

51-4-3-24/30

The Temperature Dependence of γ -Scintillations in Caesium Iodide Crystals Activated by Thallium.

the figure on p.412, where the scintillation yield (I) is plotted against temperature. Curve 1 (continuous) gives the experimental values, and curve 2 (dashed) gives theoretical values calculated from the equation $I = A/[1+b \exp(-e/kT)]$ with $b = 3.15 \times 10^4$ and $e = 4.9 \times 10^{-13}$ ergs. Near room temperature the decrease of scintillation intensity is about 0.7% per degree. There is 1 figure and 2 Soviet references.

SUBMITTED: July 1, 1957.

- 1. Caesium iodide crystals--Luminescence
- 2. Thallium (activated)--Applications
- 3. Luminescence--Temperature effects
- 4. Photomultipliers--Applications

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SOV/56-35-5-1/56

24(2) -
AUTHORS:

Obreimov, I. V., Startsev, V. I.

TITLE:

The Formation Work of an Elastic Twin in Calcite (Rabota obrazovaniya uprugogo dvoynika v kal'tsite)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 5, pp 1065-1073 (USSR)

ABSTRACT:

In the introduction the calcite crystal, which belongs to the trigonal syngony, is described in detail, and exact data concerning the form of its crystallization are given (Figs 1-3). The process of twin-formation (Figs 4, 5) investigated by R. I. Garber (Refs 1, 3-5) is discussed. The next chapter deals with the experimental arrangement and with the object of the test. First, the shape of the calcite crystals, which were prepared especially for these experiments, is discussed in detail. Figure 6 shows a prepared calcite rhombohedron, and figure 7 a prism. Figures 7 and 8 show a schematical drawing of the experimental arrangement, and figure 10 is a photograph of the elastic twin crystal 8B-3. Chapter 3 deals with the shape and the dimensions of the elastic twin in calcite formed under the influence of a concentrated load. Figure 11 shows a diagram of the twin crystal 8B-3 and figure 12 shows

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The Formation Work of an Elastic Twin in Calcite SOV/56-35-5-1/56

the dependence of the length and breadth of the twin crystal 6R on the load F. The dimensions of 8B-3 are given in table 1 ($l_0 = 1.95$ mm, $b_0 = 2.44$ mm, $h_0 = 1.95 \cdot 10^4$ cm, $F = 2.58$ kg).

Figures 14-16 show the load dependence of the thickness of the twin crystal 8B as well as the results of investigations of the crystals Nr 6, 7 and 8. Finally, the calculation of the work of formation as well as the destruction of the crystals are discussed. The following values were obtained for the work performed for the purpose of producing 1 cm² of the surface of an elastic twin crystal:

Number of twin	work erg/cm ²	number of twin	work erg/cm ²
6K	3720	8A	2670
6S	5160	8B	2400
7U	4450	8L	2890
7N	6400	8β	2400

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The linear dimensions of the twin are proportional to the load, and the area of the twin surface is proportional to the work performed by the press piston. There are 17 figures, 2 tables, and 11 references, 10 of which are Soviet.

ASSOCIATION: Khar'kovskiy institut mekhanizatsii sel'skogo khozyaystva
(Khar'kov Institute for the Mechanization of Agriculture)
Moskovskiy inzhenerno-fizicheskiy institut
(Moscow Engineering-Physical Institute)

SUBMITTED: June 7, 1958

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AUTHORS: Startsev, V.I. and Aronova, P.N. SOV/70-4-1-15/26

TITLE: The Determination of Micro-distortions in the Slip Bands in Rock Salt (Opredeleniye mikroiskazheniy v polose skol'zheniya kamennoy soli)

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 1, pp 85 - 89 (USSR)

ABSTRACT: X-ray diffraction studies have been made of the regions of the crystal lattice adjacent to the slip band in a deformed crystal of rock salt. The Debye temperature of this region has been measured and appears to be only half that of the undeformed crystal. The static displacements of atoms in the slip band and far from it have been measured. Rods of NaCl, 0.8 x 0.8 mm in cross-section, were examined at room temperature and at liquid-oxygen temperature by rotation photograph. The films were photometered to give the 200, 400 and 600 integrated intensities. The formula:

$$\log \gamma_{hkl} = \log \frac{I'_o}{I''_o} - \frac{12h^2}{mk\theta} \psi(\theta, T_1, T_2) \frac{\sin^2 \phi}{\lambda^2}$$

Card 1/3 was used;

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The Determination of Micro-distortions in the Slip Bands in Rock Salt

$\gamma_{hk\lambda} = I'_{hk\lambda} / I''_{hk\lambda}$ is the ratio of the integrated intensities at room temperature and liquid-air temperature, Θ is the Debye temperature and ψ the difference in the Debye functions. The Debye temperature for the undeformed material was found (from 7 specimens) to be $281 \text{ }^\circ\text{K} \pm 7$. A larger crystal $10 \times 10 \times 6$ mm was deformed by compression by a load of 500 g/mm^2 and a rod containing the deformed part was sawn out. The slip plane was parallel to the axis of rotation. The Debye temperature was here found to be $160 \text{ }^\circ\text{K} \pm 7$. The mean static displacements \bar{u} of the atoms were calculated from:

$$-8\pi\bar{u}^2 \frac{\sin^2 \psi}{\lambda^2}$$

$$\psi = e$$

The r.m.s. value of \bar{u} was found to be $0.18 \pm 0.02 \text{ \AA}$. The question as to whether all the plastic deformation was localised in the slip band or whether atoms throughout the crystal were statically displaced was studied by

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SOV/70-4-1-15/26
The Determination of Micro-distortions in the Slip Bands in Rock Salt

examining the crystal far from the slip band. The crystal was found to be appreciably less distorted away from the band but displacement of the atoms was still marked. Acknowledgment is made to Academician I.V. Obreimov for his advice. There are 2 figures, 4 tables and 8 Soviet references.

ASSOCIATION: Kharkovskiy filial Instituta reaktivov (Khar'kov Branch of the Institute of Reagents)

SUBMITTED: June 2, 1958

Card 3/3

AUTHORS: Startsev, V.I. and Aronova, P.N. SOV/70-4-3-31/32

TITLE: ~~The Influence of Annealing on the Structure of the~~
Crystal Lattice in a Slipband of Rock Salt

PERIODICAL: Kristallografiya; 1959, Vol 4, Nr 3, pp 438-440 (USSR)

ABSTRACT: Measurement of Laue photographs showed that in the slipbands of deformed crystal of NaCl the crystal lattice is in an unstable state. Annealing at a temperature near to the melting point fully re-establishes the lattice and the interatomic bonding. This is shown by the observation that after annealing the characteristic Debye temperature returns to its proper value. At 600 °C the re-establishment of the lattice begins to proceed intensively and at 400 °C there is practically no change. This is surprising as studies of the phenomenon in specimens of pure metals showed no changes in Debye temperature. A graph is given of the measured Debye temperature and the mean static displacement of the atoms against annealing temperature. The normal undeformed Debye temperature is 280 °K and when the crystal is deformed by a load of

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SOV/70-4-3-31/32

The Influence of Annealing on the Structure of the Crystal Lattice
in a Slipband of Rock Salt

500g/mm² this falls to 150-170 °K. The r.m.s. atomic displacement is about 0.18 Å. Investigations were also made of the scattering background between spots in the Laue photograph which was present only in the deformed state. Full return to the normal state of the crystal required about 10 hours at 760 °C.

There are 1 table, 2 figures and 4 Soviet references.

ASSOCIATION: Khar'kovskiy filial IRYeA

SUBMITTED: September 2, 1958

Card 2/2

24(2)

AUTHORS:

Aronova, P. N., Startsev, V. I.

SOV/48-23-5-14/31

TITLE:

Determination of the Static Displacements of Atoms in the Slipping Band of Rock Salt (Opredeleniye staticheskikh smeshcheniy atomov v polose skol'zheniya kamennoy soli)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 5, pp 606-610 (USSR)

ABSTRACT:

First, reference is made to the method developed by G. V. Kurdyumov and his collaborators for the determination of the static displacement of the atoms in the deformation of metals. It was found that when subjecting metals to cold-treatment their Debye temperature does not change. As was shown by N. A. Brilliantov and N. A. Obreimov, a large number of slip planes is generated on the deformation of parallelepiped rock salt crystals; these planes are visible in the polarization microscope. The determination of the Debye temperature of non-deformed crystals is then dealt with, and the values obtained are tabulated. Sample measurements are given in connection with the Debye temperature in the slipping bands. A micropicture of such a slipping band with a polarization microscope is then

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Determination of the Static Displacements of Atoms
in the Slipping Band of Rock Salt

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shown, and the values measured on some samples are also specified. Next, mention is made of the relationship between the mean displacement square and the Debye function, and the computed values of the root mean displacement squares of the atoms are specified. The static deformation is dealt with next. Measuring values of atom displacement in the slipping band and pertinent values of Debye temperature are tabulated. Results show that plastic deformations are not restricted only to the slipping bands, but that also atoms lying at a considerable distance are affected by them. This unstable atomic state may undergo recrystallization with an appropriate thermal treatment. This is likewise investigated and results are summarized in a table. There are 3 figures, 1 table, and 6 Soviet references.

