Finkel', M. Ya.

68-10-22/22

AUTHOR: Finkel', M.Ya.

TITLE: On the Paper by I.G.Antypko and G.P.Zhbannikova, "On the Temperature of Gas After Primary Coolers" (K stat'ye I.G. Antypko i G.P.Zhbannikovoy "O temperature gaza posle pervichnykh kholodil'nikov")

PERIODICAL: Koks i Khimiya, 1957, Nr 10, pp.63-64 (USSR)

ABSTRACT: In the original paper, published in Koks i Khimiya, 1957, Nr 2, an increase of the temperature of gas leaving primary coolers was proposed. The author points out that such a measure, which gives only insignificant advantages, is detrimental to the operating condition of the whole by-product plant and therefore cannot be recommended.

ASSOCIATION: UKhIN. Ukr. zaochnyy khimicheskiy Inst. (Khar'kov)

AVAILABLE: Library of Congress.

Card 1/1

FINKEL', M.Ya.; prinimali uchastiye: SHEVCHENKO, A.I.; KAUFMAN, A.S., [deceased]; STEPANENKO, V.S.; FEDOROV, N.I.; PAVLOVA, N.F.; AYZENBERG, L.G.; FAYNGOL'D, S.G.; LITVINOVA, K.I.; VASLYAYEV, G.P.; STETSENKO, Ye.Ya.; LITVINOVA, O.Yu.; USTINOVA, A.G.

Improvement of the saturation process in the production of ammonium sulfate. Koks i khim. no.7:43-46 '60. (MIRA 13:7)

1. Ukrainskiy uglekhimicheskiy institut (for Finkel').
2. Yasinovskiy koksokhimicheskiy zavod (for Vaslyayev).
3. Giprokoks (for Ustinova).
(Ammonium sulfate)

FINKEL', M.Ya.; TOLOCHKO, A.I.; MELAMED, R.I.

Improve the quality of ammonium sulfate. Standartizatsiia 25 no.11:38 N '61. (MIRA 14:11)

(Ammonium sulfate)

FINKEL', M.Ya.

Problem of the purification of coke gas with electric filters.
Koks i khim. no.2:33-34 '62. (MIRA 15:3)

1. Ukrainskiy uglekhimicheskiy institut.
(Coke-oven gas) (Electric filters)

FINKEL', M.Ya.

Modernization of the technological procedures in ammonium sulfate producing sections. Koks i khim. no.12:33-36 '62. (MIRA 16:1)

1. Ukrainskiy uglekhimicheskiy institut.
(Coke industry--By-products) (Ammonium sulfate)

CHERNYSHEVA, K.N., FINKEL', R.M.

Affections of the nervous system in A_2 influenza. Vrach.delo no.5:457-459 My '58 (MIRA 11:7)

1. Kafedra nervnykh bolezney (zav. - prof. A.S. Pentsik) Rizhskogo meditsinskogo instituta i pervaya Rizhskaya klinicheskaya bol'nitsa.
(NERVOUS SYSTEM--DISEASES)
(INFLUENZA)

ZHUKOVA, M.P., kand.med.nauk; FINKEL', R.N.; SHKLOVSKAYA, I.G.; ASEYEVA, N.P.; SEREZHNIKOVA, S.F.

Errors in the determination of the activity of minor forms of pulmonary tuberculosis. Probl. tub. 42 no.12:33-36 '64.
(MIRA 18:8)

1. Moskovskiy nauchno-issledovatel'skiy institut tuberkuleza (direktor - kand.med.nauk T.P.Mochalova; zamestitel' direktora po nauchnoy chasti - prof. D.D.Aseyev) Ministerstva zdravookhraneniya RSFSR i protivotuberkuleznyy dispanser Nr. 16 (glavnyy vrach P.A. Zal'munin), Moskva.

L 7037-65 EWT(m)/EWP(k)/EWP(q)/EWP(b) Pf-4 AFWL/ASD(f)/RAEM(t) JD/HW/JG

ACCESSION NR: AP4036527 S/0089/64/016/005/0426/0432

AUTHOR: Amonenko, V. M.; Azhazha, V. M.; Ivanov, V. Ye.; Tikhinskiy, G. F.; Finkel', V. A. B

TITLE: Deformation and failure of rolled beryllium of different purity 17

SOURCE: Atomnaya energiya, v. 16, no. 5, 1964, 426-432

TOPIC TAGS: beryllium, beryllium deformation, beryllium failure, beryllium strength, commercial beryllium, high purity beryllium, precipitation hardening 18 18

ABSTRACT: The authors investigated the plastic deformation and the type of failure in 99.0 and 99.8% pure beryllium strip at temperatures varying from 20 to 800 C. The specimens were prepared by vacuum distillation and magnesium reduction followed by rolling in a vacuum mill at a residual pressure of 10^{-5} Hg and approximately 750 C. Total reduction of the specimens was 85 to 90%. Purity control was carried out by residual resistivity measurements. The authors found that the basic mechanism of plastic deformation was a slip in the $(10\bar{1}0)$ $11\bar{2}0$ system. Failure occurred either along cleavage planes at low temperatures or along grain boundaries at elevated temperatures. Impurities considerably af-

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L 7037-65

ACCESSION NR: AP4036527

fected the magnitude of plastic deformation as well as the character of failure. The yield point of the high purity specimens was much lower within the investigated temperature range than that of 99.0% pure metal. Commercially pure metal was actually found to be a precipitation-hardened alloy. The tendency towards lower plasticity in polycrystalline beryllium was also established by other investigators as the amount of impurities was increased. The authors emphasize that they have not experimented with maximum-purity specimens and that it was possible to produce 99.9% pure beryllium having an electric resistivity of [illegible]. However, the properties of this highly pure beryllium remain to be studied. Orig. art. has: 5 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 29Dec63 ENCL: 00 SUB CODE: MM

NO REF SOV: 009 OTHER: 008

Card 2/2

PAPIROV, I.I.; TIKHINSKIY, G.F.; FINKEL', V.A.

Hardening of Be-Ni alloys. Fiz. met. i metalloved. 17 no.4: 613-614 Ap '64. (MIRA 17:8)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.

AUTHORS: Palatnik, L.S. and Finkel', V.A. SOV/70-3-4-10/26

TITLE: On Certain Regularities in the Structures of Triple Metallic Compounds (O nekotorykh zakonomernostyakh v strukturakh troynykh metallicheskikh soyedineniy)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 4, pp 467-472 (USSR)

ABSTRACT: Analysis of the data published on triple intermetallic compounds shows that the basic regularities established for two-component phases continue to apply to three-component phases. As a rule, two metals have similar values of atomic radii in a three-component system (Cu and Au or Fe and Ni, etc.). For interstitial phases this need not be so and a third metal can be interstitial in an alloy of two others. Numerous regularities (standard types of structures) are observed but there are some alloys which cannot be fitted in. These are characterised by a high Al content and extremely various structure. They are, for example, $Mg_3Cr_2Al_{18}$, $Cr_4Si_4Al_{13}$, β-Cu_2FeAl_7, $Ni_4Mn_{11}Al_{60}$. The main regular classes are:

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SOV/70-3-4-10/26

On Certain Regularities in the Structures of Triple Metallic Compounds

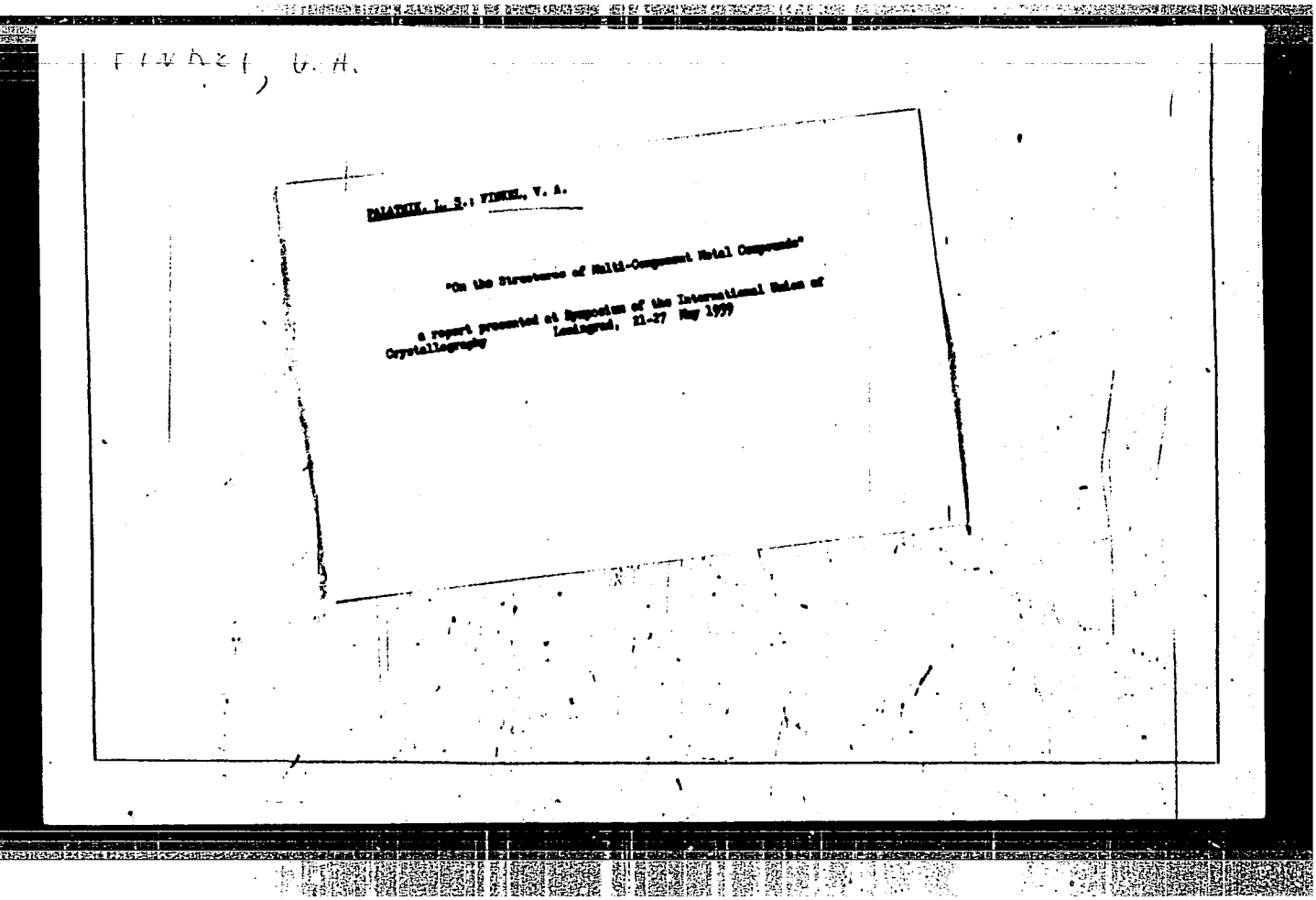
1) Triple electron compounds with electron concentrations of 3/2.
2) Triple interstitial phases. (23 examples quoted).
3) Laves phases, NiAs structures and Sigma phases.

