensation on pyrex glass or on mica with silver contacts prepared beforehand. The results are of interest since they permit an estimate of the depth of penetration of the field in

Card 1/32



ACCESSION NR: AP4025914

niobium ( $\sim 10^{-4}$  cm, about one order of magnitude higher than in "soft" superconductors) and show that the high critical fields in niobium alloys are due to thin superconducting paths in the alloys. The precautions taken to reduce the effect of gas impurities are briefly described. The critical field for the 50 micron film was about 25,000 Oe, about 10 times that for bulk niobium. The field for the 20 micron film is much higher but could not be measured with the available external magnetic field (22,000 Oe). The transition temperatures for the 20 and 50 micron films were 6.5 and 7.5K respectively as against 9.1K for bulk niobium, indicating that the films were still not sufficiently pure. Orig. art. has: 1 figure.

ASSOCIATION: Fiziko-tehnicheskij institut AN UkrSSR (Physico-technical Institute, AN UkrSSR)

SUBMITTED: 27Aug63

DATE ACQ: 16Apr64

ENCL: 01

SUB CODE: PH

NO REF SOV: 004

OTHER: 004

Card 2/2

L 22171-65 ASDA-5/AFWL/SSD

ACCESSION NR: AP5001820

S/0056/64/047/006/2022/2026

AUTHOR: Aliyev, F. Yu.; Lazarev, B. G.; Sudovtsov, A. I.

TITLE: Experimental determination of the electronic component of the coefficient of thermal expansion of iron

SOURCE: Zkurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 6, 1964, 2022-2026

TOPIC TAGS: iron, thermal expansion coefficient, electronic component, low temperature research

ABSTRACT: Results are presented of an investigation of the thermal expansion of iron at liquid-helium temperatures, using an improved version of an earlier technique (A. I. Sudovtsov, dissertation, FTI, Khar'kov, 1954). Until recently experimental data on the thermal expansion at low temperatures were lacking because of the extreme difficulty of measuring small expansions at helium temperatures. The main portion of the apparatus is a coiled bimetallic strip of iron and lead, which is very sensitive to relative changes in the length of the constituent metals. Measurements can be made of the torsion angle of the coil

Card 1/2

L 22171-65

ACCESSION NR: AP5001820

3 -

both for temperature changes at constant pressure (thermal expansion) and for pressure changes at constant temperature (isothermal compressibility). The thermal-expansion sensitivity was  $(1.5 \pm 0.1) \times 10^{-9}$ . The measurements were made in the range 1.5--4.2K, where the lead has very few normal electrons. The value obtained for the electronic component is  $(3.2 \pm 0.3) \times 10^{-9} \text{ deg}^{-1}$ . The Gruneisen constant in this temperature range is found to be close to its high-temperature value, the compressibility of iron is found to be  $5.7 \times 10^{-13} \text{ cm}^2/\text{dyne}$ , and the Fermi surface is shown to be compressed under increasing pressure. It is concluded that the Debye temperature and the electron state density in iron vary in the same way with identical relative changes of volume. "The authors thank M. I. Kaganov and V. G. Bar'yakhtar for discussions of the results." Orig. art. has: 3 figures and 9 formulas.

ASSOCIATION: Fiziko-tehnicheskii institut Akademii nauk UkrSSR (Physicotechnical Institute, Academy of Sciences UkrSSR).

SUBMITTED: 18Feb64

ENCL: 00

SUB CODE: SS, MM

SR REF SOV: 005

OTHER: 008

Cord 2/2

L 35918-66 EWT(1)/EWT(m)/T/EWP(t)/ETI IJP(c) JD/GD

ACC NR: AT6015895

SOURCE CODE: UR/0000/65/000/000/0018/0022

AUTHOR: Lazarev, B. G.; Semenenko, Ye. Ye.; Sudovtsov, A. I.; Kuz'menko, V. H.

ORG: Physicotechnical Institute, AN UkrSSR (Fiziko-tekhnicheskiy institut AN UkrSSR)

TITLE: Effect of the degree of ordering on the superconducting properties of metals

SOURCE: AN UkrSSR. Issledovaniye energeticheskogo spektra elektronov v metallakh (Study of the energy spectrum of electrons in metals). Kiev, Izd-vo Naukova dumka, 1965, 18-22

TOPIC TAGS: thallium, tin, superconductivity, temperature dependence, magnetic field measurement, resistivity

ABSTRACT: The dependence of temperature in critical magnetic fields ( $H_k$ ) and resistivities was studied in 100 Å condensed films of Tl<sup>2</sup> and Sn. Amorphous structures in the condensed films representing extreme departures from crystalline equilibrium were restored by annealing, whereby the effect of lattice order on free electron conductivity was exhibited. As-condensed films had the largest values of  $H_k$  when measured as a function of temperature from 4.2 to 1.5°K. Specimens annealed between 25 and 250°K had decreasing values of  $H_k$ . All curves obeyed the relation

$$H_k = H_{k0} \left[ 1 - \left( \frac{T}{T_c} \right)^2 \right]$$

Card 1/2

Card 2/2

L 38546-66 EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD/JG/GD

ACC NR: AT60L4753

SOURCE CODE: UR/0000/65/000/000/0076/0082

AUTHORS: Kogan, V. S.; Krivko, A. I.; Lazarev, B. G.; Lazareva, L. S.; Matsakova, A. A.; Ovcharenko, O. N.