ASSOCIATION: Khar'kovskiy filial Instituta khimicheskikh reaktivov
(Khar'kov Branch of the Institute of Chemical Reagents)

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START SEV, V.I.

PHASE I BOOK EXPLOITATION

SOV/5053

Vsesoyuznaya konferentsiya po treniyu i iznosu v mashinakh. 3d, 1958.

Iznos i iznosostoykost'. Antifrictionnyye materialy (Wear and Wear Resistance, Antifriction Materials) Moscow, Izd-vo AN SSSR, 1960. 273 p. Errata slip inserted. 3,500 copies printed. (Series: Its: Trudy, v. 1)

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Resp. Ed.: M. M. Khrushchov, Professor; Eds. of Publishing House: M. Ya. Klebanov, and S. L. Orpik; Tech. Ed.: I. V. Polyakova.

PURPOSE: This collection of articles is intended for practicing engineers and research scientists.

CONTENTS: The collection, published by the Institut mashinovedeniya, AN SSSR (Institute of Science of Machinery, Academy of Sciences USSR) contains papers presented at the III Vsesoyuznaya Konfrentsiya po treniyu i iznosu v mashinakh (Third All-Union Conference on Friction and Wear in Machines) which was held April 9-15, 1958. Problems discussed were in 5 main areas: 1) Hydrodynamic Theory of Lubrication and Friction; 2) Lubrication (Chairman: Ye. M. Gut'yar, Doctor of Technical Sciences); and 3) Lubricant Materials (Chairman: G. V. Vinogradov, Doctor of Chemical Sciences); 4) Dry and Boundary Friction (Chairman: B. W. Daryagin, Corresponding Member of the Academy of Sciences USSR, and I. V. Kragel'skiy, Doctor of Technical Sciences); 5) Wear and Wear Resistance (Chairman: M. M. Khrushchov, Doctor of Technical Sciences); and 6) Friction of Technical Materials (Chairmen: I. V. Kragel'skiy, Doctor of Technical Sciences, and M. M. Khrushchov, Doctor of Technical Sciences). Chairman of the general assembly (on the first and last day of the conference) was Academician A. A. Blagonravov. I. Yu. Kruzhanskiy, Candidate of Technical Sciences, was scientific secretary. The transactions of the conference were published in 3 volumes, of which the present volume is the first. This volume contains articles concerning the wear and wear resistance of antifriction materials. Among the topics covered are: modern developments in the theory and experimental science of wear resistance of materials, specific data on the wear resistance of various combinations of materials, methods for increasing the wear resistance of certain materials, the effects of friction and wear on the structure of materials, the mechanism of the seizing of metals, the effect of various types of lubricating materials on seizing, abrasive wear of a wide variety of materials and components under many different conditions, modern developments in antifriction materials, and the effects of finish machining on wear resistance. Many personalities are mentioned in the text. References accompany most of the articles.

Gorb M. E. X-Ray Investigation of the Structure of Steel Deformed by Nonuniform Volumetric Compression at Normal and Elevated Temperatures	128
Iakheles, P. Ya. and V. I. Starobin. On the Stresses and Structural Transformations in Steel Due to Wear	136
Kleikova, E. P. Gripping of Metals Under Ordinary Conditions and the Action of Normal Loads	144
Kostetskiy B. I., P. I. Topolova, and I. G. Voskovskiy. Secondary Structures on Friction Surfaces, and the Wear of Metals	152
Krubarskiy, I. M., M. P. Fepliyda, D. B. Voskoboinikov, O. P. Podgornaya, and M. L. Turpovskiy. Dynamics of Structural Transformations in the Case of Wear	163

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GORDOV, A.N.; KIRENKOV, I.I.; LAPINA, E.A.; ERGARDT, N.N.; STARTSEV, V.I.,
red.; KUZNETSOVA, M.I., red.izd-va; MATVEYEVA, A.Ye., tekhn.red.

[Measuring high temperatures] Metody izmereniia vysokikh temperatur.
Moskva, Gos.izd-vo standartov, 1960. 52 p. (Seria obzornykh mono-
grafii po izmeritel'noi tekhnike, no.12).

(MIRA 13:12)

(Pyrometry)

STARTSEV, V.I., otv. red.; ALEKSANDROV, B.S., red.; BELYAYEV, L.M.,
red.; ERUDZ', V.G., red.; VOYTOVETSKIY, V.K., red.;
GALANIN, M.D., red.; DISTANOV, B.G., red.; KLIMOV, A.P.,
red.; SEMENENKO, M.G., red.; SHAMOVSKIY, L.M., red.

[Scintillators and scintillation materials] Stsintilliatory i
stsintilliatSIONnye materialy. Moskva, Gos. komitet Soveta
Ministrov SSSR po khimii, 1960. 319 p. (MIRA 15:4)

1. Koordinatsionnoye soveshchaniye po stsintilliatoram. 2nd, 1957.
(Scintillation counters)

S/123/61/000/012/012/042
A004/A101

AUTHORS: Iokheles, F. Ya.; Startsev, V. I.

TITLE: Investigating the microstructure, stresses and wear of 18 (18KhNVA) grade steel subjected to three different heat-treatment conditions

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 12, 1961, 81, abstract 12B576 (V sb. "Povysheniye iznosostoykosti i sroka sluzhby mashin. v. 1" Kiyev, AN UkrSSR, 1960, 242-249)

TEXT: The authors investigated the resistance to wear of 18KhNVA grade steel utilized for heavily loaded gears after bending subjected to heat treatment used at the plant (cementation, double tempering at 650°C with 6 hours 30 min. holding, oil-hardening from 850°C , tempering at $140-160^{\circ}\text{C}$ for 2 hours); high-temperature hardening (heating after cementation in a salt bath at 985°C , 10 min holding, tempering at $140-160^{\circ}\text{C}$), and step-by-step hardening (after cementation and high tempering the parts were heated to $810 \pm 10^{\circ}\text{C}$, 25 minutes holding, transferred to an oil bath with a temperature of $160-170^{\circ}\text{C}$, 5 min holding and cooling in air; tempering at 150°C). For the manufacture of gears the authors recommend

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Investigating the microstructure ...

S/123/61/000/012/012/042
A004/A101

to use step-by-step hardening which reduces deformations and inner stresses and increases the resistance to wear. There are 8 figures and 10 references.

N. Il'ina

[Abstracter's note: Complete translation]

Card 2/2

GEGUZIN, Ya.Ye.; SPARTSEV, V.I.; BURAVLEVA, M.G.; MADIKYAN, R.A.; NARBUT,
T.P.; SHPUNT, A.A.

Cloudiness ("agine") of pellets pressed from ionic crystal powders.
Kristallografiia 5 no.2:295-302 Mr-Ap '60. (MIRA 13:9)

1. Kharkovskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta
khimicheskikh reaktivov.
(Salt) (Potassium chloride)

BENGUS, V.Z.; LAVRENT'YEV, F.F.; SOYFER, L.M.; ~~STARITSKY, V.I.~~

Exposure of dislocations in calcite crystals. Kristallografiia
5 no.3:441-445 My-Je '60. (MIRA 13:8)

1. Khar'kovskiy filial Vsesoyuznogo nauchno-issledovatel'skogo
instituta khimicheskikh reaktivov.
(Calcite crystals)

STARTSEV, V.I.

S/070/60/005/03/006/008

E132/E360

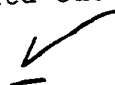
AUTHORS: Lavrent'yev, F.F., Soyfer, L.M., and Startsev, V.I.

TITLE: Thermal Etching and Annealing of Twinned Layers in Crystals of Antimony

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 3, pp.472-475

TEXT: The study of twinned layers with dimensions 5 to 20 μ in single crystals of antimony has shown that annealing at 600 °C (for less than 5 hours) leads to the establishment of mono-crystallinity in the specimen. The twin boundaries and the glide steps are the place where the most intense thermal etching occurs. Edge dislocations have been discovered both in the parent crystal and in the twinned part. The dislocation lines lie in the 111 plane. The 111 planes in antimony are the directions of the principal cleavage. The crystals of antimony were obtained, after preliminary zone refining, by the Shubnikov-Obreimov method. Specimens were in the form of plates 2-3 mm thick and 10-12 mm in diameter. They were prepared by cleaving the crystal which had been grown. The deformation produced in this process gave rise to the twinned layers mentioned. The examination was carried out

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S/070/60/005/03/006/008

E132/E560

Thermal Etching and Annealing of Twinned Layers in Crystals of Antimony

with a MIM-7 metallurgical microscope using oblique illumination and by the divergent-beam X-ray technique (reflexions from 111 and 001 planes being used): Annealing at 600 ° was carried out in a current of hydrogen. Intense thermal etching accompanied the annealing process. A special high-temperature camera was used to follow the course of the etching under these conditions. There are 5 figures and 11 references: 8 Soviet and 3 English.

ASSOCIATION: Khar'kovskiy institut mekhanizatsii i elektrifikatsii sel'skogo khozyaystva (Khar'kov Institute for the Mechanisation and Electrification of Agriculture)

SUBMITTED. September 18, 1959

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3/070/60/005/005/019/026/XX
E132/E160

AUTHORS: Startsev, V.I., Bengus, V.Z., Lavrent'yev, F.F., and Soyfer, L.M.