There are 4 tables and 50 references, 17 of which are Soviet, 15 English, 6 German and 12 Scandinavian.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet im. A.M. Gor'kogo (Khar'kov State University imeni A.M. Gor'kiy)

SUBMITTED: January 22, 1958

Card 2/2



PALATNIK, L. S.; FINKEL, V. A.

"On the Structures of Multi-Component Metal Compounds"

a report presented at Symposium of the International Union of Crystallography Leningrad, 21-27 May 1959

S/126/60/010/005/023/030
E111/E452

AUTHORS: Ivantsov, I.G., Finkel', V.A. and Amonenko, V.M.

TITLE: Influence of Carbon on the Phase Composition of an Austenitic Fe-Cr-Ni Base Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.5, pp.780-782

TEXT: The object of the present work was to elucidate the influence of carbon on the phase composition of austenitic steels as exemplified by high-vacuum melted alloys after different heat treatments in air. The range of composition covered (%) was: 0.02 to 0.2 C, 22.0 Cr, 25.0 Ni, 7.0 W, 2.0 Mo, 2.0 Co, 2.6 Ti, 0.05 B, 0.15 Al, remainder Fe. The phase composition of electrolytically obtained residues was determined by the X-ray method (Ref.5 to 9), solution being effected over several hours at 0.05 to 0.06 A/cm^2 and 12 to 15 V in a solution of 10 g each of ammonium sulphate and citric acid in 1200 ml water. The results (Tables 1 and 2) for alloys hardened from 1200 with and without subsequent ageing at 800°C show a substantial effect of carbon on phase transformations. During ageing, the chromium carbide found after hardening changes into a form which is more stable at heat-

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S/126/60/010/005/023/030
E111/E452

Influence of Carbon on the Phase Composition of an Austenitic Fe-Cr-Ni Base Alloy

treatment temperatures. There were no TiC lines in X-ray diffraction patterns from aged specimens, probably because of excess of other secondary phases in the residue. The temperature threshold for the sigma-phase is below 950°C and the concentration "Threshold" is about 0.035%. If alloying elements enter appreciably into the intermetallic compounds, they leave the solid solution and the solubility of carbon rises. The mechanism of sigma-phase formation during ageing at 800°C is more likely to be directly from austenite and not in association with chromium-carbide formation. V.S.Kogan made valuable comments on this work. There are 2 tables and 13 references: 7 Soviet and 6 Non-Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR
(Physical-Technical Institute AS UkrSSR)

SUBMITTED: February 27, 1960

Card 2/2

18.8200 1418, 4016, 2807 1035

S/181/61/003/003/017/030
B102/B205

AUTHORS: Amonenko, V. M., Tikhinskiy, G. F., Finkel', V. A., Azhazha, V. M., Shpagin, I. V.

TITLE: Plastic deformation of textured beryllium

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 796-802

TEXT: Single crystals of beryllium show highly anisotropic mechanical properties on account of their hexagonal crystal structure. A study has now been made of the mechanical properties of high-purity beryllium foils. For this purpose, thin textured Be foils of high purity (99.987% without taking hydrogen into account) were prepared by condensation of beryllium vapor on molybdenum sheet in a vacuum of $1 \cdot 10^{-6}$ mm Hg. The rate of evaporation was 0.2 g/cm^2·hr, the condensation temperature was 300-320°C, and the temperature of heat treatment was 700°C for one hr. These conditions were the same for all specimens. The purity was checked by a determination of the resistivity ratio: $R_{4.20K}/R_{293°K} = 9 \cdot 10^{-3} - 1.5 \cdot 10^{-2}$. The grain size varied from 8 to 15 μ, the foils had a thickness of 170-300 μ, and the density was

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Plastic deformation ...

1.831 g/cm^3. The texture was studied by X-ray analysis using a tube designed by B. Ya. Pines and V. S. Kogan. Two different textures (I and II) were studied. Texture I of the Be foil showed no relationship with that of the molybdenum backing which had been carbidized. The X-ray diagrams showed no (002) line, i.e., an axisymmetric texture with the axis [001] (perpendicular to the surface of the foil) could be assumed. Texture II showed "interaction" of the condensate of hexagonal beryllium with the backing (body-centered cubic Mo) with the texture (100) [011]. On account of this "interaction", the basal plane (002) was orientated at an angle of 45° toward the surface of the foil, which resulted in a shift of the interference points. The plastic deformation (rate: 1% per min) was studied at 20-800°C. The temperature was measured by means of a Pt-PtRh thermocouple (accuracy: $\pm 2^{\circ}$). The specimens had a size of 50 × 4 × (0.17-0.3) mm. Three kinds of specimens with different directions of the texture relative to the direction of expansion were studied. Type I: The basal plane coincided with the plane of the specimen. The temperature dependence of the breaking point σ_b of the longitudinal expansion δ and of the lateral contraction Ψ was measured (Fig. 4). The maximum value of σ_b at room tem-

perature was 43 kg/mm^2. δ increased monotonically from 14% at room temperature to 77% at 600°C. These specimens showed a three-dimensional plasticity. X-ray analysis disclosed effects of prismatic sliding in the entire range of temperatures (20-800°C). Type II: The basal plane formed an angle of 45° with the plane of the specimen. It showed practically the same temperature dependence of σ_b; at room temperature σ_b = 44 kg/mm^2 and δ = 18% (somewhat higher than in the case of I). These specimens exhibited a two-dimensional plasticity. The temperature-dependent variations in width and thickness are illustrated in Fig. 5. The two types show different rupture. Type III: The same texture as II but expansion in the direction [010]. These specimens showed a particularly low strength; at room temperature, there is practically no longitudinal expansion. X-ray diagrams showed no variations. Only at 200°C they showed an insignificant shift of the intensity maxima. Maximum δ appeared at 550°C (26.5%). The behavior of these specimens on expansion in one direction perpendicular to the plane of a prism of type II is similar to Be single crystals. I. A. Gindin and V. S. Kogan are thanked for a discussion. There are 6 figures and 16 references: 11 Soviet-bloc and 5 non-Soviet-bloc.

Plastic deformation ...

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

SUBMITTED: July 15, 1960

Legend to Figs: 1 - I, 2 - II, 3 - III (type of texture);
a) change in width, b) change in thickness.

18.1215 2808,1555,1418 25917 S/126/61/012/001/009/020
E021/E406

AUTHORS: Amonenko, V.M., Papirov, I.I., Tikhinskiy, G.F. and Finkel', V.A.

TITLE: Orientated growth of beryllium precipitates on oriented and on isotropic bases

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.1, pp.73-77

TEXT: The plasticity of beryllium can be increased by preparing it with a preferred orientation. A preferred orientation can sometimes be obtained by condensing the metal onto a base with a preferred orientation or by changing the angle between the direction of the molecular stream and the normal to the base. In the present work, the structure of beryllium precipitates prepared by the condensation of vapour in vacuo on a textured base of various metals, and also the variation of structure with the angle of inclination of the molecular stream to the base, were investigated. The method of precipitation used was described earlier (Ref.10: FMM, 1960, 10, 4, 581). Beryllium of 99.987% purity (discounting oxygen) was vaporized in a resistance furnace with a BeO crucible. The rate of evaporation was about 0.2 g/cm^2 hr, the condensation

Card 1/5

surface temperature 300 to 350°C. The precipitate was annealed for 1 hour at 700 to 750°C. Precipitation was carried out in a vacuum of (1 - 5) x 10^{-6} mm Hg. Rolled sheets of Mo, Ta, Ni, Cu, Ti and armco Fe were used as a base. The texture of the condensed beryllium was investigated by X-ray methods. Some of the photographs obtained are shown in the paper (of a layer condensed on a molybdenum base, on nickel, and on an amorphous base). Fig.2 shows the orientation of the crystals on the same bases. The results are given in the table. Epitaxial growth was observed in several cases with precipitates up to 500 μ thick. The best plastic properties of beryllium were obtained by condensation in the [$2\bar{1}\bar{1}$] direction on a molybdenum base, and on a neutral base. The orientation of beryllium condensed on a nickel base is unfavourable for plastic deformation. There are 2 figures, 1 table and 16 references: 9 Soviet and 7 non-Soviet. The four most recent references to English language publications read as follows: Newman R.C. Proc.Phys.Soc., 1956, B69, (4), 432; James J.A. Trans. Faraday Soc., 1955, 51, 833; Finch G.I., Sun C.H. Trans. Faraday Soc., 1936, 32, 852; Burgers W.G., Dippel C. J.Physica, 1934, 1, 549.

Card 2/5

25917 S/126/61/012/001/009/020
Orientated growth of beryllium ... E021/E406

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

SUBMITTED: November 9, 1960 (initially)
January 11, 1961 (after revision)

Card 3/5

S/126/61/012/005/023/028
E040/E435

AUTHORS: Vasyutinskiy, B.M., Kartmazov, G.N., Finkel', V.A.