ORG: none

TITLE: The phase diagram of the niobium-tin system

SOURCE: Soveshchaniye po metallovedeniyu i metallofizike sverkhprovodnikov. Ist, 1964. Metallovedeniye i metallofizika sverkhprovodnikov (Metallography and physics of metals in superconductors); trudy soveshchaniya. Moscow, Izd-vo Nauka, 1965, 76-82

TOPIC TAGS: superconductivity, superconducting alloy, tin base alloy, niobium alloy, x ray analysis, spectrographic analysis, critical magnetic field, intermetallic compound, alloy phase diagram

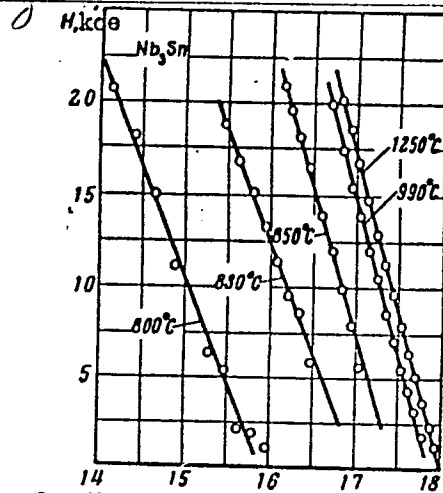
ABSTRACT: This paper is a continuation of an earlier work by V. S. Kogan, A. I. Krivko, B. G. Lazarev, L. S. Lazareva, A. A. Matsakova, and O. N. Ovcharenko (FMM, 1963, 15, 143) in which it was found that specimens produced by holding niobium in molten tin at temperatures above and below 850C differed in their superconducting properties. The superconductivity transition temperature for specimens produced at 990C and 1250C is 18.0K and 18.1K, respectively (see Fig. 1). For diffusion layers formed at below 850C, the superconductivity transition temperature is reduced; the lower  $T_k$ , the lower the temperature of formation of the layer. For specimens

Card 1/3

L 38546-66

ACC NR: AT6014753

Fig. 1. Critical magnetic field  $H_k$  as a function of temperature for diffusion layers of  $Nb_3Sn$  obtained at temperatures of 800--1250C.



obtained at above 850C,  $T_k$  agrees with the known value for  $Nb_3Sn$ . X-ray studies confirmed that only the compound  $Nb_3Sn$  is formed when specimens are prepared at over 850C. For temperatures below 850C, the diffraction pattern shows that  $Nb_2Sn_3$  is formed. It was concluded that in specimens prepared at temperatures below 850C there is present a very thin interlayer beneath the new phase. The formula  $NbSn$  is ascribed to the new compound. The superconductivity transition temperature of the  $NbSn$  was found to be 2.7K. In other papers the new compound has been given the

Card 2/3

L 38546-66

ACC NR: AT6014753

formula  $NbSn_2$  or  $Nb_2Sn_3$ . The authors thank L. N. Mosova for conducting the qualitative spectral analysis. Orig. art. has: 5 graphs, 1 table, and 1 photograph.

SUB CODE: 11, 20/ SUBM DATE: 23Dec65/ ORIG REF: 002/ OTH REF: 018

Card 3/3 *llb*

L 38537-66 EWT(m)/T/EWP(w)/EWP(t)/ETI IJP(c) JG/JD/GD

ACC NR: AT6014756

SOURCE CODE: UR/0000/65/000/000/0089/0090

AUTHORS: Lazarev, B. G.; Lazareva, L. S.; Matsakova, A. A.; Ovcharenko, O. N.

ORG: none

TITLE: The superconductivity of V<sub>3</sub>Ga

SOURCE: Soveshchaniye po metallovedeniyu i metallofizike sverkhprovodnikov. 1st, 1964. Metallovedeniye i metallofizika sverkhprovodnikov (Metallography and physics of metals in superconductors); trudy soveshchaniya. Moscow, Izd-vo Nauka, 1965, 89-90

TOPIC TAGS: superconductivity, critical magnetic field, hydrostatic pressure, gallium compound, vanadium compound, intermetallic compound

ABSTRACT: The superconducting properties of the intermetallic compound V<sub>3</sub>Ga are studied. The compound was prepared by arc smelting in an argon atmosphere. The specimens were in the form of wafers with a thickness of ~ 5 mm. The effect of hydrostatic pressure on the transition temperature was determined. The critical magnetic field as a function of temperature was also studied (see Fig. 1). The specific-heat discontinuity and the discontinuity of the thermal expansion coefficient could not be determined from the data of the work.

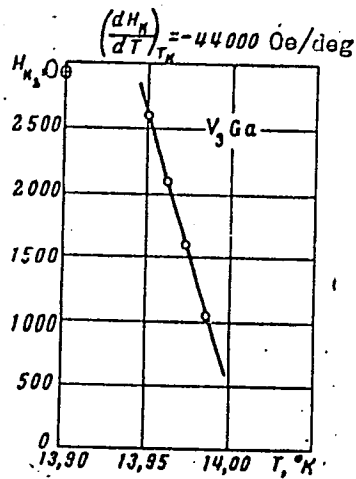
Card 1/2



L 38537-66

ACC NR: AT6014756

Fig. 1. Critical magnetic field  $H_k$  as a function of temperature near  $T_k$  for  $V_3Ga$ .



Orig. art. has: 2 graphs.

SUB CODE: 11,20/ SUBM DATE: 23Dec65/ ORIG REF: 005/ OTH REF: 003

Card 2/2  $\Phi$

L 52959-65 EWT(1)/EWT(m)/EWA(d)/ENP(t)/ENP(z)/ENP(b) IJP(c) JD/GG

ACCESSION NR: AP5010499

UR/0056/65/048/004/1065/1070

AUTHOR: Lazarev, B. G.; Lazareva, L. S.; Makarov, V. I.; Ignat'yeva, T. A.

33  
31  
6

TITLE: Impurity effect in the pressure dependence of the superconducting temperature of thallium. I.

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 4, 1965, 1065-1070

TOPIC TAGS: thallium, superconductivity, pressure dependence, impurity effect, superconducting transition temperature

ABSTRACT: The article deals with the effects of different impurities on the pressure-induced shift of the superconducting transition temperature of thallium. Samples of 99.998% pure thallium mixed with high-purity bismuth, mercury, and antimony were prepared in the form of wires 0.4 mm in diameter and 15--20 mm long. The homogeneity of the impurity distribution was evidenced by the  $(2-3) \times 10^{-3}$  °K width of the superconducting transition. High pressure was produced by the ice-bomb technique and monitored with a superconducting manometer accurate to  $\pm 50$  kg/cm<sup>2</sup>. The pressure effect was measured by a potentiometer method, using two sam-

Card 1/2

L 52959-65

ACCESSION NR: AP5010499

2

ples, inside and outside the pressure vessel respectively. The tests show that even small Bi, Sb, or Hg impurity concentrations can reverse the sign of the pressure effect in thallium, making it negative. The anomalous behavior of thallium is attributed to a complex energy dependence of the electron state density near the Fermi surface, and to a sharp impurity effect in the energy spectrum of the thallium conduction electrons. "The authors thank V. G. Bar'yakhtar for a discussion of the results." Orig. art. has: 8 figures and 1 formula.