TITLE: The Formation of Dislocations in the Twinning of Calcite

PERIODICAL: Kristallografiya, 1960, Vol.5, No.5, pp.737-743

TEXT: It is found that in calcite a twin boundary not containing dislocations is made visible by selective etching although the intensity of etching is significantly less than the intensity of etching at dislocations. The existence of incoherent twin boundaries containing dislocations has been experimentally shown. In the crystal in the twinning process complete dislocations are formed. The twins were produced by Garber's method (Ref.5). Twin layers were studied on the face of the crystal not forming steps on twinning, i.e. 100 or 010. The twin plane could be indexed as 110 with the boundaries of the twinned layers parallel to [001].

There are 4 figures and 12 references: 11 Soviet and 1 English.

ASSOCIATION: Vsesoyuznyy institut khimicheskikh reaktivov,
Khar'kovskiy filial (All-Union Institute for Chemical Reagents, Khar'kov Branch)

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RECEIVED: February 2, 1960

S/051/60/008/04/018/032
E201/E691

AUTHORS: Tsirlin, Yu. A., Startsev, V.I. and Soyfer, L.M.

TITLE: Luminescent Properties of Caesium Iodide Crystals Grown from Superheated Melt

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 4, pp 537-540 (USSR)

ABSTRACT: Knoepfel, Loepfe, Stoll et al., (Refs 1-3) reported that CsI crystals grown from superheated (to 800-900°C) melts exhibit luminescence and have an α-yield of 9.3%. The present authors repeated Knoepfel, Loepfe, Stoll et al's work using analytically pure (Series 1), zone-refined (Series 2) and very pure (Series 3) CsI crystals. Crystals of Series 1 and 2 were found to contain 2.3×10^{-4} - $2.7 \times 10^{-5}\%$ Tl; their absorption spectra (Fig 1) had a Tl band at 299 mμ. Series 3 crystals were subjected to chromatographic purification and quadruple re-crystallization; this treatment reduced the amount of Tl in them to below $10^{-7}\%$ (Fig 2) and no scintillations were observed on excitation with γ-rays. Samples of each series were placed in carefully cleaned quartz ampules, which were evacuated, sealed and heated for up to 5 hours at 900°C. After such heating temperature of the melt was reduced and new crystals were grown at the rate

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Luminescent Properties of Caesium Iodide Crystals Grown from Superheated Melt

of 3-5 mm/hour. The relative γ -scintillation yields of crystals of each series are shown in Fig 3. Series 1 yields rose with the duration of superheating to about 60% (after 5 hours heating), while those of Series 2 and 3 rose to over 10% after 1-2 hours and on further superheating fell to below 10%. The results obtained show clearly that luminescence produced by superheating cannot be due to thallium impurities, but it is probably caused by dissolution of quartz impurities and consequent activation of CsI with silicon; the hypothesis of Knoepfel, Loepfe, Stoll et al. that this luminescence is due to iodine vacancies was rejected by the authors. Acknowledgments are made to N.S. Budnik and L.G. Maystrenko for help in growing of crystals and measurements on them, and to A.N. Panova for obtaining the absorption spectra. There are 4 figures and 9 references, 4 of which are Soviet, 4 Swiss and 1 Italian. ✓

SUBMITTED: July 13, 1959

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S/051/60/008/04/019/032
E201/E691

24.3500
AUTHORS:

Startsev, V.I., Baturicheva, Z.B. and Tsirlin, Yu.A.

TITLE:

The Temperature Dependence of Luminescence of NaI(Tl) Crystals at Temperatures of 0-270°C. 21

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 4, pp 541-544 (USSR)

ABSTRACT:

The reported (Refs 1-4) temperature dependences of the intensity of luminescence of NaI(Tl) are contradictory. The aim of the present work was to study the temperature dependence of the intensity of luminescence of NaI(Tl) with 0.05-0.1% Tl excited with γ -rays. The temperature dependence was obtained between 0 and 270°C at the rates of heating varying from 15 to 90 deg/hour. An NaI(Tl) crystal of 13 mm diameter and height (4 in Fig 1) was placed in an aluminium container 6 inside a copper block 3 which was joined by means of a copper rod with a heater. Temperatures were measured with a copper-constantan thermocouple and the temperature difference between the surface and the centre of the crystal did not exceed 2°C. A photo-multiplier 9 (FGU-19) was separated from the crystal by a plane-parallel glass plate 7 and it was air cooled. The crystal was excited with γ -rays from Cs137 ($E_\gamma = 661$ keV). Dependence of the anode current of the

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The Temperature Dependence of Luminescence of NaI(Tl) Crystals at Temperatures of 0-270°C

photomultiplier on the crystal temperature (integral measurements) was obtained by means of a microammeter M-91a across which a 10 μ F capacitance was connected (this ensured that $x = RC$ of the system was 4 sec). Alternately a pre-amplifier was connected to the photomultiplier anode and pulses from its output were fed to an oscillograph 25I and photographed (pulse measurements). The decay time was deduced from the form of the dependence of the pulse amplitude on the absolute temperature T and on x . After several heating-cooling cycles (Fig 2, curves 1 and 2) the intensity of luminescence was found to decrease linearly with rise of temperature at the rate of 0.12 ± 0.03 %/deg (Fig 2, curve 3). Luminescent properties of the crystals were not affected by the amount of thallium between 0.05 and 0.1%. At room temperature the main component of luminescence, amounting to 90-95% of the total signal, had a decay time $\tau_1 = 0.25$ μ sec; the remaining 5-10% of luminescence had a decay time $\tau_2 = 0.7-1.2$ μ sec. Dependence of the decay time τ_1 on temperature is shown in Fig 5. Theoretical dependences of the photomultiplier signal V on the absolute temperature T and on $x = RC$ calculated using $\tau(T)$ and $V_0(T)$, where $V_0 = \lim V$ as $RC \rightarrow 0$. The theoretical

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The Temperature Dependence of Luminescence of NaI(Tl) Crystals at Temperatures of 0-270°C

curves agreed satisfactorily with the authors' experimental results (Ref 3) and with the data of Webb and Johanson (Ref 2) and Kinard (Ref 3), but they differed from the results reported by Solon et al., (Ref 1) and by Meessen (Ref 4). There are 5 figures and 7 references, 1 of which is Soviet, 5 English and 1 French. ✓

SUBMITTED: July 17, 1959

Card 3/3

S/020/60/134/004/006/023
B019/B067

AUTHORS: Soyfer, L. M. and Startsev, V. I.

TITLE: Some Phenomena Which Were Observed During the Deformation of Antimony Monocrystals 21

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 4, pp. 795 - 798

TEXT: The authors investigated the twinning process of antimony mono-crystals caused by mechanical deformations by studying selective corrosion which allows dislocations to be determined. The samples (thin disks, 2 - 3 mm thick, diameter: 10 - 15 mm) were cut out from the mono-crystal in the direction of the (111) cleavage traces, the caustic solution was composed of 9 unit volumes of concentrated nitric acid and 4 unit volumes of distilled water. As appears from Figs. 1 and 2 a dis-twinning leads to an incomplete regeneration of the crystal lattice and causes lattice defects. These defects in turn cause a hardening of the crystal. The experiments also showed that the dislocations may form at any point of the twinning layers. As is shown by theoretical

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Some Phenomena Which Were Observed During
the Deformation of Antimony Monocrystals

S/020/60/134/004/006/023
B019/B067

considerations and by experiments (Refs. 3, 4) elastic twinning does not lead to disorientation of these two blocks if the angle between the two blocks is not more than $2 - 3^\circ$. During the study of selective corrosion it was observed that this angle is smaller than $1/2^\circ$. Finally, it is demonstrated that dislocations occur in high-purity antimony monocrystals on bending the crystals also by a gliding of the crystallographic planes. This is in contrast with the assertions made earlier (Ref. 7). R. I. Garber and V. M. Kosevich are mentioned. The authors thank V. G. Bengus and F. F. Lavrent'yev for the discussion of the results. There are 4 figures and 7 Soviet references. ✓

ASSOCIATION: Khar'kovskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta khimicheskikh reaktivov (Khar'kov Branch of the All-Union Scientific Research Institute of Chemical Reagents)

PRESENTED: May 11, 1960, by I. V. Obreimov, Academician

SUBMITTED: April 29, 1960

Card 2/2

BENGUS, V.Z.; KOMNIK, S.N.; STARISEV, V.I.

Generation of dislocations in calcite crystals. Kristallografiia
6 no.4:599-604 JI-Ag '61. (MIRA 14:8)

1. Vsesoyuznyy institut khimicheskikh reaktivov, Khan'kovskiy
filial.

(Dislocations in crystals) (Calcite crystals)

BENGUS, V.Z.; KOMNIK, S.N.; STARTSEV, V.I.

Certain phenomena observed on the boundaries of a twinning
interlamination in calcite. Kristallografiia 6 no.4:614-620
Jl-Ag '61. (MIRA 14:8)

1. Vsesoyuznyy institut khimicheskikh reaktivov, Khar'kovskiy
filial.

(Dislocations in crystals) (Calcite crystals)

S620/61/138/005/012/025
B:04/B205

25312

24,7500

AUTHORS: Soyfer, L. M., and Startsev, V. I.