TITLE: The structure of chromium in the temperature range of 700 - 1700°C

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.5, 1961, 771-773

TEXT: Previous investigations of the crystalline structure of Ni-Cr alloys in the temperature range of 1840 to 1930°C indicated the presence of a cubic, face-centred β-phase of chromium and the possibility was suggested that chromium exists in five allotropic modifications. To verify these assumptions, a study was made of the crystalline structure of 80 x 10 x 2 mm chromium specimens with a purity of 99.94%. The examination was made in a high-temperature X-ray camera, which was first evacuated to 10^{-4} mm Hg and then filled in with argon to the pressure of 300 mm Hg. The specimen was heated by passing through it electric current (up to 600 A). The examination was made in Cr anticathode radiation at a specimen-film distance of 60 mm, which ensured good resolution of the α-doublet and enabled an accurate determination of the lattice parameter. The experimental

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set-up was designed to facilitate reflection from the (211) plane of the body-centred chromium in the whole interval of the test temperatures. The experimental results are shown in Fig.1 and 2. The results shown in Fig.1 indicate the absence of any polymorphic transformations in pure chromium within the temperature range investigated. There are 2 figures and 14 references: 11 Soviet-bloc and 3 non-Soviet-bloc. The three references to English language publications read as follows:
Ref.1: Bloom D.S., Grant N.J. J. Metals, v.3 (11), 1951, 1009;
Ref.2: Abrahamson E., Grant N.J. J. Metals, v.8, 1956, 975;
Ref.3: Stein C., Grant N.J. J. Metals, v.7, 1955, 127.

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

SUBMITTED: April 19, 1961

187500 1418
21, 2100

33453
S/126/61/012/006/010/023
E021/E435

AUTHORS: Amonenko, V.M., Ivanov, V.Ye., Tikhinskiy, G.F., Finkel', V.A., Shpagin, I.V.

TITLE: The high temperature polymorphism of beryllium

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.6, 1961, 865-872

TEXT: Measurements of the electrical conductivity of beryllium were carried out on specimens in the form of plates about 0.3 mm thick, prepared by condensing beryllium vapour on molybdenum sheet at 300°C and 2 x 10^{-6} mm Hg pressure. The beryllium was of purity 99.96 to 99.97% (total metallic impurities 0.01%, oxygen content 0.01% and carbon content less than 0.02%). The density of the beryllium was 1833 g/cm^3. The plates had axial symmetry with the [001] axis perpendicular to the surface. Electric resistance measurements were carried out in the range 18 to 1280°C, in an atmosphere of purified helium above 900°C. Fig.1 shows the relation between temperature and relative electrical resistance of beryllium. Curve 1 is for 99.97% beryllium and shows a continuous smooth increase with increase in

Card 1/3

temperature. Curve 2 is for 98% beryllium. This shows the effect of impurities in the region 200 to 800°C. Curve 3 is for 99.97% beryllium after 10% deformation and annealing at 900°C for 1.5 h, and shows the effect of residual stresses which are difficult to eliminate. At 1254 ± 5°C the electrical resistance increases rapidly, due to a polymorphic transformation. Samples similar to those used for electrical resistance measurements but no less than 0.5 mm thick were investigated by X-ray analysis. The results showed that there was a transformation at 1254 ± 5°C from the hexagonal α-Be lattice to the body-centred cubic β-Be lattice with the parameter a = 2.5464 kX. The transformation was accompanied by a decrease in specific volume.

Acknowledgments are expressed to M.I.Kaganov and V.S.Kogan for discussions and to S.F.Kovtun for supplying the vanadium used in the anodes. There are 7 figures and 18 references: 8 Soviet-bloc and 10 non-Soviet-bloc. The four most recent references to English language publications read as follows: Ref.4: Kaufmann A.R., Gordon P., Lillie D.W. Trans. ASM, v.42, 1950, 785. Ref.6: Sidchu S.S., Henry C.O. J. Appl. Phys., v.21, (10), 1950,

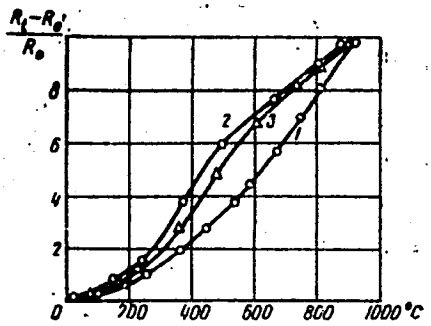
The high temperature ...

1036; Ref.7: Seybolt A., Lukesh I., White D. J. Appl. Phys., v.22, 1951, 986; Ref.11: Martin A.J., Moore A.J. Less-Common Met., v.1, (2), 1959, 85.

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

SUBMITTED: April 19, 1961

Fig.1.



Card 3/3

S/185/62/007/006/010/014
D407/D301

AUTHORS: Vasyutyns'kyy, B. M., Kartmazov, H. M. and Finkel', V.O.

TITLE: X-ray investigations of the structure of tantalum up to 2700°C

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 6, 1962, 661-662

TEXT: In the present investigation, the temperature range is extended beyond 2200°C. The specimens were made of tantalum wool, 0.3 mm thick. The metal was annealed in a vacuum at 2200°C so as to remove gaseous impurities. The X-ray analysis was carried out in a high-temperature X-ray chamber in a vacuum of $1\text{-}3\cdot10^{-4}$ mm Hg. The specimens were heated by an electric current. Only the tantalum line was observed over the entire temperature range; the parameters of the body-centered cubic lattice vary smoothly with temperature. This indicates the absence of phase transitions in tantalum. The temperature dependence of the lattice parameters of tantalum

Card 1/2

X-ray investigations ...

can be expressed by the empirical formula

$$a_{T^oC} = (3.3017 + 1.4142 \cdot 10^{-5} T + 0.8660 \cdot 10^{-8} T^2) kX.$$

The coefficient of linear expansion was calculated by an approximate formula. The temperature dependence of the coefficient of linear expansion is shown in a figure. At temperatures above 2000°C the lattice parameter varies almost linearly with temperature, whereas the coefficient of linear expansion remains practically unchanged. There are 2 figures. The most important English-language reference reads as follows: J. W. Edwards, R. Speiser, H. L. Johnson, J. Appl. Phys., 22, 424, 1951.

ASSOCIATION: Fizyko-tekhnichnyy instytut AN UkrRSR, Kharkiv (Physicotechnical Institute of the AS UkrRSR, Kharkiv)

SUBMITTED: February 1, 1962

Card 2/2

S/126/62/013/006/013/018
E021/E192

AUTHORS: Amonenko, V.M., Papirov, I.I., Tikhinskiy, G.F., and Finkel', V.A.

TITLE: Investigation of whisker crystals of beryllium. I. Preparation of whisker crystals and determination of their orientation.

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.6, 1962, 928-930

TEXT: Single crystal beryllium whiskers were prepared by evaporation in vacuo and condensation of the vapour on a cylindrical column of molybdenum sheet. Distilled beryllium of purity 99.99% (neglecting oxygen and carbon) was used. The vaporising temperatures were 1365-1600 °C and the condensing temperatures 770-950 °C. The rate of evaporation varied from 0.4 to 0.9 g/cm^2.hour, and the rate of growth of the whiskers from 0.01 to 0.07 g/cm^2.hour. The majority of the crystals had a diameter of several tenths of a micron and a length of several millimetres. X-ray investigations (by rotating the sample in the D-S camera) showed that the whiskers were single crystals.

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Investigation of whisker crystals ... S/126/62/013/006/013/018
E021/E192

There was some splitting of reflections indicating plastic deformation in the process of removal from the condensate. The directions of growth of the crystals investigated were [221], [331], and [111]. Thus the growth does not occur in the direction of closest packing.
There are 2 figures and 1 table.

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

SUBMITTED: December 2, 1961

Card 2/2

39756
S/126/62/014/001/012/018
E193/E383

5.4300

AUTHORS: Amonenko, V.M., Ivanov, V.Ye., Tikhinskiy, G.F. and Finkel', V.A.

TITLE: On the problem of the solubility of impurities in beryllium

PERIODICAL: Fizika metallov i metallovedeniye, v. 14, no. 1, 1962, 128 - 130

TEXT: Data on the solid solubility of nonmetallic impurities (carbon, nitrogen, oxygen) in beryllium are scarce and sometimes contradictory. This prompted the present authors to study this problem by comparing the temperature-dependence of the lattice parameters of high-purity beryllium with that of beryllium containing nonmetallic impurities in quantities sufficient to ensure the formation of saturated solid solutions. These relationships are demonstrated in Fig. 1, where the magnitude (kX) of a (lefthand scale) and c (righthand scale) is plotted against the temperature (^{o}C), the broken and continuous curves relating, respectively, to specimens containing 0.4% impurities (mainly C and O) and 99.98% pure beryllium,

Card 1/3

On the problem of ....

the dotted lines representing data obtained by Martin and Moore (Less-Com. Metals, 1959, 1, no. 2, 85) for commercial-grade metal. The solubility limit at 1 200 °C was evaluated in the following manner: experimental data on the degree of lattice distortion (Δc, kX/1 at.%) of Ti and Zr due to dissolution of oxygen (C.F. Domogola, D.J. McPherson - J. Metals, 1954, 6, 2, 238; E.S. Bumps, H.D. Kessler, H. Hunsen - Trans. ASM, 1953, 45, 1008) were plotted against the reciprocal of the volume of the elementary cells of these metals (i.e. against the value characterizing the size of the interstitial pores); on linear extrapolation of this graph to the reciprocal of the volume and elementary cell of Be, the magnitude of Δc = 0.02 kX/1 at.%, was obtained, which corresponded to the total solubility of interstitial impurities equalling 1 to 1.5%. This value, although evidently too high owing to inaccuracy of extrapolation and inability to take into account the increase in the thermal-expansion coefficient due to distortion of the vibration spectrum of the lattice by the impurity atoms, is not in contradiction to the value of 0.3% obtained by metallographic analysis (J. Greenspan. TID - 7526 (part 1), 1957 (quoted

Card 2/3

S/126/62/014/001/012/018
E193/E383

On the problem of ....

according to G.E. Darvin, I.H. Budery - "Beryllium", London, 1960, p. 291)). There are 2 figures.

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

SUBMITTED: December 2, 1961

Card 3/3

VASYUTINSKIY, B.M.; KARTMAZOV, G.N.; FINKEL', V.A.

Obtaining filiform crystals of chromium. Fiz.met.i metalloved. 14 no.5:792-793 N '62. (MIRA 15:12)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.
(Chromium) (Crystallization)

AMONENKO, V.M.; IVANOV, V.Ye.; TIKHINSKIY, G.F.; FINKEL', V.A.

X-ray study of the solubility of impurities in beryllim. Fiz. met.i metalloved. 14 no.6:852-856 D '62. (MIRA 16:2)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.
(Beryllium—Inclusions)
(X rays—Industrial applications)

FINKEL', V.M.; ZRAYCHENKO, V.A.; DEYASHKINA, T.K.