ASSOCIATION: Fiziko-tekhnicheskii institut Akademii nauk Ukrainsskoy SSR (Physico-technical Institute, Academy of Sciences UkrSSR)

SUBMITTED: 20Nov64

ENCL: 00

SUB CODE: 68, GP

HR REF SOV: 007

OTHER: 006

*BBB*  
Card 2/2

L 62250-65 EPA(s)-2/EWA(h)/EWP(k)/EWA(c)/EWT(l)/EWT(m)/EWP(b)/EWA(d)/EWP(t) IJP(c)

ACCESSION NR: AP5019219 CG/JD/HW/JG

UR/0056/65/049/001/0085/0089

AUTHOR: Brandt, N. B.; Gluzburg, N. I.; Ignat'yeva, T. A.; Lazarev, B. G.; Lazareva, L. S.; Makarov, V. I.

44  
42  
8

TITLE: Influence of impurities on the pressure effect in thallium 27

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 1, 1965, 85-89

TOPIC TAGS: thallium, mercury, mercury impurity, impurity effect, pressure effect, Fermi surface, high pressure research

ABSTRACT: This is a continuation of an earlier study (ZhETF v. 48, 1065, 1965) of the influence of impurities on the superconducting transition temperature of thallium under pressure. In the present study, to check on some of the hypotheses advanced in the earlier paper, the authors extended the pressure range to 28,000 atm, and measured the pressure effect in both pure and mercury-bearing thallium, using the same thallium-mercury alloys as in the earlier work. Cylindrical samples of 2.5 mm diameter and 3-4 mm length were used, and the superconducting transition was measured with a tin manometer and recorded by an induction method. The apparatus and procedure employed were the same as described in detail elsewhere (PTE no. 2, 151, 1960; PTE v. 3, 3461, 1961), apart from slight modifications. It was

Card 1/2

L 62230-65

ACCESSION NR: AP5019219

2

found that at high pressures (20,000.-28,000 atm) the dependence of the transition temperature ( $T_c$ ) on the pressure (P) was similar for the mercury-bearing and pure thallium, but different at low pressures (up to approximately 7000 atm), with the sign of the effect reversing at a concentration ~ 0.9% Th. It is suggested that this behavior of thallium and its alloys is related to the characteristic features of the pressure dependence of the density of states on the Fermi surface. In particular, the results confirm hypotheses advanced in the earlier paper, that thallium has two components in the pressure dependence of  $T_c$ , linear and nonlinear, and that the impurity content affects mainly the nonlinear component. It is possible that the impurity dependence affects the Fermi-surface topology of thallium. Orig. art. has: 3 figures. [02]

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University);  
Fiziko-tekhnicheskiy institut Akademii nauk UkrSSR (Physicotechnical Institute,  
Academy of Sciences, UkrSSR)

SUBMITTED: 05Feb65

ENCL: 00

SUB CODE: MA,SS

NO REF SOV: 005

OTHER: 002

ATD PRESS: 4075

Card 2/2

L 3893-66 EWT(1)/EWT(m)/EWP(t)/ENP(b) IJP(c) JD/GG

ACCESSION NR: AP5018076

UR/0020/65/163/001/0074/0075

AUTHOR: <sup>44.95</sup> Lazarev, B. G. (Academician AN UkrSSR); <sup>44.55</sup> Lazareva, L. S.; <sup>60</sup> Ignat'yeva, T. <sup>54</sup> A.; <sup>44.55</sup> Makarov, V. I. <sup>8</sup>

TITLE: On the change of the topology of the Fermi surface in thallium under the influence of impurities <sup>27</sup>

SOURCE: AN SSSR. Doklady, v. 163, no. 1, 1965, 74-75

TOPIC TAGS: superconductivity, thallium, impurity effect

ABSTRACT: The authors observed experimentally a singular behavior in the temperature of the superconducting transition ( $T_c$ ) of thallium (change in the number of valleys on the Fermi surface) in investigations of the influence of impurities on the pressure dependence of  $T_c$ . The study was made by investigating the joint influence of impurities of different valences and of the pressure on  $T_c$  of thallium. The results show that the impurities whose valence is larger than that of thallium (Bi) decrease the positive pressure effect with increasing concentration, causing the pressure to become negative starting with a certain value of the concentration (0.2 at.%). In the case of an impurity of lower valence (Hg), the positive pressure effect increases at low concentrations. With further increase of the concentration, the positive effect decreases and becomes negative at ~0.9 at.% Hg. The

Card 1/2

L 3893-66  
ACCESSION NR: AP5018076

6

results are interpreted as an experimental confirmation that one of the valleys of the Fermi surface of thallium vanishes under the influence of an impurity. "The authors thank V. G. Bar'yakhtar for a discussion." Orig. art. has: 2 formulas and 1 figure. <sup>77, 35</sup>

ASSOCIATION: Fiziko-tehnicheskiy institut Akademii nauk UkrSSR (Physicotechnical Institute, AN UkrSSR) <sup>44, 35</sup>

SUMMITTED: 16Feb65

ENCL: 00

SUB CODE: 88

NR REF SOV: 007

OTHER: 005



Card 2/2

L 14074-66 EWT(l)/EWT(m)/EWA(d)/EWP(t)/EWP(z)/EWP(b) IJP(c) JD

ACC NR: AP6003242

SOURCE CODE: UR/0020/65/165/006/1275/1277

AUTHOR: Lazarev, B. G.; Semenenko, Ye. Ye.; Sudovtsov, A. I.; Kuz'menko, V. M. <sup>64</sup>

ORG: Physicotechnical Institute, Academy of Sciences UkrSSR (Fiziko-tekhnicheskii institut Akademii nauk SSSR)

TITLE: <sup>21, 44, 55</sup> Maximum critical magnetic fields in superconducting metals <sub>8</sub>

SOURCE: AN SSSR. Doklady, v. 165, no. 6, 1965, 1275-1277

TOPIC TAGS: critical magnetic field, indium, tin, thallium, superconductivity, crystal lattice distortion