TITLE: Motion of dislocations in antimony crystals

PERIODICAL: Akademiya Nauk SSSR. Doklady, v. 138, no. 5, 1961.
1084-1087

TEXT: The motion of dislocations in antimony crystals has been studied by a selective etching method described in a previous paper of the authors (DAN, 131, no. 4, 795 (1960)). A previously etched crystal was fastened in a glass vessel such that a narrow slit was left between the bottom of the vessel and the face to be examined. The etching solution was poured into the slit. The pressure applied to the crystal was high enough to ensure free motion of dislocations, which was examined under a microscope and photographed. The motion of dislocations was clearly visible. Strongly marked initial and final positions of the etching pits are interconnected by traces of moving pits (weakly marked pits) (see Fig. 1). Crystallographic studies have shown that antimony has three glide patterns characterized by the three $\{11\bar{1}\}$ planes, which appear on the plane examined.

Card 1/5

S/011/61/133/005/012/025
E-11/3225

Motion of dislocations in an ^{annealed} ~~annealed~~ alloy ...

the (111) plane, as the three slip planes $\langle 110 \rangle$. All these glide patterns are produced by pressure, as has already been shown in the previous paper mentioned above. The distances between two fixed positions occupied by a moving dislocation amount to $\sim 10\mu$. The dislocations move at velocities ranging from $1 \cdot 10^7$ to $1 \cdot 10^8$ cm/sec. Their velocity rises with increasing pressure. Studies of twin dislocations indicate that dislocation loops originating at the twin boundaries are widened in their slip planes. This phenomenon was established even without applying external mechanical stress. From the ratio of the density of the loops to the width of the twin layers, the conclusion is drawn that narrow twin layers are stressed more strongly than wide ones. Next, a description is given of the interaction of dislocations, which could be studied by the method applied here. It was found that two dislocations meeting during motion will unite. Further, the authors describe the curvilinear motion of dislocations, in which case the latter do not move in one slip plane but in different planes successively. The motion of dislocations is essentially determined by the surrounding impurity atoms, which reduce their mobility. A marked decrease in the number of dislocations is displayed by freshly grown crystals which are etched under pressure. This phenomenon

Card 2/3

S/O20/61/138/005/012/025
E104/B205

25312

Motion of dislocations in antimony ...

can be prevented by aging at temperatures of 300-400°C, or by storing the specimens for several months. Besides, the mobility of dislocations is markedly reduced, which fact reveals the effect of air. In connection herewith, the reader is referred to A. Kh. Kottrell (*Dislokatsii i plasticheskoye techeniye v kristallakh*, 1958, p. 158). Finally, the authors discuss a method used to demonstrate the motion of dislocations in a single crystal. A thoroughly grown single crystal is known to consist of a mosaic-like arrangement of blocks. The dislocations are situated on the edges of the blocks which are mutually disoriented to a low degree. The dislocation density is directly related to the degree of mutual disorientation of two blocks. When such a crystal is annealed, the boundaries of the blocks are shifted and, consequently, the dislocations start moving. These processes can easily be visualized by a proper treatment of the crystal. F. F. Lavrent'yev and V. Z. Bengus are thanked for valuable discussions. There are 4 figures and 12 references: 7 Soviet-bloc and 5 non-Soviet-bloc. The most important references to English-language publications read as follows: J.J. Gilman, W.G. Johnston, *J. Appl. Phys.*, 30, no. 2, 129 (1959); *Internat. Cont. Lake Placid*, 1956, 1957, p. 116; C.S. Barret, *Trans. Am. Inst. Mining and Met. Eng.* 161, 31

Card 3/5



Motion of dislocations in antimony ...

25312

S/020/61/138/005/012/025
B104/B205

(1945).

ASSOCIATION: Fiziko-tekhnicheskiy institut nizkikh temperatur Akademii nauk USSR (Institute of Physics and Technology of Low Temperatures of the Academy of Sciences UkrSSR)

PRESENTED: March 7, 1961, by G. V. Kurdyumov, Academician

SUBMITTED: March 4, 1961

Card 4/5

S/020/61/141/003/007/021
B104/B212

24-7500

AUTHORS:

Bengus, V. Z., Komnik, S. N., and Startsev, V. I.

TITLE:

Motion of twinning dislocations in calcite

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 141, no. 3, 1961, 607-610

TEXT: The mechanical stress which starts the motion of twinning dislocations, is an important factor in the description of twinning processes. The present paper reports on tests which have been performed to determine these stresses. The motion of twinning dislocations was observed by the method of repeated etching suggested by J. Gilman et al. (Dislocations and Mechanical Properties of Crystals, N. Y., 1957, p. 116). The mechanical stress which caused the motion of twinning dislocation, was induced by pressing the diamond pyramid of a ~~PMT-3~~ (PMT-3) microhardness device into the specimen. By varying the load of the diamond pyramid that load was determined, at which twinning dislocations started moving. For the calculation of the forces acting on each dislocation, strain-field formed by neighboring dislocations had to be allowed for. The stress required for starting a motion ranged between 60 and 15 g/mm², and was dependent on the amount and character of the neighboring dislocations. The authors voice the opinion that these

Card 1/3

X

30720

Motion of twinning dislocations...

S/020/61/141/003/007/021
B104/B212

values might permit the determination of interaction forces between dislocations. The establishment of equilibrium distribution for dislocations in accumulations was analyzed. Results point to the fact that the resistance of dislocations to a motion is equal for all dislocations and is equal to the starting stress. If there is no external stress, then the following

relation will be valid for the starting stress σ_0 : $\sigma_0 = \frac{n G b}{L (1-\nu)}$, where n denotes the number of dislocations in an accumulation G the shear modulus, b the Burgers vector, L the length of the accumulation, and ν Poisson's ratio. This expression was derived on the assumption that the barrier be sufficiently long, that the dislocations be arranged in straight lines, and that the force acting on a dislocation be evenly distributed. Test results are compiled in Table 1. The large spread of σ_0 is caused by the curvature of dislocations and similar properties of the crystal. The authors thank A. I. Landau and L. A. Pastur for discussions. There are 2 figures, 1 table, and 8 references: 3 Soviet and 5 non-Soviet. The three most recent references to English-language publications read as follows: A. H. Cottrell, B. A. Bibly, Phil. Mag., 42, 573 (1951); J. Eshelby, F. Frank, F. Nabarro, Phil. Mag., 42, 351 (1951); J. Bhimasenachar, Proc. Indian
Card 2/3

30/20

Motion of twinning dislocations...

S/020/61/141/003/007/021
B104/B212

Acad. Sci., A22, 199 (1945).

ASSOCIATION: Fiziko-tekhnicheskij institut nizkikh temperatur Akademii nauk USSR (Physicotechnical Institute of Low Temperatures of the Academy of Sciences UkrSSR)

PRESENTED: June 3, 1961, by I. V. Obreimov, Academician

SUBMITTED: June 3, 1961

Table 1: Test results.

n	L, cm	$\sigma, \text{Г/мм}^2$	n	L, cm	$\sigma, \text{Г/мм}^2$
130	0,1126	45	26	0,0111	91
96	0,0635	59	357	0,1500	94
26	0,0170	60	27	0,0112	95
23	0,0134	67	33	0,0127	102
15	0,0068	86	45	0,0128	138

Card 3/3

S/126/62/013/003/016/023
EO91/E135

AUTHORS: Lavrent'yev, F.F., and Startsev, V.I.
TITLE: On the structure of the accommodation region in
monocrystals of zinc and bismuth
PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.3,
1962, 441-450

TEXT: Bismuth and zinc were purified by zone refining, and
monocrystals of these metals of high purity were obtained.
Specimens were cut from the monocrystals along the cleavage plane
at liquid nitrogen temperature (in order to reduce deformation
by slip). On splitting a crystal, stresses are set up under the
action of which twinning bands form. Therefore, application of
additional stress for the production of twins and accommodation
regions is unnecessary. The specimens were studied with a
metallurgical microscope, using oblique illumination, and with
a microinterferometer. In order to expose dislocations in
bismuth, monocrystals of this metal were etched in a solution
consisting of 10 parts H_2SO_4 , 10 parts H_2O and 1 part HNO_3 (67%).
Card 1/3

On the structure of the ...

S/126/62/013/003/016/023
E091/E135

The zinc crystals were irradiated with a converging beam and then annealed. A special attachment to the metallurgical microscope was constructed by means of which changes in the accommodation region during annealing could be kept under constant observation. After annealing, the zinc crystals were again irradiated and studied metallographically. Polygonisation of accommodation regions was observed to occur when the dimensions of the latter exceeded 100 μ . On annealing, fusion of blocks of polygonised accommodation regions occurs. The algebraic sum of the angles between the blocks agrees well with the resultant angles between the blocks produced after fusion, which confirms the dislocation structure of the accommodation region. Selective etching of monocrystals of bismuth showed that dislocations concentrate at the boundary between the accommodation region and the parent crystal. In zinc crystals no polygonisation of accommodation regions of less than 100 μ dimensions takes place during annealing; only a decrease of the width of this region occurs. Accommodation regions, the dimensions of which are less than 15 μ , disappeared completely after annealing for 5 hours at

Card 2/3

STANTSEV, V. I.