Characteristics of cementite decomposition in hypereutectoid steel. Izv. vys. ucheb. zav.; chern. met. 6 no.10:95-100 '63. (MIRA 16:12)

1. Sibirskiy metallurgicheskiy institut.

FINKEL', V.M.; BEREZOVSKIY, V.N.; ZRAYCHENKO, V.A.

Elastic and plastic deformation of transformer steel. Izv. vys. ucheb. zav.; chern. met. 6 no.12:126-132 '63. (MIRA 17:1)

1. Sibirskiy metallurgicheskiy institut.

Finkel', V.A.

AID Nr. 983-1 5 June

STRUCTURE OF TANTALUM AT HIGH TEMPERATURES (USSR)

Amonenko, V. M., B. M. Vasyntinskiy, G. N. Kartmazov, Yu. N. Smirnov, and V. A. Finkel'. Fizika metallov i metallovedeniye, v. 15, no. 3, Mar 1963, 444-449. S/126/63/015/003/016/025

The Physicotechnical Institute, Academy of Sciences USSR, has studied the structure of Ta at 20 to 2600°C and the effect of vacuum heat treatment on the structure and properties. X-ray diffraction patterns obtained with a high-temperature x-ray camera in a vacuum of $3 \cdot 10^{-5}$ mm Hg showed that the body-centered cubic structure of Ta remains unchanged at all temperatures tested. The lattice parameter "a" increases from ~3.3030 kX at 20°C to 3.3750 kX at 2600°C. The coefficient of thermal expansion was calculated from "a." Annealing in a vacuum of $3 \cdot 10^{-5}$ to $1 \cdot 10^{-3}$ mm Hg at temperatures up to 2200°C was found to increase "a" and microhardness. Curves of these two parameters versus temperature show maxima under all conditions tested; their magnitude increases with increasing pressure. With a constant annealing

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AID Nr. 983-1 5 June

STRUCTURE OF TANTALUM [Cont'd] S/126/63/015/003/016/025

time of 10 min these maxima occur at 1600° to 1800°C under all pressures tested. With prolonged annealing the maxima are shifted toward lower temperatures, occurring at ~1500-1600°C with annealing for 6 hrs. Both phenomena are attributed to gas absorption by the Ta. X-ray diffraction patterns of a specimen annealed for 15 hrs showed the lines of two high-temperature modifications of Ta_2O_5 at 1460 to 1490°C and 1500 to 1540°C. [ND]

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S/126/63/015/003/018/025
E193/E183

AUTHORS: Papirov I.I., Tikhinskiy G.F., and Finkel', V.A.

TITLE: Diffusionless phase transformations in the Be - 8 at.% nickel alloy

PERIODICAL: Fizika metallov i metallovedeniye, v.15, no.3, 1963, 462-465

TEXT: X-ray diffraction analysis, metallographic examination and microhardness measurements were used to study the phase transformation taking place in the Be - 8 at.% nickel alloy at fast rates of cooling. The tests were carried out either on solid test pieces quenched in various media from the β-phase range, or on specimens obtained by melting a thin strip by a current pulse and cooling the resultant droplets in nitrogen; the particle size of the droplets varied from a few microns to 1 - 2 mm.
Conclusions. 1) The diffusionless decomposition of the β-phase cannot be completely suppressed by quenching in water or other liquid media at room temperature. 2) Rapid cooling of small droplets of the molten alloy coming in contact with a copper plate at -196 °C results in the alloy undergoing diffusionless β → α

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transformation accompanied by a considerable increase in hardness. 3) The metastable solid solution formed by ultra-rapid cooling is decomposed by 2 hours' treatment at 600 °C; the transformation is accompanied by the precipitation of an intermetallic compound $Be_{21}Ni_5$. 4) Specimens with various structures were found to have the following microhardness (kg/mm^2): α-solid solution of nickel in Be at the equilibrium concentration (at room temperature), 373 - 383; γ-phase ($Be_{21}Ni_5$), 1214 - 1290; the eutectoid before quenching, 635 - 716; α-solid solution of Ni and Be after quenching, 946 - 1008; an alloy quenched and aged for 2 hours at 600 °C, 635 - 716.
There are 2 figures and 1 table.

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

SUBMITTED: August 9, 1962 (initially),
September 15, 1962 (after revision).

SMIRNOV, Yu.N.; FINKEL', V.A.

X-ray study of a chromium structure at 40-725°C. Fiz. met. i metalloved. 16 no.4:637 O '63. (MIRA 16:12)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.

S/0126/64/017/004/0613/0614

ACCESSION NR: AP4034060

AUTHORS: Papirov, I. I.; Tikhinskiy, G. F.; Finkel', V. A.

TITLE: On the problem of hardening of Be Ni alloy

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 4, 1964, 613-614

TOPIC TAGS: hardening, annealing, beryllium, nickel, radiographic apparatus RKD 57, alpha beryllium line, beta beryllium line, hypoeutectic alloy

ABSTRACT: The purpose of this work was to study the hardening process in Be-Ni alloy at high rates of cooling. Minute specimens produced by contact arc discharges were cooled on the inside walls of a copper container of 80-mm diameter, rotating at a speed of 2500 rpm. Hardening of the specimens took place over a thickness of 10 μ, with the cooling rate of 10^6 degrees/sec. Radiographic analysis was performed with an equipment of the type RKD-57. The radiogram of the hardened specimen was to be characterized by the absence of the α-Be line and the change in relative intensity of the line of the γ phase, but the absence of the α-Be line was observed only in the smallest specimens constituting about 25% of the total number. Tempering was done at temperatures of 100-400C and the exposure time at these temperatures was one hour. Radiograms of specimens tempered at temperatures

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ACCESSION NR: AP4034060

below 300C could not be distinguished from those of hardened specimens, but radiograms of specimens tempered at above 340C showed α-Be lines. Hardening of pure Be and of intermetallic compounds did not cause any change in the form of the radiogram. Experiments with hypoeutectic alloys with 5-20% Ni contained the α-Be line. Orig. art. has: 1 photograph.

ASSOCIATION: Fiziko-tekhnicheskiy institut, AN SSSR (Physico-technical Institute, AN SSSR)

SUBMITTED: 01Aug63 ENCL: 00

SUB CODE: MM NO REF SOV: 001 OTHER: 001

Card 2/2

ACCESSION NR: AP4043619 S/0056/64/047/002/0476/0479

AUTHOR: Smirnov, Yu. N.; Finkel', V. A.

TITLE: Crystalline structure of chromium at 113--373K

SOURCE: Zh. eksper. i teor. fiz., v. 47, no. 2, 1964, 476-479

TOPIC TAGS: crystal structure, chromium, low temperature research, cubic crystal, x-ray diffraction analysis, second order phase transition

ABSTRACT: This is a continuation of earlier work by the authors (FMM, v. 12, 771, 1961 and v. 16, 637, 1963), and its purpose was to study further the presence, temperature, and nature of a low-temperature transformation in chromium, since the available data are contradictory. The investigations were made with polycrystalline chromium in the form of a lump of vacuum condensate 99.95% pure. The structure was investigated over a wide range of temperatures by

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ACCESSION NR: AP4043619

by an x-ray diffractometric method. The apparatus and the measurements are described. The results are shown that the unit cell of the body-centered cube is retained in the entire investigated temperature interval. The existence of a second-order phase transition (paramagnetism-antiferromagnetism transition) is confirmed at 317K. It is found that at 168K there is a first-order phase transition which is obviously connected with the change in the magnetic anisotropy at this temperature. Orig. art. has: 2 figures and 1 formula.

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

SUBMITTED: 21Mar64 ENCL: 02

SUB CODE: MM, SS NR REF SOV: 006 OTHER: 010

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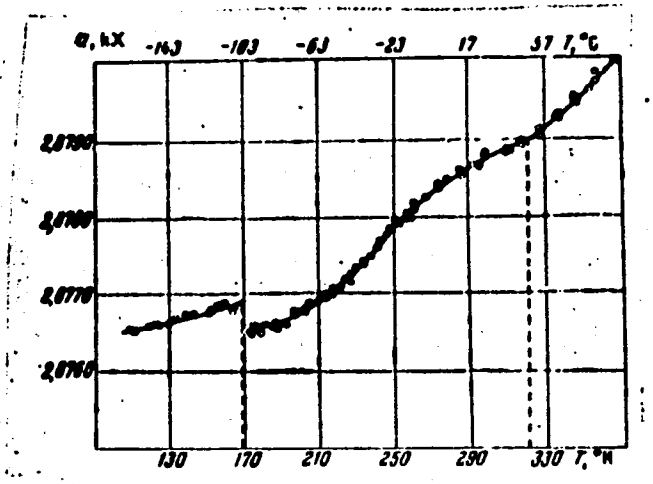
ACCESSION NR: AP4043619

ENCLOSURE: 01

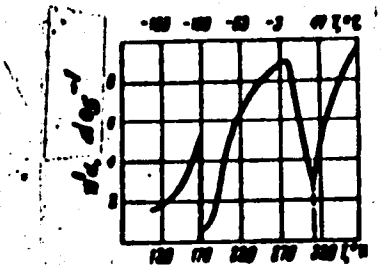


Temperature dependence of crystal lattice parameter

Card 3/4

ACCESSION NR: AP4043619

ENCLOSURE 02



Temperature dependence of chromium thermal expansion coefficient

Card 4/4

L 16451-65 EWT(m)/EWP(t)/EWP(b) Pad IJP(c)/ESD(t)/SSD/AFWL JD/HW

ACCESSION NR: AP4042045 S/0126/64/017/006/0877/0880

AUTHOR: Bolgov, I. S.; Smirnov, Yu. N./ Finkel', V. A.