ABSTRACT: Lattice distortions are used as a criterion for measuring the critical magnetic fields and temperatures in indium, tin and thallium specimens produced by condensation on a glass substrate cooled by liquid helium. The critical magnetic field in the longitudinal direction was determined from the normal electrical resistance of the specimens at this field intensity. The highest critical magnetic fields are observed in freshly precipitated specimens, where the lattice is most strongly distorted. The critical magnetic fields in well annealed specimens is close to that

Card 1/2

UDC: 537.312.62



L 14074-66

ACC NR: AP6003242

of a conventional single crystal specimen. It was found that the maximum magnetic fields are independent of the thickness of the specimen. When the resistivity is high, the curves for critical magnetic field strength as a function of resistivity in indium are identical in form, showing saturation at a resistivity of  $(5-6) \cdot 10^{-6} \Omega \cdot \text{cm}$  (which corresponds to the mean free path of electrons, i.e. about 100 interatomic distances). Similar behavior was observed for the maximum critical field in tin. The critical field increases linearly in thallium and shows no tendency to saturation. The data indicate that a metal formed by condensation on an extremely cold substrate displays maximum distortion of the crystal lattice. Therefore the magnetic fields of  $(20-25) \cdot 10^3$  oersteds for indium and  $(40-45) \cdot 10^3$  oersteds for tin are the maximum fields for these metals. Orig. art. has: 4 figures.

SUB CODE: 20/ SUBM DATE: 06Sep65/ ORIG REF: 008/ OTH REF: 007

  
Card 2/2

L 32037-66 EWT(m)/T/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6018939

SOURCE CODE: UR/0126/66/021/006/0828/0832

AUTHOR: Kogan, V. S.; Lazarev, B. G.; Matsakova, A. A.; Ovcharenko, O. N.; Yakimenko, L. F.

45  
B

ORG: Physicotechnical Institute, AN UkrSSR (Fiziko-tehnicheskiiy institut AN UkrSSR)

21 21

TITLE: The width of the homogeneity region of intermetallic phases in the Nb-Sn and V-Ga systems

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 6, 1966, 828-832

TOPIC TAGS: superconducting compound, niobium alloy, binary alloy, tin containing alloy, vanadium alloy, gallium containing alloy, intermetallic compound, compound homogeneity region

ABSTRACT: Experiments have been made to determine the width of the homogeneity region of intermetallic phases formed in the Nb-Sn and V-Ga systems, i.e., systems whose components have widely different melting temperatures. Nb<sub>3</sub>Sn and V<sub>3</sub>Ga intermetallic compounds were obtained by diffusion of Nb<sub>3</sub>Sn by holding an Nb specimen for several hours in molten tin at 1000C, and V<sub>3</sub>Ga by holding a vanadium specimen wetted with gallium in a vacuum at about 1200C. X-ray diffraction patterns of the diffusion layer on vanadium showed that the surface layer contacting gallium and the inner layer adjacent to vanadium had equal lattice parameters, 4.819 ± 0.002 Å. The temperature of transition to the superconductivity state of V<sub>3</sub>Ga was found to be

Card 1/2

UDC: 548.53

L 32037-66

ACC NR: AP6018939

14.44K with a transition zone width of 0.2K. These data confirmed that the diffusion zone consisted only of  $V_3Ga$  compound of stoichiometric composition. Similar results were obtained for  $Nb_3Sn$  compound. The layers adjacent to Sn and Nb had the same lattice parameters, equal to  $5.288 \pm 0.001$  A, which showed that the homogeneity region of  $Nb_3Sn$  compound is also very narrow. A wide homogeneity region reported in some earlier works for the refractory metal-rich phases in alloys whose components have widely different melting temperatures is presumably a result of tested alloys being in nonequilibrium state owing to a low diffusion rate of these phases. Orig. art. has: 3 figures. [MS]

SUB CODE: 11/ SUBM DATE: 26Jul65/ ORIG REF: 004/ OTH REF: 005/ ATD PRESS 5019

Card 2/2 *sp*

L 22254-66 EWT(1)/EWT(m)/EWP(t) IJP(c) GG/JD

ACC NR: AP6010974

SOURCE CODE: UR/0056/66/050/003/0546/0550

AUTHOR: Lazarev, B. G.; Lazareva, L. S.; Makarov, V. M.; Tereshina, N. S. 59  
8

ORG: Physicotechnical Institute, Academy of Sciences, Ukrainian SSR (Fiziko-tekhniche-skiy institut Akademii nauk Ukrainskoy SSR)

TITLE: Effect of impurities on the variation of the superconducting transition temperature of thallium with pressure 21

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 50, no. 3, 1966, 546-550 21

TOPIC TAGS: superconductivity, superconductor, critical temperature, transition temperature, thallium, indium, *temperature dependence*

ABSTRACT: The effect of indium impurities on the dependence of the superconducting transition temperature ( $T_k(p)$ ) of thallium on pressure was investigated. It was found that the effect of indium (which has the same valency as thallium) on the  $T_k(p)$  dependence of thallium is similar to that of antimony and bismuth (the valence of which is greater than that of thallium). For thallium alloys containing 3.57 and 7.15 at.% of indium, the dependence  $T_k(p)$  is linear, the values of  $dT_k/dp$  being  $1.2 \cdot 10^{-5}$  and  $1.6 \cdot 10^{-5}$  deg/atm, respectively. These values are close to that for pure thallium ( $dT_k/dp = 1.4 \cdot 10^{-5}$ ) at pressures from 20,000 to 28,000 atm. The

Card 1/2 2

L 22254-66

ACC NR: AP6010974

experimental data obtained confirm earlier predictions on the sensitivity of the electron spectrum of thallium to impurities and pressure.

[CS]

SUB CODE: 20// SUBM DATE: 04Oct65/ ORIG REF: 003/ OTH REF: 002

Card 2/2 nst

ACC NR: AP6037060

(N)

SOURCE CODE: UR/0056/66/051/005/1328/1331

AUTHOR: Kogan, V. S.; Lazarev, B. G.; Yakimenko, L. F.