Dissertation defended for the degree of Doctor Of Physicomathematical Sciences at the Institute of Crystallography in 1962:

"Experimental Investigations of Crystal Twinning and Several Related Phenomena."

Vest. Akad. Nauk SSSR. No. 4, Moscow, 1963, pages 119-145

L 13033-63 EWT(1)/EWP(q)/EWT(m)/BDS AFFTC/ASD/ESD-3 JD/JW/JG
ACCESSION NR: AP3000617 S/0181/63/005/005/1377/1385

66
63

AUTHOR: Pariyskiy, V. B.; Landau, A. I.; Startsev, V. I.

TITLE: Jerky motion of dislocations in single crystals of LiF ✓

SOURCE: Fizika tverdogo tela, v. 5, no. 5, 1963, 1377-1385 ✓

TOPIC TAGS: dislocation, LiF, barrier, etching test, dislocation loop, annealing, dislocation motion, jerk, irregular motion, dislocation movement, dislocation jump

ABSTRACT: The authors have made a study of jerky movements of dislocations in single crystals of LiF with various impurity contents. The samples were given preliminary annealing treatment for 5 to 24 hours at 750-800C and then etched, either by a weak aqueous solution of Fe ions or by an etchant such as SR-4. No external stress was applied. The etching tests revealed multiple dislocation loops and jerky displacement of the ends of the loops. Time intervals between successive jumps were measured, and the velocity of dislocation motion proved to be on the order of 5 microns per second. The experimental results show that between repeated etchings of a particular crystal the intensity of jerky motion drops very markedly. Hardly a single new jump will occur between two successive etchings within a period of 1-2 minutes. The authors reject a number of possible

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L 13033-63

ACCESSION NR: AP3000617

3

explanations previously proposed, and they conclude that the jerky motion is associated with periodic restraints placed on the dislocations at barriers. Such barriers may be dislocations of other slip systems, packing defects, accumulation of vacancies or impurity atoms, or other flaws. These barriers are removed successively by etching the crystal surface, freeing the end of the dislocation to move till it is pinned at a new barrier. "In conclusion, the authors express their gratitude to L. M. Soyfer for his aid in the work and also to Y. M. Borzhkovskaya for getting the manuscript ready for printing." Orig. art. has: 5 figures, 2 tables, and 2 formulas.

ASSOCIATION: Fiziko-tehnicheskii institut nizkikh temperatur AN USSR, Khar'kov
(Physicotechnical Institute of Low Temperatures, Academy of Sciences, USSR)

SUBMITTED: 27Dec62

DATE ACQ: 11Jun63

ENCL: 00

SUB CODE: 00

NO REF SOV: 004

OTHER: 005

Card 2/2

L 18099-63 EWT(1)/EWP(q)/EWT(m)/BDS AFFTC/ASD/ESD-3 JD
ACCESSION NR: AP3004101 S/0070/63/008/004/0632/0640

AUTHORS: Startsev, V. I.; Bengus, V. Z.; Komnik, S. N.; Lavrent'yev, F. F.

TITLE: Interaction of dislocations during twin growth in crystals

SOURCE: Kristallografiya, v. 8, no. 4, 1963, 632-640

TOPIC TAGS: dislocation, interaction, crystal, twinning, zinc, calcite, relief

ABSTRACT: The authors have studied the interaction of dislocations in zinc and calcite crystals. A high density of twinning dislocations and their paired correlates in the neighboring edges of fine twin layers in calcite have been detected experimentally. It has been found that the stress necessary to shift the edge of a thin twin layer (less than 1/μ) is much greater than that necessary to move the twin edge of a thicker layer. Different kinds of pile-ups of twinning dislocations were observed experimentally at the edges of twin layers. It has been shown that the distribution pattern of dislocations in these pile-ups is determined by the type of deposit. Experiments have also proved that the region of accommodation is repelled from the twin boundary in zinc crystals (because of the interaction of twinning and writ dislocations. It has been shown that the lack of agreement between the experimentally measured relief created by twinning in zinc and the relief

Card 1/2

L 18099-63

ACCESSION NR: AP3004101

plotted from geometrical constructions is due to slippage in a twin. The interaction of twinning and unit dislocations during untwinning of zinc crystals leads to the formation of nonbasic partial dislocations (observed experimentally), which may be the cause of increased strength. Orig. art. has: 6 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut nizkikh temperatur AN USSR (Physical and Technical Institute of Low Temperatures, Academy of Sciences, Ukrainian SSR)

SUBMITTED: 06Mar63

DATE ACQ: 15Aug63

ENCL: 00

SUB CODE: FH

NO REF SOV: 007

OTHER: 005

Card 2/2

ACCESSION NR: AP4033100

S/0120/64/000/002/0024/0028

AUTHOR: Afanas'yev, N. G.; Vy*sotskaya, A. V.; Gol'dshteyn, V. A.;
Startsev, V. L.

TITLE: Using a double-focusing magnetic spectrometer for recording a wide
part of an electron spectrum

SOURCE: Pribory* i tekhnika eksperimenta, no. 2, 1964, 24-28

TOPIC TAGS: spectrometer, magnetic spectrometer, double focusing magnetic
spectrometer, electron spectrum, nuclear science

ABSTRACT: A uniform-field spectrometer with a thick nuclear photoplate
mounted along the focal line as a detector was used for recording a wide
spectrum. Calculation and experimental verification of the focal line are given;
horizontal and vertical aberrations are calculated; the vertical form of the
spectral line for 2- and 4-mm-diameter sources was estimated and measured.

Card 1/2

ACCESSION NR: AP4033100

The resolution, aperture ratio, and line form of the spectrometer were accurately determined by the photo method. The resolution, 0.2 and 0.4%, and the aperture ratio, 0.95×10^{-2} and 0.38×10^{-2} ster, for the above sources, respectively, were found to be almost constant for the entire energy range and in good agreement with their estimated values. Orig. art. has: 9 figures, 16 formulas, and 3 tables.

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

SUBMITTED: 18May63

DATE ACQ: 11May64

ENCL: 00

SUB CODE: NS

NO REF SOV: 002

OTHER: 000

Card 2/2

L 13748-65 AEDC(b)

S/0120 /64/000/005/0048/0054

ACCESSION NR: AP4047458

AUTHOR: Afanas'yev, N. G.; Vy*sotskaya, A. V.; Gol'dshteyn, V. A.;
Dem'yanov, A. V.; Startsev, V. I. B

TITLE: Magnetic spectrometer for electrons with energy up to 100 Mev

SOURCE: Pribery* i tekhnika eksperimenta, no. 5, 1964, 48-54

TOPIC TAGS: spectrometer, magnetic spectrometer, magnetic spectrometer
focusing

ABSTRACT: Design principles, construction, and experimental results obtained with a uniform-field double-focusing magnetic spectrometer are reported. By using circular borders, perfect horizontal focusing and satisfactory vertical focusing have been ensured; the measurement of nuclear-reaction products within 22-158° is possible; the magnet gap is 29 mm; the spectrometer input and output are equipped with magnetic shields. The design features of the spectrometer are

Card 1/3

L 13748-65

ACCESSION NR: AP4047458

shown in Enclosure 1. The main windings are supplied by an 11-kw dynamo-electric amplifier. Resolution, for 2- and 4-mm-dia sources, is 0.2 and 0.4%, respectively; the capture angle in the median plane is 18° . Other design data is given. Calculation of horizontal aberrations is made up to the 4th order and vertical aberrations up to the 3rd order. Orig. art. has: 9 figures and 4 formulas.

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

SUBMITTED: 12Nov63

ENCL: 01

SUB CODE: OP, NP

NO REF SOV: 004

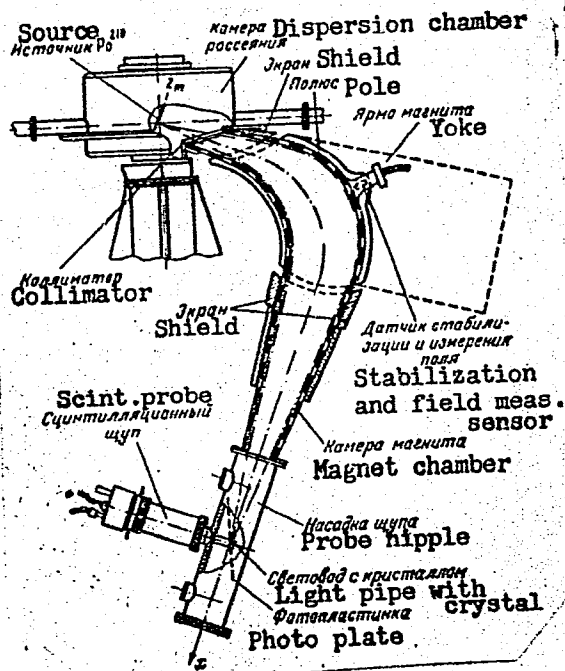
OTHER: 005

Card 2/3

L 13748-65
ACCESSION NR: AP4047458

ENCLOSURE: 1

Magnetic spectrometer and
a counter for checking
the focusing



Card 3/3

ACCESSION NR: AP4039652

S/0181/64/006/006/1671/1674

AUTHORS: Soldatov, V. P.; Startsev, V. I.