TITLE: Phase transformations in cobalt

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 6, 1964, 877-880

TOPIC TAGS: cobalt, first order transition, second order transition, hexagonal structure, face centered structure, thermal expansion, anomaly

ABSTRACT: The cobalt structure at temperatures above 400 C has not been adequately studied. The authors, therefore, investigated the structure of high-purity cobalt at temperatures ranging from 20 to 1300 C. Electrolytic 80 x 8 x 2 mm plates were vacuum annealed at 300 C for several hours and their structure examined in a high-temperature vacuum x-ray chamber. The length - cross sectional ratio of the specimens provided an isothermal area of at least 10 mm in the center which was x-rayed. The authors found that a first order transition occurred from hexagonal α-Co to face-centered β-Co at 403 to 420 C during heating. The $\beta \rightarrow \alpha$ transformation was greatly affected by the cooling rate because of the martensite character of that process. Even when cooling proceeded rather slowly, the minimum

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L 16451-65

ACCESSION NR: AP4042045

transformation point was at 320 C. The atomic volume and the coefficient of thermal expansion at different temperatures were computed. It was convenient to calculate the mean coefficient of linear expansion (α) for a comparison between the coefficients of α - and β-Co. At 1100 C an anomaly of the coefficient of thermal expansion was observed. The authors conclude that the anomalous shape of the temperature curve is caused by second order phase transition with ferromagnetic Co changing into a paramagnetic state. Other authors have erroneously attributed the anomaly to first order phase transformation. Orig. art. has: 3 figures and 1 tables.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR (Physico Technical Institute AN UkrSSR)

SUBMITTED: 23Jul63 ENCL: 00

SUB CODE. MM NO REF SOV: 005 OTHER: 012

Card 2/2

SMIRNOV, Yu.N.; FINKEL', V.A.

Crystalline structure of chromium at 113° to 373°K. Zhur. eksp. i teor. fiz. 47 no.2:476-479 Ag '64. (MIRA 17:10)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.

GORBOVETS, M.N.; FINKEL', V.A.

Use of the "UKM" level indicator for the automatic control and regulation of carbon black and chalk level. Kauch.i rez. 24 no.1:47-50 Ja '65. (MIRA 18:3)

1. Vsesoyuznyy gosudarstvennyy proyektno-konstruktorskiy institut Giprostroyindustriya i zavod "Kauchuk".

L 11956-66 EWT(l)/EWT(m)/EPF(n)-2/T/EWP(t)/EWP(b)/EWA(c) IJP(c) JD/JG/GG

ACC NR: AP5026597 SOURCE CODE: UR/0056/65/049/004/1077/1082

AUTHORS: Smirnov, Yu. N.; Finkel', V. A.

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

TITLE: Crystal structure of tantalum, niobium, vanadium at 110-400K

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 4, 1965, 1077-1082

TOPIC TAGS: crystal structure, tantalum, niobium, vanadium, x ray diffraction analysis, electric resistance, thermal expansion, antiferromagnetism

ABSTRACT: The structures of tantalum, niobium, and vanadium were investigated in the temperature range 110-400K by x-ray diffraction analysis, in view of lack of data on these metals below room temperature. As an auxiliary method, the electrical resistance of these metals was measured in the temperature range 110-300K. Polycrystalline samples with low-temperature attachment was described by the authors earlier (ZhETF v. 47, 476, 1964). The measurement showed that both metals retained their body-centered cubic structure over the entire

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L 11956-66

ACC NR: AP5026597 9

range of temperatures. No singularities were observed in the temperature dependence of the linear expansion coefficients to indicate the presence of phase transitions. The temperature dependence of the relative electric resistance of tantalum and niobium likewise exhibited no anomalies in the 110-300K range. Anomalies were observed in the thermal expansion coefficient of vanadium, at temperatures between ~200K and ~233K, depending on the purity of the sample, and in the temperature dependence of the electric resistivity. This anomaly is of the λ-point type and is ascribed to a transition to the antiferromagnetic state in the vanadium. Authors thank B. M. Vasyutinskiy, G. N. Kartmazov, and I. V. Shpagin for help with the work. Orig. art. has: 3 figures and formulas.

SUB CODE: 20/ SUBM DATE: 26May65/ NR REF SOV: 005/ OTH REF: 017

Card 2/2

L 17603-66 EWT(1)/T IJP(c) GG

ACC NR: AP6002716 SOURCE CODE: UR/0056/65/049/006/1774/1778

AUTHORS: Vorob'yev, V. V.; Smirnov, Yu. N.; Finkel', V. A. 50 B

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

TITLE: Crystal structure of gadolinium at 120 -- 370K

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 6, 1965, 1774-1778

TOPIC TAGS: gadolinium, rare earth metal, second order phase transition, temperature dependence, x ray analysis, crystal lattice structure, magnetic moment

ABSTRACT: 21,44,55 The authors have investigated by x ray structure analysis the crystalline structure of polycrystalline gadolinium in the temperature interval 120 -- 370K. The research was motivated by the complexity of the magnetic structures of rare earth metals (presence of both first and second order phase transitions) and by the fact

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L 17603-66

ACC NR: AP6002716

that earlier x ray-structure investigations of gadolinium were made at low temperature and at low accuracy, particularly with regards to the temperature dependence of the crystal-lattice periods in the vicinity of the Curie point and in the 210 -- 250K range. The polycrystalline gadolinium was 99.7 pure and in the form of ground and polished prisms measuring 9 x 13 x 1.5 mm. The test procedure, by means of an URS-50I x ray spectrometer, was described earlier (ZhETF v. 47, 476, 1964). The measurement yielded the temperature dependence of the crystal-lattice parameters, the atomic volume, and the coefficients of linear and volume expansions. A negative λ-anomaly connected with the transition of the ferromagnetic gadolinium into the paramagnetic state, is observed in the coefficient of thermal expansion at 293K. The curve showing the temperature dependence of the atomic volume exhibits a maximum at 200K as a result of a change in the direction of the magnetic moment relative to the [001] axis. This change agrees with the theory of second-order phase transitions and with other experimental data. The complicated character of the dependence of the atomic volume on the temperature in the ferromagnetic region is connected with the complicated character of the temperature

Card 2/3

L 17603-66
ACC NR: AP6002716

dependence of the angle between the direction of the magnetic moment and the hexagonal axis. Orig. art. has: 4 figures.

SUB CODE: 20/ SUBM DATE: 27Jul65/ ORIG REF: 005/ OTH REF: 017

Card 3/3 nst

L 04784-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6024471 SOURCE CODE: UR/0181/66/008/007/2092/2097

62
60
B

AUTHOR: Finkel', V. A.; Papirov, I. I.; Tikhinskiy, G. F.

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

TITLE: Investigation of plastic deformation of single crystals of beryllium during compression

A 14 27

SOURCE: Fizika tverdogo tela, v. 8, no. 7, 1966, 2092-2097

TOPIC TAGS: beryllium, plastic deformation, pressure effect, x ray study, crystal lattice structure

ABSTRACT: The authors describe x-ray structure investigations of the plastic deformation of single crystals of beryllium with different orientations. The plastic deformation was investigated with the aid of a special x-ray camera described elsewhere (Zav. lab. v. 32, 1248, 1966). The x-ray photographs of the sample could be taken both at fixed load, or directly during low-speed loading. The camera makes it possible not only to obtain x-ray photographs of the deformed substance, but also to determine the character of the deformation curve. The x-ray source was of the URS-70K1 type with unfiltered iron radiation. The tests were made on beryllium of technical purity (99%) with three different orientations, and are described in detail.

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L 04784-67

ACC NR: AP6024471

2

The x-ray pictures obtained during different stages of deformation are compared with different sections of the deformation curve and conclusions are drawn concerning the deformation mechanism of the beryllium. The results are also compared in some cases with those obtained by investigating beryllium crystals by ordinary techniques. The relative contributions of slip along the basal planes, prisms of the first kind, and twinning over the plane of the pyramid of the first kind to the deformation are evaluated for each orientation. The authors thank Yu. N. Smirnov and A. S. Izmalkov for help with the work. Orig. art. has: 2 figures

SUB CODE: 20/ SUBM DATE: 11Dec65/ ORIG REF: 003/ OTH REF: 008

Card 2/2

40307-66 EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD/JC

ACC NR: AP6017310 (N) SOURCE CODE: UR/0126/66/021/005/0774/0778

AUTHORS: Gindin, I. A.; Neklyudov, I. M.; Finkel', V. A.; Shubin, Yu. V.

ORG: Physico-technical Institute, AN UkrSSR (Fiziko-tekhnicheskiy institute AN UkrSSR)

TITLE: Effects of programmed loading on the plasticity of beryllium monocrystals

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 5, 1966, 774-778

TOPIC TAGS: beryllium, metal property, metal crystal, crystal property, plasticity

ABSTRACT: The effects of preliminary programmed loading at 400C on the subsequent mechanical properties of beryllium monocrystals at room temperature were investigated. One set of specimens (99.6% pure, with base plane oriented at 45° to the loading axis) was loaded (0, 5, 6, and 10 kg/mm^2) and tested in compression. Another set (99.9% pure, base plane and $\langle 10\bar{1}0 \rangle$ direction coincided with loading axis) was loaded (0, 4.3, and 5 kg/mm^2) and tested in tension. It was found that the room temperature yield stress σ_s and relative compressibility ε were 9.6, 11.3, 11.0, and 9.8 kg/mm^2 and 10.7, 17.7, 24.7 and 11.2% respectively for the preloading conditions of the first set of specimens and 14.5, 16.1, and 12.4 kg/mm^2 and 29, 36, and 39.5% respectively for the second set. Elongation was 54, 53, and 64% respectively for the second set. X-ray diagrams of the preloaded monocrystals are also presented. Orig. art. has: 5 figures.

SUB CODE: 11, 13/ SUBM DATE: 31May65/ ORIG REF: 006/ OTH REF: 006

UDC: 539.37:546.45

Card 1/1 mcp

L 08168-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6024861 SOURCE CODE: UR/0056/66/051/001/0032/0037

AUTHOR: Finkel', V. A.; Smirnov, Yu. N.; Vorob'yev, V. V.