ORG: Physicotechnical Institute, Academy of Sciences UkrSSR (Fiziko-tekhnicheskiy institut Akademii nauk UkrSSR)

TITLE: X-ray diffraction analysis of the structure of niobium-base superconducting alloys

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 5, 1966, 1328-1331

TOPIC TAGS: niobium base alloy, zirconium containing alloy, titanium containing alloy, superconducting alloy, alloy structure

ABSTRACT: A series of niobium-zirconium-titanium alloys containing 5—50% zirconium and 10—20% titanium has been investigated. It was found that all the as-cast specimens had the structure of a high-temperature cubic  $\beta$ -phase. Annealing of specimens containing up to 10% zirconium at temperatures up to 600C did not cause structural changes, which indicated that the  $\beta$ -phase was in equilibrium. Annealing of the alloys containing 20% zirconium at 550—600C caused a decomposition of the  $\beta$ -phase. In alloys containing 30% zirconium, the decomposition began at 450C, and annealing at 560C produced an equilibrium structure consisting of  $\beta$ - and  $\alpha$ -phases. Orig. art. has: 4 figures and 1 table. [TD]

SUB CODE: 11/ SUBM DATE: 08Jan66/ ORIG REF: 001/ OTH REF: 003/ ATD PRESS: 5109

Card 1/1

ACC NR: AP7001543

SOURCE CODE: UR/0020/66/171/003/0552/0554

AUTHOR: Gindin, I. A.; Starodubov, Ya. D.; Lazareva, M. B.; Lazarev, B. G.  
(Academician AN UkrSSR)

ORG: Physicotechnical Institute Academy of Sciences UkrSSR (Fiziko-tekhnicheskiy  
institut Akademii Nauk UkrSSR)

TITLE: Low-temperature recrystallization of copper rolled at 77 and 20K

SOURCE: AN SSSR. Doklady, v. 171, no. 3, 1966, 552-554

TOPIC TAGS: copper, low temperature deformation, ~~copper~~<sup>metal</sup> deformation, ~~copper~~ metal  
recrystallization, recrystallization temperature, recrystallization activation energy,  
*metal rolling, grain size, metal physical property*

ABSTRACT: Specimens of 99.98%-pure copper with an initial grain size of 100  $\mu$  were  
rolled at 293, 77, and 20K with a 10% reduction per pass and a total reduction  
of 90%. The specimens were rolled at a speed of 10 mm/min and immediately annealed  
at 293-468K. X-ray diffraction pattern examination showed that low-temperature  
deformation decreased the grain size, produced noticeable microdistortion in the  
lattice, and significantly reduced the temperature of the beginning of recrystalliza-  
tion. Copper deformed with a 90% reduction recrystallized even at room temperature.  
The lower the deformation temperature, the sooner the recrystallization begins.  
For instance, in copper rolled at 20K the recrystallization begins after 19 hr,  
while in copper rolled at 77K-after 2.5 month. With decreasing deformation tempera-

Card 1/2

UDC: 539.2

ACC NR: AP7001543

ture from 293 to 20K, the activation energy was found to decrease from 33 to 18 kcal/g-atom. This fact, and also the lowering of the recrystallization temperature, is caused by an increase in the latent deformation energy and by a higher metastability of the crystalline body. The low-temperature recrystallization makes it possible to investigate the metal recrystallization, taking into account the temperature conditions of the activation work straining, and to develop metal structures with special physical properties. V. V. Kozinets and M. P. Starolat are thanked for their assistance in the experiments. Orig. art. has: 2 figures.

SUB CODE:11,2013/SUBM DATE: 15Jul66/ ORIG REF: 008

Card 2/2



ACC NR: AT7004209

SOURCE CODE: UR/0000/66/000/000/0121/0127

AUTHORS: Kogan, V. S.; Vasyutinskiy, B. M.; Lazarev, B. G.

ORG: none

TITLE: Studying phase diagrams with the use of diffusion layers,

SOURCE: AN SSSR. Institut metallurgii. Eksperimental'naya tekhnika i metody vysokotemperaturnykh izmereniy (Experimental techniques and methods of high temperature measurement). Moscow, Izd-vo Nauka, 1966, 121-127

TOPIC TAGS: metal phase system, metal vapor deposition, metallographic examination, nickel, chromium, molybdenum, niobium, tin, iron, tantalum

ABSTRACT: The obtaining of metal phase diagrams by a multilayer technique is described. The technique, an extension of the work of L. S. Palatnik, V. M. Kosevich, and L. V. Tyrina (FMM, 1961, 11, 229), consists of condensing an appropriate metallic vapor mixture and of subsequently preparing a thin polished section from the condensate. This technique was applied to the study of the phase diagrams of the following systems: Cr-Ni, Nb-Sn, Fe-Ta, and Mo-Cr-Ni. The experimental results, shown graphically (see Fig. 1), were published earlier in three communications by B. M. Vasyutinskiy and V. S. Kogan (FMM, 1960, 9, 564). In addition, x-ray powder pictures were taken and the microhardness of the specimens was determined. The results are shown graphically. It is concluded that the condensation-diffusion layer

Card 1/2

AGC NR: AT7004209

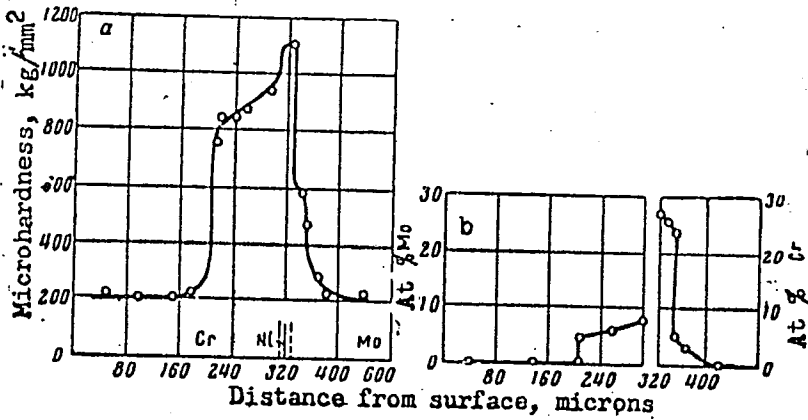


Fig. 1. Microhardness curves (a) and composition of the  $\alpha$ -solid function (b) of the system Mo-Cr-Ni, as a function of the distance from the surface layer of a specimen

technique is not capable of yielding the complete phase diagram for the system and that it requires, for successful application, some preliminary knowledge about the system. The Nb-Sn system was studied by V. S. Kogan, B. G. Lazarev, L. S. Lazareva, A. I. Krivko, and A. A. Matsakova.. Orig. art. has: 5 graphs.