TITLE: Elastic twinning in bismuth crystals

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1671-1674

TOPIC TAGS: elastic twinning, bismuth, lattice defect, twin wedging

ABSTRACT: The setup for inducing elastic twinning is illustrated in Fig. 1 on the Enclosure. The load was measured by a slotted spring dynamometer with an indicator (with a precision of 25 g). The sample was immersed in liquid nitrogen for the experiment. Twinning developed in Bi at this temperature by the appearance of elastic twins, much like the growth of twins in calcite and antimony at room temperature. At some value of internal stress, thin wedge-like twin layers formed under the knife edge or near it, growing with increase in load. In their experiments, the authors were unable to determine any definite relationship between thickness and length of the elastic twins. It was necessary always to apply some finite load to the crystal to induce the elastic twinning. This value varied from experiment to experiment, but was always small, near 0.3-0.5 kg. This suggests some incipient mechanism for the formation of such twins. The actual causes may

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ACCESSION NR: AP4039652

be many. It is concluded that each act of acquiring and of losing twinning leaves its trace in the crystal. Defects are apparently formed in the crystal lattice where twinning develops, and these defects accumulate with increase in number of loading cycles, facilitating the wedge-like growth of the elastic twins. Gliding may be an important factor in this twin growth. Orig. art. has: 4 figures.

ASSOCIATION: Fiziko-tehnicheskii institut nizkikh temperatur AN UkrSSR Kharkov
(Physicotechnical Institute of Low Temperatures AN UkrSSR)

SUBMITTED: 17Dec63

ENCL: 01

SUB CODE: SS

NO REF SOV: 008

OTHER: 000

Card 2/3

ACCESSION NR: AP4039652

ENCLOSURE: 01

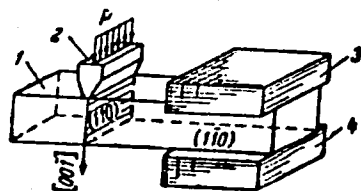


Fig. 1. Setup for deforming samples
1- sample; 2- knife edge; 3- cleats.

Card 3/3

AFANAS'YEV, N.G.; VYSOTSKAYA, A.V.; GOL'DSHTEYN, V.A.; DEM'YANOV, A.V.;
STARTSEV, V.I.

Magnetic spectrometer for electrons with an energy up to
100 Mev. Prib. i tekh. eksp. 9 no.5:48-54 S-0 '64. (MIRA 17:12)

1. Fiziko-tehnicheskii institut AN UkrSSR.

L 25086-65 EWT(1)/T/EEC(b)-2 IJP(c)

S/0181/65/007/001/0127/0131 ¹⁵

ACCESSION NR: AP5003424

AUTHORS: Konnik, S. N.; Bengus, V. Z.; Startsev, V. I. ¹⁶

TITLE: Role of the dislocation generation process in the twinning of calcite ¹⁷

SOURCE: Fizika tverdogo tela, v. 7, no. 1, 1965, 127-131

TOPIC TAGS: calcite, twinning, dislocation production, dislocation motion

ABSTRACT: It is pointed out that earlier investigations of the kinetics of expansion of stable twin layers in calcite yielded data which did not make it possible to separate the displacement of the twin dislocations from the multiplication of the dislocations. In the present article a study was made of natural calcite crystals, split along the cleavage planes (measuring 3 x 6 x 12 mm), with a thin twin layer produced in the sample (thickness ~10 μ) with the

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L 25086-65

ACCESSION NR: AP5003424

aid of a knife-edge indenter. The layer crossed parallel faces of the crystal, thus ensuring a constant crystal cross section during the deformation process. The expansion of the stable twin layer was by means of pure shear deformation at a constant rate. The deformation rate could be varied in the interval $0.1\text{--}10\mu/\text{sec}$. The dependence of the width of the layer on the time, and also on the applied load, were measured. The load was measured accurate to $\pm 5\text{ g}$ and the expansion of the layers was observed directly in a microscope (polarized light) under magnification much larger than 200. The defect structure of the crystals was displayed by selective chemical etching. The results are shown that natural calcite crystals have different defect structures. The density and the character of the distribution of the dislocation and of the background are highly varied. It is shown that the kinetic of the expansion of stable twin layers in crystals of calcite is determined by the defect structure of the crystals. The process of expansion of the stable twin layers in the calcite is controlled by the creation of

Card

2/3

L 25086-65

ACCESSION NR: AP5003424

twin dislocations, and not by the dislocation motion; the expansion is facilitated if the centers of initiation of the twin dislocations are uniformly distributed over the volume of the crystal. Crystals which were apparently perfectly transparent and did not differ in absorption displayed great differences in the defect structure when etched. A background of point defects was also seen. Orig. art. has: 3 figures. The value obtained for the coefficient of stress concentration was approximately 10^4 .

ASSOCIATION: Fiziko-tekhnicheskiy institut nizkikh temperatur AN SSSR, Khar'kov (Physicotechnical Institute of Low Temperatures)

SUBMITTED: 04Jul64

ENCL: 00

SUB CODE: SS, NP

NR REF SOV: 008

OTHER: 003

Card

3/3

STARTSEV, V.I., inzh.; STREL'CHENKO, I.I.; ANTIPOV, V.A.; BOYKO, A.M.;
PILIPENKO, G.I.; STOLIKA, S.I.

Performance of Communist Youth League brigades. Ugol' 39
no.11:27-32 N '64. (MIRA 18:2)

1. Kombinat Kuzbass ugol' (for Startsev). 2. Shakhta No.5-bis
"Trudovskaya" (for all except Startsev).

САНДИН, С.И.; БИРЮКОВ, И.И.; СТАВРОСКИ, В.И.

Role of the formation of dislocations in cable drawing.
Fiz. tver. tela 7 no.1:129-131 Ja '65.

(MIRA 18:3)

1. Fiziko-tekhnicheskii institut niskikh temperatur AN SSSR,
Khar'kov.

АРАПОВ, Р.Р.; СТАРТСЕВ, В.И.

Securing unified measurements is an important condition for
the improvement of production quality. Izv. tekhn. no.4:48-49
Ap '65. (MIRA 18:7)

LORIKYAN, M.P.; STARTSEV, V.I.

Simple stable source for light flashes. Prib. i tekh. eksp. 10 no.1:
219 Ja-F '65. (MIRA 18:7)

1. Fizicheskiy institut Gosudarstvennogo komiteta po ispol'zovaniyu
atomnoy energii SSSR i Fiziko-tekhnicheskiy institut AN UkrSSR.

L 00736-66 EPF(c)/EWT(m) RM

ACCESSION NR: AP5022694

UR/0181/65/007/009/2607/2611

AUTHOR: Bol'shutkin, D. N.; ⁶⁵Leont'yeva, A. V.; ⁵⁵Snigirev, V. G.; ⁵⁵Startsev, V. I.

TITLE: Hardness of crystalline methane ^{1, 55}

40
34
B

SOURCE: Fizika tverdogo tela, v. 7, no. 9, 1965, 2607-2611

TOPIC TAGS: hardness, methane, solid state

ABSTRACT: The authors study the effect of temperature on hardness and creep in polycrystalline methane at nitrogen and hydrogen temperatures. Since methane is actively dissolved by nitrogen and hydrogen, the specimens were prepared and their hardness was determined in the same hermetically sealed cryostat. The specimens were transparent without visible flaws and had a smooth horizontal surface. The hardness of the methane was determined by sinking a conical indenter into the specimen. The loading unit of the instrument consists of a metal cylinder with a weight of $P = 600$ g. On the lower section of the cylinder are three conical indenters with vertex angles of 90° located equidistantly around the cylinder. Penetration of the indenter was monitored on a cathetrometer with an accuracy of 0.01 mm. In determining the hardness, penetration of the indenter is given as $h = h_1 + h_2$ where h_1 is penetration under a load $P_1 = 10$ g, which is read on a spring indicator; h_2

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L 00736-66

ACCESSION NR: AP5022694

is penetration of the indenter when the load is increased from 10 to 200 g. Since the hardness H , measured by the conical indenter, is independent of the load, then

$$H = \frac{P}{\pi h^2} = \frac{P_1}{\pi h_1^2}$$

and consequently

$$H = \frac{P}{\pi \left(\sqrt{\frac{P_1}{\pi H}} + h_2 \right)^2}$$

from which the following relationship was derived for calculating the hardness

$$H = \frac{(\sqrt{P} - \sqrt{P_1})^2}{\pi h_2^2}$$

The hardness of crystalline methane is given as a function of temperature in fig. 1 of the Enclosure. Curves for argon and krypton are given for comparison (C. Trepp, *Schweizer archiv.*, Bd. 24, 191, 230, 1958). A reduction in temperature was found to reduce the creep effect in solid methane. A physical explanation is given for the effect of temperature on hardness and creep on the basis of the dislocation

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L 00736-66

ACCESSION NR: AP5022694

theory. "In conclusion, the authors thank B. Ya. Sukharevskiy for help in the work and valuable advice, and V. Z. Bengus for consultation." Orig. art. has: 4 figures, 8 formulas, 1 table. 6

ASSOCIATION: Fiziko-tekhnicheskiy institut nizkikh temperatur AN UkrSSR, Kharkov (Physicotechnical Institute of Low Temperatures, AN UkrSSR) 5/2

SUBMITTED: 15Feb65

ENCL: 01

SUB CODE: SS

NO REF SOV: 003

OTHER: 005

Card 3/4

L 00736-66

ACCESSION NR: AP5022694

ENCLOSURE: 01

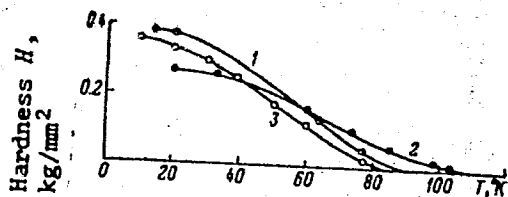


Fig. 1. Curves for hardness as a function of temperature in CH₄, (1); Kr (2); Ar (3).