47
B

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

TITLE: Crystal structure of terbium at 120 -- 300K

47

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 1, 1966, 32-37

TOPIC TAGS: terbium, low temperature research, crystal lattice structure, x ray diffraction analysis, phase transition, paramagnetism, antiferromagnetism

ABSTRACT: This is a continuation of an earlier study of the crystal structure of rare earth metals (REM) (ZhETF v. 49, 1774, 1965), which was devoted to gadolinium. The present study was devoted to 99.5% pure polycrystalline terbium. The low-temperature x-ray diffraction procedure employed was also described by the authors earlier (ZhETF v. 47, 84, 1964 and v. 49, 1077, 1965). The tests were made at temperatures 120 -- 300K. The results show that at 234K there a λ-anomaly of the coefficient of linear expansion, connected with the transition of the paramagnetic terbium into the antiferromagnetic state. At 223K a jump in the atomic volume is observed, signifying that the transition of the antiferromagnetic helicoidal structure into a ferromagnetic one (with colinear ordering) is a first-order transition. A small rhombic

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L 08168-67

ACC NR: AP6024861 O

distortion of the hexagonal crystal structure of the terbium lattice taken place at 223K. Slight discrepancies observed between the measured values of the transition temperatures and the latest published data may be connected with difference in the purity of the investigated terbium. Orig. art. has: 4 figures

SUB CODE: 20/ SUBM DATE: 31Jan66/ ORIG REF: 006/ OTH REF: 013

Card 2/2 nst

L 10444-67 EWT(m)/EWP(t)/ETI IJP(c) JD/JG

ACC NR: AP6023705 SOURCE CODE: UR/0126/66/021/004/0620/0621

53

AUTHORS: Vasyutinskiy, B. M.; Kartmazov, G. N.; Smirnov, Yu. N.; Finkel', V. A.

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

TITLE: Investigation of the crystalline structure of niobium and vanadium at high temperatures

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 4, 1966, 620-621

TOPIC TAGS: niobium, vanadium, x ray spectroscopy, crystal lattice parameter

ABSTRACT: The crystal structure of niobium and vanadium was determined as a function of the temperature. The experimental procedure was described earlier by V. M. Amonenko, B. M. Vasyutinskiy, G. N. Kartmazov, Yu. N. Smirnov, and V. A. Finkel' (FMM, 1963, 15, 444). The experimental results are presented graphically (see Fig. 1). It was found that the temperature dependence of the lattice parameters obeyed the following relationship

$$a^{Nb}_{T^\circ C} = 3{,}3001\,(1 + 7{,}223 \cdot 10^{-6} \cdot T + 7{,}067 \cdot 10^{-10} \cdot T^2)\ \text{Å};$$

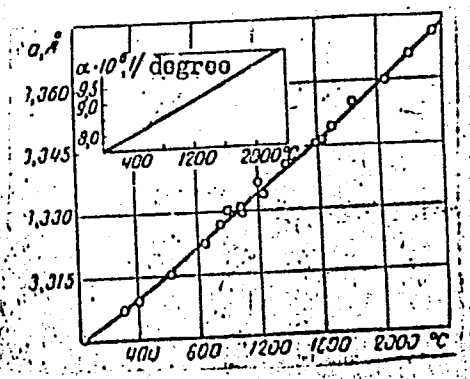
$$a^{V}_{T^\circ C} = 3{,}0290\,(1 + 7{,}314 \cdot 10^{-6} \cdot T + 2{,}944 \cdot 10^{-10} \cdot T^2)\ \text{Å}.$$

Card 1/2 UDC: 548.0:546.881/882

L 10444-67

ACC NR: AP6023705

Fig. 1. Temperature dependence of the lattice parameter and coefficient of linear expansion of niobium crystal lattice



Orig. art. has: 2 graphs and 2 equations.

SUB CODE: 20/ 11/ SUBM DATE: 02Aug65/ ORIG REF: 001/ OTH REF: 004

Card 2/2 6pp

ACC NR: AP6032475 SOURCE CODE: UR/0056/66/051/003/0786/0790

AUTHOR: Finkel', V. A.; Vorob'yev, V. V.

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

TITLE: Crystal structure of dysprosium at 77—300K

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 3, 1966, 786-790

TOPIC TAGS: crystal, crystal structure, crystal lattice, crystal lattice structure, dysprosium

ABSTRACT: The crystal structure of dysprosium is studied by the low-temperature x-ray diffraction method at temperatures between 77 and 300K. It is shown that at 178K, a negative λ anomaly of thermal expansion coefficients occurs which is related to a phase transition of the second kind similar to the helicoidal antiferromagnetism—paramagnetism type of transition. A discontinuity in the crystal lattice period and atomic volume at 85K and also the appearance of rhombic distor-

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ACC NR: AP6032475

tions of the hexagonal lattice related to an antiferromagnetism-ferromagnetism phase transition of the first kind are observed. Orig. art. has: 3 figures. [Authors' abstract]

SUB CODE: 20/SUBM DATE: 28Apr66/ORIG REF: 007/OTH REF: 006/

Card 2/2

PILYUGINA, A.A.; FINKEL', V.A.

Automatic weighing of materials. Biul. tekh.-ekon. inform. Gos. nauch.-issl. inst. nauch. i tekh. inform. 17 no.6:34-36 Je '64. (MIRA 17:11)

FINKEL',V.M.

X-ray camera design. Zav.lab.21 no.6:737 '55. (MLRA 8:9)

1. Kuznetskiy metallurgicheskiy kombinat.
(X rays--Apparatus and supplies) (Crystallography)

FINKEL', V.M.;KOVRIGIN, A.A.

Transportable X-ray equipment for determining principal stresses in rails. Zav.lab.21 no.9:1137 '55. (MLRA 9:1)

1.Kuznetskiy metallurgicheskiy kombinat imeni I.V.Stalina.
(X rays--Industrial applications) (Railroads--Rails)

124-57-2-2583D

Translation from: Referativnyy zhurnal, Mekhanika, 1957, Nr 2, p 149 (USSR)

AUTHOR: Finkel', V.M.

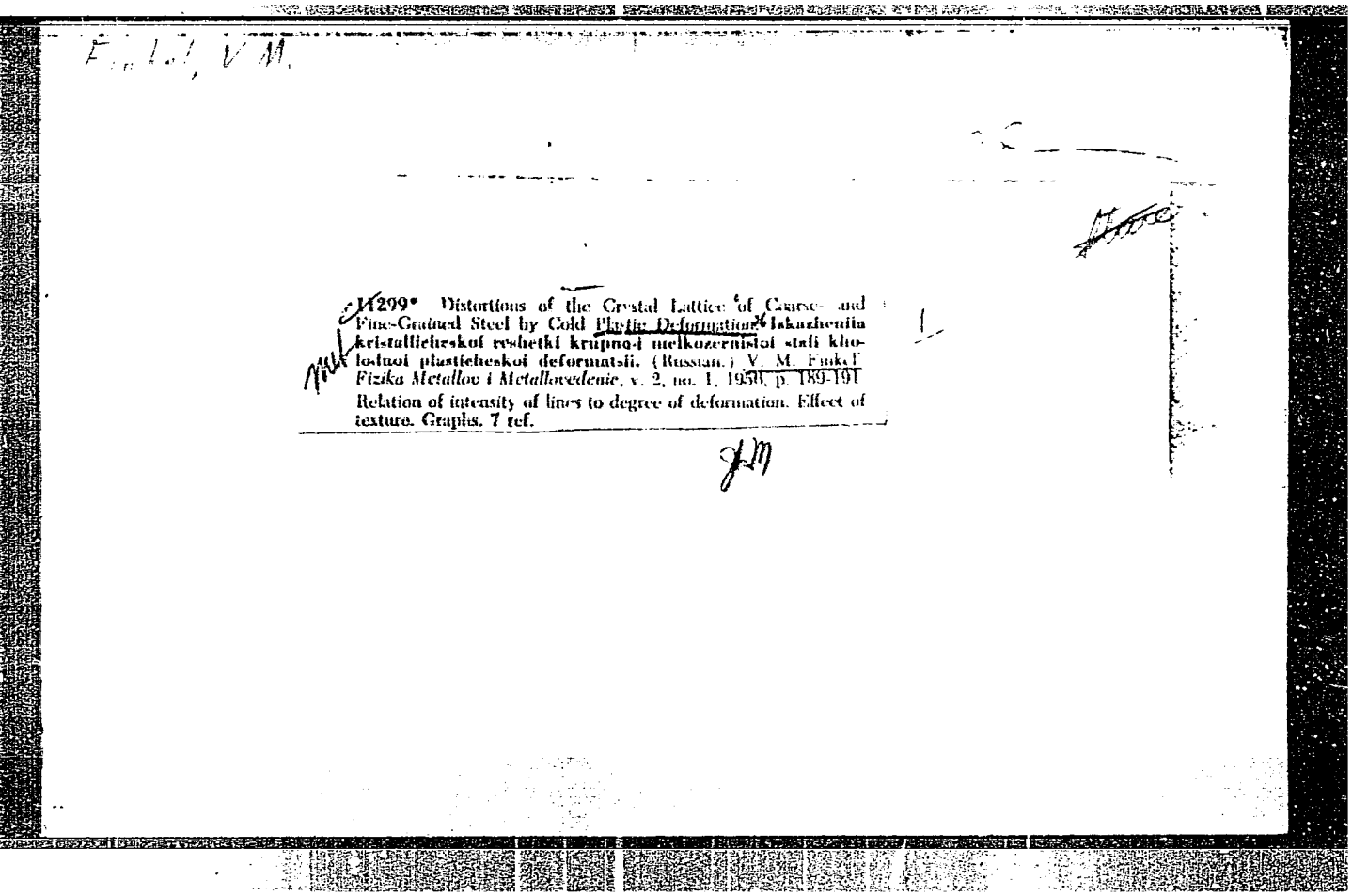
TITLE: The Distortion of the Crystal Lattice During the Static and Dynamic Deformation of Steel (Iskazheniye kristallicheskoy reshetki pri staticheskom i dinamicheskom deformirovanii stali)

ABSTRACT: Bibliographic entry on the author's dissertation for the degree of Candidate of the Physical-Mathematical Sciences, presented to the Tomskiy un-t (Tomsk University), Tomsk, 1956

ASSOCIATION: Tomskiy un-t (Tomsk University), Tomsk

1. Steel--Deformation 2. Crystals--Distortion 3. Crystals --Lattices

Card 1/1



11299* Distortions of the Crystal Lattice of Coarse- and Fine-Grained Steel by Cold Plastic Deformation. Iskazheniia kristallicheskoi reshetki krupno-i melkozernistoi stali kholodnoi plasticheskoi deformatsii. (Russian.) V. M. Finkel'. *Fizika Metallov i Metallovedenie*, v. 2, no. 1, 1956, p. 189-191.

Relation of intensity of lines to degree of deformation. Effect of texture. Graphs. 7 ref.

SOV/137-58-11-23410

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 11, p 224 (USSR)

AUTHOR: Finkel', V. M.