SUB CODE: 11/

SUBM DATE: none/

ORIG REF: 012/

OTH REF: 006

Card 2/2

PROCESSES AND PROPERTIES INDEX

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

M

F

4202. MULTIPLE-PASS AUTOMATIC WELDING OF THICK BOILER STEELS. Lyubavskii, K.V. and Lasarev, B.I. (Avtogonnoe Delo (Welding), Feb. 1949, 1-7). The above was investigated for three different low-alloy steels (max. 0.15% C, 0.76% Si, 0.40% Mn, 0.029% S, 0.021% P, 0.50% Mo) using three different types of coated electrodes. Optimum conditions of operation and influence of individual factors, such as the form of the seam, compositions of electrode cores and coatings, etc, are indicated.

METALLURGICAL LITERATURE CLASSIFICATION

COMMON ELEMENTS

COMMON VARIABLES INDEX

MATERIALS INDEX

EXPERIMENTAL DATA

RESEARCH INDEX

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

14

S

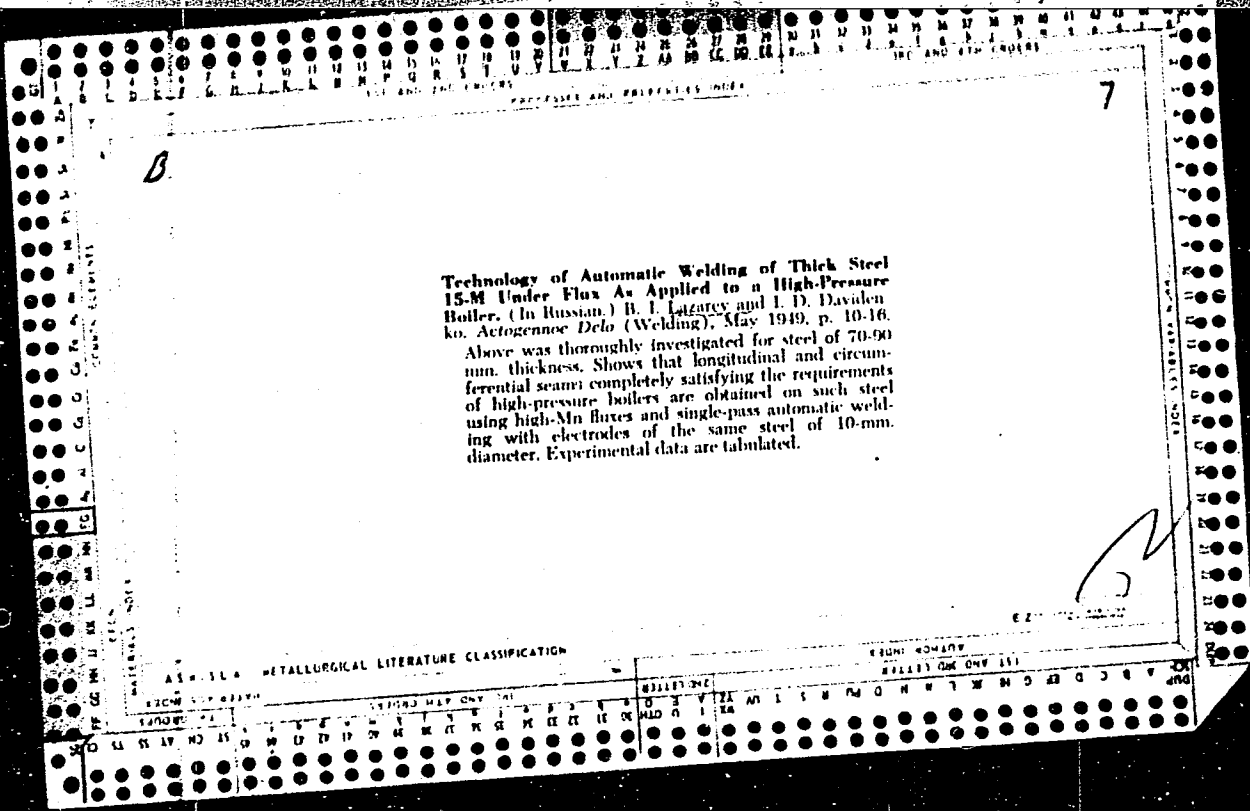
**The Automatic Welding of Very Thick Boiler Steels with Heavy Arcs.** K. V. Gubavskii and B. I. Lazarys. (Avto-Gennoe Delo, 1949, No. 1, pp. 7-15). (In Russian). An account is given of an investigation of the submerged-arc welding with heavy arcs of 80-100-mm. boiler steel plates, including some containing 0.4-0.5% of molybdenum. Special attention was paid to the influence of the flux as this affects the maximum length of arc; this length is increased by easily ionized components in the flux. Oscillographs are reproduced to show the enhanced stability of arc voltage and amperage obtained by correct choice of flux. The heat effects on the surface of the seam were produced by fluxes giving melts of high viscosity and solidification temperatures. The most satisfactory welds were obtained with either of two fluxes having the following respective compositions:  $\text{SiO}_2$  46.5, 44.0%;  $\text{MnO}$  33.0, 43.0%;  $\text{Ca}$  (total) 5.33, 4.04%;  $\text{Al}_2\text{O}_3$  2.86, 5.00%;  $\text{FeO}$  1.3, 1.2%; titanium trioxide 5.07, 0%; oxides of sodium and potassium 1.18, 1.18%;  $\text{MgO}$  2.5, 0.78%. Plates 60, 70, and 80 mm. thick were used in the tests. Test pieces were cut from various positions in the welded seam for analysis, visual examination, and tensile, bend, and impact tests. For the carbon steels the tests were carried out at room temperature, but for the molybdenum steel there were additional tests at 350 and 510° C. With the comparatively small plates used (200 x 300 or x 700 mm.), no preheating was necessary to avoid cracking, but it is considered that large parts should be heated to about 200-250° C. before welding. - S. K.