Card 4/4

L 9252-66 EWT(1)/EWT(m)/EWP(w)/T/EWP(t)/EWP(b) IJP(c) JD
ACC NR: AP5022724 SOURCE CODE: UR/0181/65/007/009/2789/2792

AUTHOR: ^{44,55} Bol'shutkin, D. N.; ^{44,55} Prokhvatilov, A. I.; ^{44,55} Sil'vestrova, T. V.; ^{44,55} Startsev, V. I.

ORG: ^{44,55} Physicotechnical Institute of Low Temperatures AN UkrSSR, Kharkov (Fiziko-⁵⁴tekhnicheskiy institut nizkikh temperatur AN UkrSSR)

TITLE: Mechanical properties of polycrystalline ammonia under unilateral compression ⁷

SOURCE: Fizika tverdogo tela, v. 7, no. 9, 1965, 2789-2792

TOPIC TAGS: ammonia, solid mechanical property, ^{21,44,55} low temperature physics

ABSTRACT: The strength and ductility of polycrystalline ammonia are studied as functions of temperature under unilateral pressure. Cylindrical specimens 10 mm in diameter and 40 mm long with uniform microstructure and polished ends were studied at temperatures from 77 to 160°K. Curves are given for the breaking point, limit of proportionality and relative compression as functions of temperature. These data show that crystalline ammonia has extremely low strength properties and ductility. Solid ammonia is quite brittle at the temperature of liquid nitrogen and shows elastic deformation right up to the breaking point. At stresses of 0.5-0.6 kg/mm², cracks are formed parallel to the axis of the specimen with an accompanying characteristic

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L 9252-66

ACC NR: AP5022724

sound and a slight reduction in loading (up to 100 g). The final breaking stress of $\sim 0.8 \text{ kg/mm}^2$ remains constant throughout the experimental temperature range. At this point there is an instantaneous reduction in loading to zero and the specimen is shattered. The shape of the fragments and the slight degree of deformation before the breaking point show that cleavage is the mechanism responsible for fracture of ammonia crystals between 77 and 130°K. Above 130°K ($0.6 T_m$), the ductility of the specimens increases and creep is observed under a constant^m load. Shearing is responsible for fracture above this point since cleavage strength remains nearly constant with temperature, while an increase in temperature causes a considerable reduction in shearing strength. The relationship between rate of uniform creep V and stress σ is $V = A\sigma^n$, where A and n are constants equal to 500 and 5 respectively at 160°K and stresses greater than the limit of proportionality. The energy of creep activation is found to be 5.6 Kcal/mol. This is approximately 10% lower than the heat of sublimation for solid ammonia. Orig. art. has: 3 figures.

SUB CODE: 07,20/

SUBM DATE: 16Apr65/

ORIG REF: 005/

OTH REF: 010

Card 2/2 *ju*

PROKHVATILOV, A.I.; PUSTOVALOV, V.V.; SIL'VESTROVA, T.V.; STARTSEV, V.I.

Temperature dependence of the hardness of crystalline ammonia.
Ukr.fiz.zhur. 10 no.10:1127-1132 O '65.

(MIRA 19:1)

1. Fiziko-tehnicheskii institut nizkikh temperatur AN UkrSSR,
Khar'kov. Submitted December 15, 1964.

L 17551-66 ENT(1)/ENT(E)/T/EWP(t) IJP(e) GG/JD
ACC NR: AP6004389 SOURCE CODE: UR/0020/66/166/003/0588/0591

AUTHORS: Soldatov, V. P.; Startsev, V. I.

ORG: Physicotechnical Institute of Low Temperatures, Academy of Sciences SSSR (Fiziko-tekhnicheskly Institut nizkikh temperatur Akademii nauk SSSR)

TITLE: On the equilibrium shape of a twin which is slowed down at an obstacle

SOURCE: AN SSSR. Doklady, v. 166, no. 3, 1966, 588-591

TOPIC TAGS: crystal growth, twinning, bismuth, single crystal, crystal imperfection

ABSTRACT: The authors have investigated the shape of a twinning layer growing into a bismuth single crystal under the influence of an external force, for the purpose of observing effects predicted theoretically by A. M. Kosevich and L. A. Pastur (FTT v. 3, 1291 and 1871, 1961), wherein the twin will have a zero apex angle if there are no obstacles preventing its penetration to the crystal, and an angle of

21,44,55

47
44
B

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UDC: 548.4

L 17551-66

ACC NR: AP6004389

3

180° in the presence of such an obstacle. The experiments were carried out on single crystal bismuth samples in the form of prisms measuring 10 x 5 x 2 mm, in which the twinning plane (110) was perpendicular to the face of the crystal. The load was applied along the (110) plane and along the (001) direction. The artificial glide plane ($\bar{1}\bar{1}0$) was the observation surface. The tests showed that when a thin wedgelike twin moves freely in the crystal without encountering obstacles, it penetrates into the crystal smoothly, like the point of a needle, remaining sharp all the time, and the twin thickness changes little. If an obstacle is encountered in the form of a twinning layer of different orientation, then the growth stops, the thickness of the twin increases rapidly, and its end becomes rounded off. The radius of the rounded end increases with pressure. If the obstacle is very small, the deformation of the twin is similar to that produced when the obstacle is in the form of a twinning layer. A lenslike twin can be observed in such a case. The photographs of the different twin formations agreed with the theoretical predictions. Authors thank L. A. Pastur, V. Z. Bengus, and S. V. Lubents for a discussion of the work. This report was presented by Academician I.

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L 17551-66

ACC NR: AP6004389

0

V. Obreimov. Orig. art. has: 4 figures and 4 formulas.

SUB CODE: 20/ SUBM DATE: 08Jul65/ ORIG REF: 006/

Card 3/3 nst

L 29986-66 EWT(1)/EWT(m)/T/EWP(t)/ETI IJP(c) JD/GG

ACC NR: AF6012490

SOURCE CODE: UR/0181/66/008/004/1227/1238

AUTHOR: Pariyskiy, V. B.; Lubenets, S. V.; Startsev, V. I.

ORG: Physicotechnical Institute of Low Temperatures, AN UkrSSR, Khar'kov (Fiziko-
tekhnicheskii institut nizkikh temperatur AN UkrSSR) 50 B

TITLE: Mobility of dislocations in single-crystal potassium bromide 27

SOURCE: Fizika tverdogo tela, v. 8, no. 4, 1966, 1227-1238

TOPIC TAGS: potassium bromide, single crystal, crystal dislocation phenomenon,
shear stress, crystal deformation

ABSTRACT: In view of the fact that the experimentally observed connection between the speed of dislocations and the applied voltage in these crystals have not yet been fully explained theoretically, the authors have attempted to obtain different information on the character of dislocation motion in single-crystal KBr, in which the motion of dislocations has not been heretofore investigated. The tests were made with annealed single crystals with dislocation density 10^3 cm^{-2} and with total impurity content $2 \times 10^{-2}\%$. The dislocation structure was exhibited by means of an etching procedure described by the authors earlier (Kristallografiya v. 7, 328, 1962). The motion of the dislocations was observed by applying mechanical loads in different manners (compression with a deformation machine, static load producing

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L 29986-66

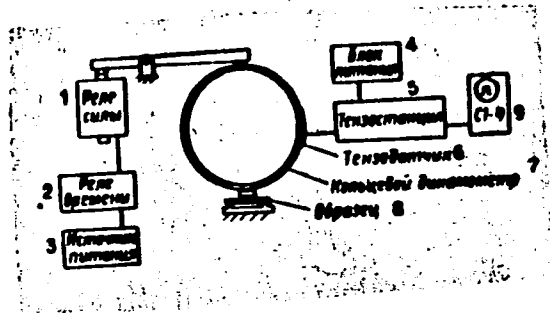
ACC NR: AF6012490

pure flexure in an etchant, pulsed loading of long duration (2×10^{-2} sec and above) or short duration (10^{-4} - 10^{-6} sec). In addition, a special system was developed, which made it possible to produce a rectangular loading pulse and measure the magnitude and duration of the applied load directly during the loading, and regulate the applied load (Fig. 1). The operation of the system is briefly described. The results show that below a definite shear stress the dislocations hardly move, but above approximately 80 g/mm^2 the dislocation velocity increases rapidly and then increases at a slower rate. There was little difference between edge and screw dislocations. The results exhibited a certain similarity with previously observed data for NaCl and LiF. The obtained experimental dependence of the dislocation speed on the applied load cannot be described in terms of a single thermal activation process with a constant activation volume, since this volume decreases by approximately 400 times on going from small velocities to larger velocities. The results also confirm the effects proposed by W. G. Johnston and J. J. Gilman (J. Appl. Phys. v. 30, 128, 1959), wherein the dislocations are first accelerated within a very short path (smaller than 1.7μ), after which they move uniformly. The delay of the dislocation motion following application of pulsed load decreases exponentially with increasing load. Orig. art. has: 9 figures and 6 formulas.