TITLE: On the Static and Dynamic Deformation of Steel (O staticheskom i dinamicheskom deformirovanii stali)

PERIODICAL: Dokl. 7-y Nauchn. konferentsii, posvyashch. 40-letiyu Velikoy Oktyabr'sk. sots. revolyutsii. Nr 2. Tomsk, Tomskiy un-t, 1957, pp 63-64

ABSTRACT: The distortions in crystal lattices and the dimensions of blocks in the mosaic structure were investigated on specimens of rail steel and steel of the St 3 grade after they had been subjected to static and dynamic deformation. The method of harmonic analysis of the shape of an interference line was employed. The distortions of the crystal lattice become more pronounced as the strain rate is increased. In the case of dynamic deformation of rail steel, the Joule effect manifests itself in a reduction of microstresses although the hardness and distortions of the third kind are of considerable magnitude. The relationship between the properties of steel and the strain rate is regarded as a function of the interrelationship of such factors as harden-

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On the Static and Dynamic Deformation of Steel

ing and recovery, as well as of the behavior of interlayers separating the individual crystals and blocks. It is established that breaking down of blocks is more intense during dynamic deformation than it is during static deformation.

Z. F.

SOV/137-58-11-23419

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 11, p 226 (USSR)

AUTHOR: Finkel', V. M.

TITLE: On the Nature of the Cold Shortness of Steel (O prirode khladnolomkosti stali)

PERIODICAL: Dokl. 7-y Nauchn. konferentsii, posvyashch. 40-letiyu Velikoy Oktyabr'sk. sots. revolyutsii. Nr 2. Tomsk. Tomskiy un-t, 1957, p 72

ABSTRACT: Ref. RzhMet. 1958, Nr 11, abstract 23418

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SOV/137-58-11-23418

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 11, p 225 (USSR)

AUTHOR: Finkel', V.M.

TITLE: On the Nature of the Cold Shortness of Steel (O prirode khladnolomkosti stali)

PERIODICAL: Izv. vyssh. uchebn. zavedeniy. Fizika, 1958, Nr 1, pp 147-151

ABSTRACT: Cleavage surfaces of untreated and normalized specimens of rail steel, as well as of specimens which had been hardened and annealed, were investigated by means of X-ray methods; the a_k [resilience] values of the above specimens were also determined. The tests were performed at temperatures ranging from -60° to $+100^{\circ}$C. The width (b) of the reflexes (211) and (222) and the intensity ratio $I_{(220)}/I_{(110)}$ were measured. Curves representing the a_k, the b, and the $I_{(220)}/I_{(110)}$ as functions of the temperature are shown. Compared with untreated specimens, the a_k of normalized specimens increases at room temperature by a factor of 2 and that of specimens which had been hardened and annealed by a factor of 6; correspondingly, an increase is observed in the magnitude of b. Temperatures of transition from

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the ductile to the brittle state were determined for specimens which had been subjected to various heat-treatment procedures. At these temperatures, the points of the beginning of the reduction of b and of an increase in the ratio $I_{(220)}/I_{(110)}$ are linked with the cessation of processes of plastic deformation that occurs upon transition from the ductile to brittle failure. Thus, the latter is characterized by smaller lattice distortions.

A. B.

FINKEL', V.M.

X-ray analysis of statically and dynamically deformed steel. (MIRA 11:6)
Izv. vys. ucheb. zav.; fiz. no.2:23-29 '58.

1.Sibirskiy metallurgicheskiy institut im. S. Ordzhonikidze.
(Steel--Metallography)

FINKEL, V.M.

SOV/126-6-4-28/34

AUTHOR: Shivrin, O.N.

TITLE: Discussion on V.M.Finkel's Paper on "Crystal Lattice Distortions in Coarse and Fine Grained Steel During Cold, Plastic Deformation" (Fizika Metallov i Metallovedeniye, 1956, Vol 2, Nr 1, p 189) (Po povodu stat'i V.M.Finkelya "Iskazheniya Kristallicheskoy Reshetki Krupno- i Melkozernistoy Stali Pri Kholodnoy Plasticheskoy Deformatsii")

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 4, pp 757-760 (USSR)

ABSTRACT: It was reported by Finkel' that in a wide range (80%) of plastic deformation the intensity of the (310) lines (Co-radiation) of coarsely grained steel remained practically constant. Under the same conditions, the intensity of the (211) lines (Cr-radiation) was 1.4 times higher, but also did not depend on the degree of the plastic deformation. While granting that this fact is of great practical interest, O.N.Shivrin disagrees with Finkel's interpretation of his experimental results and points out that: (i) It has been shown (Ref.1, 2) the

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Discussion on V.M.Finkel's Paper on "Crystal Lattice Distortions in Coarsely and Finely Grained Steel During Cold, Plastic Deformation"

process of block fragmentation which causes weakening of the extinction effect practically ceases at 8-10% deformation; with increasing deformation one should expect a decrease of the line intensity as a result of the formation of distortions of the 111-rd type. Such an effect was in fact observed by Shivrin in the case of steel 2 deformed by turning at high rates of feed and small depth of the cut, and in the case of brass and copper under hydrostatic pressure: In every case the intensity of lines increased up to a certain degree of deformation only. (ii) Since the intensity of the diffraction background is associated with the magnitude of the distortions of the 111-rd type, but not with the extinction effect, the fact of its remaining constant during deformation of coarsely grained metal is quite incomprehensible. No matter how strong is the masking effect of extinction on the weakening of the intensity of the lines due to

Discussion on V.M.Finkel''s Paper on "Crystal Lattice Distortions in Coarsely and Finely Grained Steel During Cold, Plastic Deformation"

distortions of the 111-rd type, the magnitude of which should be considerable at 80% deformation, their effect should be reflected in the variation of the background intensity. This, for some reason or other, was not observed by Finkel'. (iii) Block fragmentation results in (a) weakening of the primary extinction effect which is directly associated with the size of the blocks, and indirectly in (b) weakening of the secondary extinction effect due to the increase of the degree of disorientation of the blocks within the crystallites. This means that a metal can be characterised by coarsely grained structure and still not show any secondary extinction effect if only the structure of the crystallites is sufficiently close to the ideal, and that the secondary extinction effect can be considerable even in finely grained metals if only the degree of disorientation of the blocks within each crystallite is sufficiently small. The character of the variation of the line intensity will depend on whether the primary or secondary extinction only, or

Discussion on V.M.Finkel's Paper on "Crystal Lattice Distortions in Coarsely and Finely Grained Steel During Cold, Plastic Deformation"

both these effects take place in a polycrystalline metal specimen. It is easy to show that, as was postulated by Averbach (Ref.3, 4) in the presence of primary extinction only, the variation of the intensity of the lines of high orders is negligible. (This fact, for some reason or other, is overlooked by Finkel'.) On the other hand, the presence of secondary extinction (Ref.5, 6), particularly when the conditions are favourable for the formation of texture (Ref.7), the variation of the lines intensity can be quite different. For this reason Finkel's contention that the observed effect was caused exclusively by the secondary extinction is not quite justified, since in the case under consideration the effect of texture might have been the predominant factor. (iv) The difference (not much larger than the limit of the experimental error) of the values of $\sqrt{u^2}$ in the (310) and (211) directions can be attributed not only to the anisotropy of the distortions of the III-rd type, but also to the

Discussion on V.M.Finkel's Paper on "Crystal Lattice Distortions in Coarsely and Finely Grained Steel During Cold, Plastic Deformation"

difference between the depth of penetration of the Co- and Cr-radiation. Some authors favour the hypothesis of the weakened surface layer in which small distortions are neutralised. In the final analysis the correctness of this or other theory can be proved only by further experimental work. There are 9 Soviet references.

ASSOCIATION: Petrozavodskiy Gosuniversitet (Petrozavodsk State University)

SUBMITTED: 28th January 1957.

Reply by V.M.Finkel' states the following:

In spite of the "coarsely" and "finely" grained structure of the experimental steels, the size of the regions of coherent dispersion in steel 3 did not exceed 1.7×10^{-5}cm at 2% deformation and 1.1×10^{-5}cm at 4% deformation. In the case of the heat-treated rail steel, the size of the mosaic blocks was smaller by one order of magnitude (e.g. 2×10^{-6}cm at 10% deformation).

Reply by V.M.Finkel'

Consequently, the observed phenomena cannot be attributed to the effect of primary extinction in either case since primary extinction is practically non-existent at the size of the regions of coherent dispersion quoted above. (Ref.3, 4). To account for the stability of the intensity of the (310) lines, one has to assume that its decrease due to the effect of micro-distortions of the 111-rd type is counter-balanced by an opposite effect of some other physical factors, such as secondary extinction and texture. The secondary extinction can, in all probability, display itself throughout the whole deformation range: In its initial stages it is associated with the process of block fragmentation and the resulting disorientation of the mosaic blocks, in the later stages it is caused by the process of disorientation not directly connected with the block fragmentation (Ref.5). Unlike secondary extinction, the effect of primary extinction (in a coarsely grained aggregate), being associated with the process of fragmentation only, probably disappears in the initial

Reply by V.M.Finkel'

stages of the deformation (having increased the intensity of the lines), after which the intensity of the lines decreases due to the effect of the distortions of the lll-rd type. Shivrin carried out his experiments on brass and copper in which the size of the mosaic blocks is one or two orders of magnitude larger than that in steel, so that the maximum on his curves is obviously associated with the effect of the primary extinction. When a high carbon content steel is quenched, a structure is obtained which is submicroscopically nonhomogeneous, and which is characterised by small size of the blocks and high degree of their disorientation. This minimises or possibly even eliminates secondary extinction, which would explain the different character of the variation of the lines intensity with deformation in annealed and quenched specimens of steel 3.
He (Finkel) did not take into account the effect of texture, since this effect in the case of plane (310) is negligible (Ref.7). In addition, had the observed phenomena been attributed to the effect of texture only, it would imply that the character of the texture in

Reply by V.M.Finkel'

steel 3 and rail steel is basically different (since in the former case $l_{(310)}$ is constant and $l_{(211)}$ increases with increasing degree of deformation, while in the latter case both $l_{(310)}$ and $l_{(211)}$ decrease) which, of course, cannot be true. It is difficult to understand why Shivrin should be surprised by the fact that the background intensity in deformed steel 3 did not change: The variation of the background intensity in the high carbon content, rail steel did not exceed 7-8%. It is only to be expected that it should amount to less in the case of steel 3 in which, owing to its low carbon content, the lattice distortions caused by deformation are much smaller than those in steel 3. Since the variation of the background intensity is generally small it cannot be used as a practical criterion of the degree of lattice distortion. As regarding Shivrin's comments on the problem of anisotropy, the hypothesis of the weakened surface layer does not seem to have any bearing on this problem: Unstable,

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Reply by V.M.Finkel'

elastic distortions may be present in the surface layer, while distortions of the III-rd type are of non-elastic nature. There are 9 Soviet references.