L -

L -

*[Handwritten signature]*

ASB-55A METALLURGICAL LITERATURE CLASSIFICATION



7

B

**Automatic Welding of Two-Ply Sheets Clad With "08Kh12" Steel.** (In Russian.) K. V. Lyubavskii and B. I. Lazarev. *Atogennoe Delo* (Welding), Jan. 1950, p. 1-10.

Presents results of the above for low-carbon steel sheet with stainless-steel cladding. Characteristics of welds obtained by use of three types of electrodes are tabulated. Special features of the apparatus are described and illustrated. Optimum welding conditions are tabulated.

C

ASME, S.A. METALLURGICAL LITERATURE CLASSIFICATION

LAZAREV, B. I.

USSR/Engineering - Steel, Clad Welding, Steel

Jan 50

"Automatic Welding of Stainless Clad Steel," Prof K. V. Lyubavskiy, B. I. Lazarev, Engr, Gen Sci Res Inst of Heavy Mach Bldg, 10 pp

"Avtogen Delo" No 1

Conducted experiments to develop welding procedure for clad sheets with face layer of chromium steel. Gives data on chemical composition and mechanical properties of welded joints executed with preliminary welding of face layer using electrodes which insure obtaining austenitic structure. Results permitted introduction of automatic welding method at Mach-Bldg Plant imeni Ordzhonikidze.

PA 160T15

BAR

6997\* Automatic Three-Phase Arc Welding of Thick  
"15M" Steel. (In Russian.) K. V. Laubovskii, B. I. Lazarev,  
and M. M. Timofeyev. *Arzheniye Delo*, v. 22, Nov. 1951, p.  
7-10.

Experiments on 3-phase arc welding and on development of  
special fluxes are claimed to be the basis for wide introduction  
of this method into industry, especially for the production of  
thick-walled vessels and similar construction. Macrographs,  
tables, and diagrams.

Лаубовский К. В. Доктор технических наук, профессор; ЛАЗАРЕВ, Б. И., кандидат



TS227.L66

TREASURE ISLAND BOOK REVIEW

AID 731 - s

LAZAREV, B. I., Kand. of Tech. sci., TOROPOV, VA., Cand. of Tech. Sci., LYUBAVSKIY, K. V., Dr. of Tech. Sci., and PASHURANIS, F. I., Eng.  
SVARKA AUSTENITNYKH STAL'Y, PREDRAZNACHENNYKH DLYA RABOTY PRI POVYSHENNYKH TEMPERATURAKH (Welding of Austenitic Steels Designed to Withstand High Temperatures). In K. V. Lyubavskiy, ed. Novoye v tekhnologii svarki (Innovations in the Welding Technique). MASHGIZ, 1955. p. 3-29.

The authors present an interpretation of the data obtained in research conducted by the Central Scientific Research Institute of Machine-Building Technology (TsNIITMASH) on arc welding of austenitic steel used in forging, casting and tubing. The temperatures in various places in the welded parts are observed. The crystallization which occurs in welded metals, the mechanical properties of welded sections, and the structure of the metal in the seam after welding are discussed. The use of electrodes and their effects on various austenitic steels under different conditions in welding and on welding parts are described. The authors recommend certain electrodes for welding austenitic steels used in tubing, forging and casting. Twenty seven pictures and graphs, 9 tables. 3 Russian references (1936-1951).

1/1

TS227.L66

TREASURE ISLAND BOOK REVIEW

AID 783 - 8

LAZAREV, B. I., Kand of Tech. Sci., and LYUBAVSKIY, K. V., Dr. of Tech. Sci.  
SVARKA VYSOKOPROCHNOY STALI DLYA TOLSTOSTENNYKH SOSUODOV VYSOKOGO DAVLENIYA  
(Welding of High-Strength Steel for Thick-walled Vessels under High Pressures).  
In K. V. Lyubavskiy, ed. Novoye v tekhnologii svarki (Innovations in the welding  
Technique). MASHIZ, 1955. p. 56-81.

The authors present the exhausting material on research carried out by them  
(and other scientists) on low-alloyed steels to be used in the construction of  
thick walled vessels under high pressures. The 16GNi-type steel is the main  
subject of this report. Its experimental weldings with the Fts-6 and Fts-7  
fusing agents and by the TsL-21 electrodes are described. Mechanical properties  
of the 16GNi-type steel and the chemical composition of the EI569 wire used  
as electrode are shown. Twenty seven pictures (including a general view of a  
high cylindrical vessel designed to withstand high pressures, p. 80,) and  
graphs, 11 tables. 4 Russian references, 1948-1953.

1/1

AID P - 5202

Subject : USSR/Engineering

Card 1/2 Pub. 107-a - 1/13

Authors : Lyubavskiy, K. V., Dr. of Tech. Sci., Prof. and B. I. Lazarev, Kand. of Tech. Sci.

Title : Electrodes for welding EI-257 steel

Periodical : Svar. proizvod., 7, 1-6, J1 1956

Abstract : The authors describe the development of electrodes for welding connections of special pipes made of the EI 257 tubing steel up to 30 mm thick, chiefly used at large power plants. The TsT-7 type electrode was found the most satisfactory for the purpose. Six tables, 11 graphs, 2 photos of the micro- and macro-structure of the welded seams; 5 Russian references (1955) and 2 American references (1955).

AID P - 5202

Svar. proizv., 7, 1-6, J1 1956

Card 2/2 Pub. 107-a - 1/13

Institution : Central Scientific Research Institute of Machine-Building  
Technology (TsNIITMASH), with which both authors are  
affiliated.

Submitted : No date

LAZAREV, B. F.

18

4  
452c

Steel alloy for boiler drums and other large dimensional  
containers. R. I. Inter. K. Y. ...  
U.S. Pat. 1,574,411 Aug. 26, 1925  
...  
... of an alloy contg. C. 0.12-0.15, Mn 0.3-0.5, S 0.01-0.02,  
0.07 Ni 1.0-1.5, and Mo 0.10-0.20

12

KHIL'KEVICH, F.A.; LAZAREV, B.L.; BAZILEVICH, S.V.

Operating blast furnaces with oxygen enriched blast. Metallurg 2 no.6:  
3-7 Je '57. (MIRA 10:6)

1. Nizhne-Tagil'skiy metallurgicheskiy kombinat.  
(Blast furnaces) (Oxygen--Industrial applications)

LAZAREV, B. I.