ASSOCIATION: Sibirskiy Metallurgicheskiy Institut (Siberian Metallurgical Institute)

SUBMITTED: 1st April 1957.

Comments of O.N.Shivrin on the Reply of V.M.Finkel'

(i) In his reply Finkel' gives the dimensions of the mosaic blocks of the investigated materials which were not given in his original paper. The quoted figures do, in fact, exclude the possibility of the intensity of the (211) and (310) lines being affected by primary extinction, but then he (Shivrin) did not assert that such an effect was possible. On the contrary, he emphasized that secondary extinction is not directly

 associated with the size of the blocks and that such a

Comments of O.N.Shivrin on the Reply of V.M.Finkel'

direct connection exists in the case of the primary extinction only. (ii) The data on the size of the blocks given by Finkel' are not reliable. If the quoted size of the blocks in quenched and tempered rail steel deformed 10% is in fact $D = 3.8 \times 10^{-7}$cm then the width of the lines (310) calculated from the Selyakov formula is $B = 0.285$ radion or 16^{0}. This broadening is supposed to be due to the small size of the blocks only, without taking into account the effect of the distortions of the II-nd type. Under these conditions the (310) lines would disappear completely and one could not discuss the variation of their intensity. This proves that the quoted data on the size of the blocks are incorrect. (iii) The assumption that secondary extinction diminishes throughout the whole deformation range cannot be regarded as well substantiated, since increasing disorientation of the blocks leads to its rapid disappearance. (iv) The increase of the lines intensity observed in brass and copper cannot be attributed to the effect of primary extinction since this effect is negligible

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Comments of O.N.Shivrin on the Reply of V.M.Finkel

already at the size of the blocks equal to 1 x 10^{-4}cm. In the case under consideration the size of the blocks was 4 x 10^{-5}, 0.9 x 10^{-5} and 4 x 10^{-6}cm at 2, 5 and 20% deformation, respectively. (v) Finkel's statement that the character of texture in the rail steel and in steel 3 cannot but be the same, has not been questioned. However, it should be borne in mind that even small additions of alloying elements can affect the character of texture formation (Ref.12). Finkel's explanation of the variation of the lines intensity, based on the assumption that it is due to secondary extinction only

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Comments of O.N.Shivrin on the Reply of V.M.Finkel'

is not very convincing. There are 12 references of which 8 are Soviet and 4 English.

ASSOCIATION: Petrozavodskiy Gosuniversitet (Petrozavodsk State University)

SUBMITTED: 10th April 1957.

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FINKEL', V.M., dots., kand.fiz.-mat.nauk

Possibility of excluding the effect of texture on the intensity of X-ray interferences. Izv.vys.ucheb.zav.; chern.met. no.8: 119-126 Ag '58. (MIRA 11:11)

1. Problemnaya laboratoriya metallovedeniya i metallofiziki Sibirskogo metallurgicheskogo instituta.
(Deformations (Mechanics)) (Metallography) (Interferometry)

FINKEL', V.M., kand.fiz.-mat.nauk

Sixth all-Union conference on the use of X rays for the investigation of materials. Izv.vys.ucheb.zav.; chern.met. no.8:170-171 Ag '58. (MIRA 11:11)

1. Sibirskiy metallurgicheskiy institut.
(X rays--Industrial applications)

24(2) SOV/48-23-5-15/31

AUTHOR: Finkel', V. M.

TITLE: On the Possibilities of Eliminating the Influence Exerted by Texture on the Intensity of X-Ray Interference (O vozmozhnosti isklyucheniya vliyaniya tekstury na intensivnost' rentgenovskikh interferentsiy)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 5, pp 611-614 (USSR)

ABSTRACT: In the introduction the influence exerted by texture on the intensity of X-ray interference is stated as being explained by the orientation of the structural grain surfaces. To eliminate this influence it is necessary to introduce a method making it possible to record all or at least most of the reflecting surfaces of the structural grains and to measure the reflection intensity. As this would require the rotation around any axis, the authors applied the method tested in the determination of deformations of the 3rd kind, permitting the measurement of the intensities of the various interference lines. A principle scheme of such a system is shown (Fig 1). The ground section is inclined by a certain angle and the interference is observed. Next, a graph is given depicting the

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On the Possibilities of Eliminating the Influence Exerted by Texture on the Intensity of X-Ray Interference

mechanical arrangement for the rotation of the crystal (Fig 2), and mathematical considerations are made concerning the intervals of interference lines in dependence of the angle of rotation. The results obtained with this method are compared with other methods in a diagram, and it becomes evident that it is actually possible to eliminate the influence of the texture. Two X-ray pictures are given in the appendix for an exemplification. There are 4 figures and 11 references, 7 of which are Soviet.

ASSOCIATION: Sibirskiy metallurgicheskiy institut
(Siberian Metallurgical Institute)

S/139/60/000/005/001/031
E032/E114

AUTHORS: Finkel', V.M., and Gurzheyev, V.N.

TITLE: A Study of Small Angle Scattering in Elastically and Plastically Strained Copper

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No. 5, pp 3-7

TEXT: The scattering of X-rays in the small angle region, i.e. in the region close to the primary beam, is determined by the distribution and size of the microstructure of the material under investigation. The present paper reports two methods for studying the small angle scattering in elastically and plastically strained copper. In the first method the primary X-ray beam is very narrow and this is achieved by careful collimation. This method requires long exposures (of the order of 100 hours). If a counter is employed as the detector, considerable errors are introduced owing to an appreciable X-ray background due to the scattering by slit edges and to cosmic radiation. From the experimental point of view, the method is very difficult and requires high-output tubes. The second method is based on the apparatus described by Zhurkov and Slutsker (Ref. 6). Here, a divergent beam is limited on one

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A Study of Small Angle Scattering in Elastically and Plastically Strained Copper

side by a screen and a baffle placed at a distance from each other. The baffle serves to absorb the radiation scattered by the edge of the screen. In this method angles of the order of 1' from the primary beam can be investigated. The present authors have modified the Zhurkov-Slutsker method as follows. A wide monochromatized beam is passed through a collimator consisting of three slits. The width of the first and second slits can be adjusted within the range 0.3-0.5 mm and the actual width is chosen so as to obtain the maximum possible intensity as well as a geometrically sharp beam on one side. The optimum slit widths are chosen empirically. The third slit is in the form of a lead baffle having a sharp edge and absorbs radiation scattered by the edge of the second slit. In practice this baffle is brought right up to the beam without actually entering it. The total length of the collimating system is 160 mm. The specimen is placed immediately behind the baffle and coincides with the centre of rotation of the counter. A 0.1 mm wide slit is placed in front of the counter.

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A Study of Small Angle Scattering in Elastically and Plastically Strained Copper

A schematic drawing of the device is shown in Fig. 1 in which 1 is the slit system, 2 is the X-ray beam, 3 is a monitor, 4 is the X-ray machine (type УРС-55 (URS-55)), 5 is the specimen, 6 is a goniometer, and 7 is the working counter. The scattered radiation is detected by self-quenching counters of type МСТР-4 (MSTR-4). In the absence of the specimen, the primary beam was found to be in the form of a sharp Gaussian curve. The region where the intensity increases very rapidly (1000-4000 pulses/sec in the first minute) was taken as the starting point for the measurements. The total width of the primary beam was about 20'. The device has been used to measure X-ray scattering in the region up to 2-3'. Since the experiments were only preliminary, all the measurements were carried out in air. Figs 2-4 show the intensity of the X-rays (pulses/sec) as a function of angle from the primary beam for thin (0.3-0.4 mm) copper foils subjected to different mechanical and heat treatments.

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A Study of Small Angle Scattering in Elastically and Plastically Strained Copper

Acknowledgements are made to A.I. Slutsker for valuable advice and Professor Doctor of Technical Sciences Yu.V. Grdin, in whose laboratory the present work was carried out.
There are 4 figures and 25 references: 14 English, 5 Soviet, 3 German and 2 international.

ASSOCIATION: Sibirskiy metallurgicheskiy institut imeni S. Ordzhonikidze
(Siberian Metallurgical Institute imeni S. Ordzhonikidze)

SUBMITTED: July 6, 1959

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24.7700 (1043, 1143, 1559)

S/139/60/000/006/021/038
E193/E483

AUTHOR: Finkel', V.M.

TITLE: X-Ray Investigation of Elastic Deformation of Mono and Poly-Crystals

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No.6, pp.135-141

TEXT: Some investigators (Ref.1, 2) have shown that X-ray diffraction patterns, obtained by the Laue method on single crystals stressed within the elastic range, were identical with those of unstressed specimens. However, the Laue method is not sufficiently sensitive to reveal small changes in the crystal lattice geometry and, since many other workers (Ref.3, 5 to 11) have found evidence of misalignment of blocks in elastically stressed single crystals, the investigation described in the present paper was undertaken in order to obtain more conclusive evidence on the effect of elastic deformation on the degree of misorientation of the blocks in mosaic structures. The experiments were carried out on NaCl and KCl single crystals, studied with the aid of the classical method of twin-crystal

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X-Ray Investigation of Elastic Deformation of Mono- and Poly-crystals

X-ray spectrometer. The principle of this method is illustrated in the diagram (Fig.1). A divergent X-ray beam is reflected from the stationary monochromatic crystal A onto the surface of the investigated crystal B, which can be rotated about an axis perpendicular to the plane of the diagram. As the angle of incidence between the X-ray beam and the surface of crystal B varies, the beam is reflected by different crystallographic planes As a result, crystal B reflects the X-ray beam within an angle which is larger than the angle of divergence of the original beam. The difference between these two angles gives a measure of misalignment of the crystallographic planes which constitute the surface of the crystal studied. The results of experiments carried out on single NaCl and KCl crystals, stressed in bending or in compression, showed that the degree of misalignment of the blocks of the mosaic structure in these compounds remains constant until the applied stress exceeds the elastic limit. These findings were confirmed by the results of X-ray diffraction

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