135-4-2/15

SUBJECT: USSR/Welding

AUTHORS: Lazarev B.I., Candidate of Technical Sciences, and Entin, S.D.,  
Candidate of Technical Sciences.

TITLE: Magnetic Method for Determining the Ferrite Phase in Weld  
Metal. (Opredeleniye ferritnoy phazy v metallu shva magnitnym  
metodom).

PERIODICAL: "Svarochnoye Proizvodstvo", 1957, # 4, pp 5-8 (USSR)

ABSTRACT: Subject laboratory investigation had the purpose of finding  
an effective method and designing an apparatus for control and  
quick determination of the quantity of the ferrite phase of  
welds in austenitic steel. The electrodes "UT-7" (used for auste-  
nitic steel "Ж405" and "Ж257") and "UT-15" (used for steel  
"1X18H12T" and "1X18H9T") were investigated. Their chemical  
composition is listed in the article.

The proposed method of determining the quantity of the ferrite  
phase contained in heterogeneous alloys is based on the known  
fact that the ferrite phase is ferromagnetic, whereas austenite  
and the majority of the composite carbides are paramagnetic.

Card 1/2

TITLE:

Magnetic Method for Determining the Ferrite Phase in Weld Metal. (Opredeleniye ferritnoy phazy v metalle shva magnitnym metodom). 135-4-2/15

The method requires the use of very strong electric magnets. When used in combination with a ballistic device, the determination is only possible in a research laboratory or in an industrial plant laboratory.

For quick testing under conditions of the industrial production, an electromagnetic device has been developed (by TsNIITMASH). (Its circuit diagram is shown in the article).

The article contains 3 tables, 4 diagrams, 1 electrical scheme, 1 sketch, and 2 micro-photographs.

ASSOCIATION: TsNIITMASH

PRESENTED BY:

SUBMITTED:

AVAILABLE: At the Library of Congress  
Card 2/2



LAZAREV, B. I.

AUTHORS: Gel'man, A.S., Griboyedova, T.S., Ye.A. Davidovskaya, 129-3-4/14  
Lazarev, B.I., Lyubavskiy, K.V., Slepak, E.S., Trunin,  
I.I. and Fedortsov-Lutikov, G.P.

TITLE: Investigation of the Steel 1X18H12T as Tube Material for  
Power-generation Equipment (Issledovaniye stali 1Kh18N12T  
v kachestve trubnogo materiala dlya energoustanovok)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, No.3,  
pp. 16 - 24 (USSR).

ABSTRACT: For producing tubes operating at super-critical steam parameters, it is necessary to have available a cheap, strong and ductile material which has a stable structure and stable properties at 550 to 650 °C, is not inclined to develop inter-crystallite corrosion and possesses good technological properties. The work carried out in 1952 and 1953 by TsNIITMASH jointly with the imeni Ordzhonikidze Works (Ref.1) proved that it was possible to utilise cheap steel of the type 1X18H9T for operation at high temperatures. Later, complex investigations were carried out with this steel as a material for tubes of super-critical parameter power-generation equipment. The steel 1X18H9T may contain large quantities of ferite and, after long-duration annealing at 600 to 700 °C, it embrittles due to the formation of a  $\sigma$ -phase. Increase in the nickel content

Card1/4

Investigation of the Steel 1X18H12T as Tube Material for Power-  
generation Equipment

129-3-4/14

to 11-13% brought about an appreciable increase in the stability of the austenite without affecting the high strength. This steel, designated as 1X18H12T steel, does not show any  $\alpha$ - or  $\beta$ -phase separation during ageing at 700 °C for 10 000 hours and at 750 °C for 3 000 hours; only slight quantities of carbides were found to separate out. Thereby, the impact strength is maintained at 22-24 kg/cm<sup>2</sup> for this steel, whilst in the case of the steel 1X18H9T, it drops to 9-18 kg/cm<sup>2</sup>. The investigations described in this paper were carried out on commercial tubes, rods and also on laboratory produced steels with compositions as given in Table 1, p.16. The results are entered in tables and plotted in graphs. It is concluded that the steel 1X18H12T, containing 0.08-0.12% C, max. 75% Si, 1-2% Mn, 17-18.5% Cr, 11-13% Ni, max. 0.20% S and max. 0.035% P, is suitable for operation at high temperatures; the Ti content of the steel is thereby determined by means of the formula  $5(C-0.02)$ . The best combination of mechanical properties was obtained after annealing at 1 050 to 1 100 °C for 30 min. and cooling in air, and this regime is recommended for tubes as well as for bends. Weld joints should be annealed at 1 000 to 1 050 °C for 1 hour and then cooled in air. The mechanical properties of steels

Card2/4

129-3-4/14

Investigation of the Steel 1X18H12T as Tube Material for Power-generation Equipment

heat-treated in accordance with these recommendations are entered in Table 6, p.24, for test temperatures of 20, 600, 650 and 700 °C. Practically no embrittlement takes place for this steel after ageing at 600 and 750 °C for durations of 3 000 to 10 000 hours; no  $\sigma$ -phase formation could be detected after such ageing for steel containing 12% Ni, whilst under similar conditions,  $\sigma$ -phase formation can occur in steel containing 10 % Ni. Preliminary, non-uniform work-hardening influences the ultimate strength of the steel, but does not influence appreciably the ductility in the case of long-duration loading. In the case of contact-welding of tubes of superheaters, the strength of non-heat-treated weld joints is not lower than that of the base metal. Steam at 600 °C and long-duration tests for up to 3 000 hours do not affect appreciably the long-duration strength of the steel and of welded joints. The steels 1X18H12T and 1X18H9T are less inclined to develop thermal fatigue than the steel 1X14H14B2M, and the authors recommend using the steel 1X18H12T for tubes of power-generating equipment, operating with steam of super-critical parameters. There are 5 figures, 6 tables and 8 references, 5 of which are Russian, and 3 English.

Card3/4

Investigation of the Steel 1X18H12T as Tube Material for Power-  
generation Equipment 129-3-4/14

ASSOCIATION: TsNIITMASH

AVAILABLE: Library of Congress  
Card 4/4