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L 29986-66
ACC NR: AP6012490

Fig. 1. Pulsed loading equipment for KBr crystals.
1 - Force relay, 2 - time relay, 3 - power source, 4 - power supply block, 5 - tension metering equipment, 6 - tension gauge, 7 - dynamotor, 8 - sample, 9 - oscilloscope.



SUB CODE: 20/ SUBM DATE: 26 Jul 65/ ORIG REF: 008/ OTH REF: 007

Card 3/3 *So*

L 04672-67 ENT(1)/ENT(m)/T/ENP(t)/ETI IJP(c) GG/JD

SOURCE CODE: UR/0181/66/008/007/1994/2000

ACC NR: AP6024455

62
B

AUTHOR: Platkov, V. Ya.; Startsev, V. I.

ORG: Physicotechnical Institute of Low Temperatures, AN UkrSSR, Khar'kov (Fiziko-
tekhnicheskiiy institut nizkikh temperatur AN UkrSSR)

TITLE: Amplitude and time dependences of the internal friction in ionic crystals

SOURCE: Fizika tverdogo tela, v. 8, no. 7, 1966, 1994-2000

TOPIC TAGS: internal friction, ionic crystals, crystal dislocation phenomenon, Young
modulus, relaxation process, plastic deformation, temperature dependence

ABSTRACT: The authors present the results of an investigation of internal friction
due to the presence of dislocations in single-crystal KBr, KCl, RbI, and in part NaCl.
The internal friction and Young's modulus were measured using a double compound oscil-
lator in which the ultrasonic oscillations were produced by X-cut quartz excited in
the natural longitudinal mode (77.7 and 90.5 kcs). The sample was cleaved along the
cleavage plane and glued to the quartz. The different crystals were made of different
lengths, such that the difference between their natural frequencies and the natural
frequency of the quartz did not exceed 500 cps. The measurements were made at 4.2,
77, and 273K, maintained constant within $\pm 0.1^\circ$. Plots were obtained of the internal
friction and Young's modulus against the amplitude of the strain, the variation of
Young's modulus during excitation, the variation of the depth of relaxation of the
modulus as a result of prior plastic deformation, and the influence of temperature on

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L 01672-67

ACC NR: AP6024455

the depth of the relaxation of Young's modulus. The relations obtained were found to be in qualitative agreement with the Granato-Lucke theory. A hysteresis was observed in the Young's modulus relaxation in the amplitude-dependent region. The influence of prior plastic deformation and of the temperature was investigated. A qualitative explanation of the observed results is presented. Orig. art. has: 8 figures and 2 formulas.

SUB CODE: 20/ SUBM DATE: 01Oct65/ ORIG REF: 003/ OTH REF: 004

kh

Card 2/2

ACC NR: AP6019635 (A, N) SOURCE CODE: UR/0048/66/030/002/0371/0377 76

AUTHOR: Afanas'yev, N.G. Startsev, V.I.; Smelov, Ye.K.; Kuplennikov, E.L.; Stepula, Ye.V.; Petrenko, V.V.; Fursov, G.L. 74 B

ORG: none

TITLE: Investigation of elastic scattering of 70 MeV electrons on C-12 and Be-9 and the mean square radii of those nuclei /Report, Fifteenth Annual Conference on Nuclear Spectroscopy and Nuclear Structure, held at Minsk, 25 January to 2 February 1965/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 30, no. 2, 1966, 371-377

TOPIC TAGS: electron scattering, elastic scattering, form factor, nuclear radius, beryllium, carbon

ABSTRACT: The authors have measured the elastic scattering cross sections of C¹² and Be⁹ for 70 MeV electrons at different scattering angles between 30 and 150° in order to evaluate the root-mean square radii of the nuclei. The 70 MeV electron energy was chosen for the measurements because at that energy the momentum transfers are high enough to permit determining the momentum transfer dependence of the form factor, and yet low enough to allow of neglecting higher powers than the second (of the momentum transfer) in the expression for the form factor. The electron beam was produced by a pulsed accelerator. The primary beam intensity was measured with a secondary emission monitor which was calibrated with a Faraday cup. The electrons that were

L 41309-66

ACC NR: AP6019635

2

elastically scattered at a given angle from the graphite¹⁵, polyethylene¹⁵ or beryllium foil target were focused with a magnetic field onto a Cerenkov counter which recorded them. The scattering angle at which scattered electrons were recorded could be changed without breaking the vacuum. In addition to the measurements with the Cerenkov counter measurements were realized with photographic recording of the scattered electrons. Although some of the corrections involved in the different techniques are different (the corrections are discussed at some length), the cross sections measured by the two different recording methods were in excellent agreement. The values obtained from the momentum transfer dependence of the form factor for the rms radii of Be⁹ and C¹² were 2.26 ± 0.1 and 2.35 ± 0.01 fermi, respectively. Orig. art. has: 12 formulas, 5 figures, and 3 tables.

SUB CODE: 20 SUBM DATE: 00 ORIG. REF: 004 OTH REF: 002

Card 2/2 hs

ACC NR: AP6034224

SOURCE CODE: UR/0120/66/000/005/0090/0094

AUTHOR: Afanas'yev, N. G.; Denyak, V. M.; Reva, D. P.; Savitskiy, G. A.; Startsev, V. I.; Shevchenko, N. G.

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

TITLE: A cherenkov counter for recording high energy electrons

SOURCE: Pribory i tekhnika eksperimenta, no. 5, 1966, 90-94

TOPIC TAGS: radiation counter, nuclear physics apparatus, electron detection, *CERENKOV COUNTER*, *SPECTROMETER*

ABSTRACT: A Cherenkov counter serving as a detector of fast electrons at the output of a magnetic spectrometer is described. The counter is designed to detect electrons with $E_e > 100$ Mev. from linear accelerators with sendings durations ranging from 0.2 to 2.5 μ sec. The electronic circuit of the counter includes a scaling circuit with a ratio of 1:4 and with the resolution of 30 nsec, a pulse forming circuit, and passing circuit which permit counter operation to be synchronized with the electrons accelerator. The time resolution of the counter (50 nsec.) permits recording of up to 4 pulses for each sending from the accelerator. Recording effectiveness is near 100%. The authors express their gratitude to V. V. Kondratenko, S. D. Faynizlberg, A. I. Germanov, and L. A. Makhnenko. for the development of the device. Orig. art. has: 5 figures.

SUB CODE: 20 / SUBM DATE: 03Aug65/ ORIG REF: 003/ OTH REF: 003

Card 1/1

UDC: 539.1.074.4

ACC NR: AP7001978

SOURCE CODE: GE/0030/66/018/002/0863/0871

AUTHOR: Startsev, V. I.; Soldatov, V. P.; Brodsky, M. M.

ORG: Physicotechnical Institute for Low Temperatures, Ukrainian Academy of Sciences, Kharkov

TITLE: Growth rate of twin layer in bismuth single crystals

SOURCE: Physica status solidi, v. 18, no. 2, 1966, 863-871

TOPIC TAGS: bismuth, ~~bismuth crystal~~, single crystal growth, twinning, single crystal, activation energy

ABSTRACT: An attempt is made to determine the stress relationship of the normal and tangential rate of twinning in bismuth single crystals of different purities. On the basis of experimental data, it is concluded that the broadening of twin layers occurs by a heterogeneous mechanism. The activation energy is determined for the processes of twin layer broadening and twin growth in the direction of shear. It is established that the process of twin layer broadening in bismuth involves the simultaneous reorientation of about 10^4 atomic planes and

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ACC NR: AP7001978

that the 10 to 10^2 twinning dislocations participate in each plane per centimeter length of twin plane in the direction of shear. The authors thank S. N. Komnik, F. F. Lavrentov, V. B. Pariiskii, and V. Z. Bengus for valuable discussions. Orig. art. has: 8 figures and 15 formulas. [Based on authors' abstract] [NT]

SUB CODE: 20/SUBM DATE: 01Aug66/ORIG REF: 006/OTH REF: 009/

Card 2/2

ACC NR: AP6034245

SOURCE CODE: UR/0120/66/000/005/0229/0230

AUTHOR: Afanas'yev, N. G.; Denyak, V. M.; Startsev, V. I.

ORG: Physics-Engineering Institute, AN UkrSSR, Khar'kov (Fiziko-tekhnicheskij institut AN UkrSSR)

TITLE: Generator of triple electrical and light pulses having a nanosecond duration

SOURCE: Pribory i tekhnika eksperimenta, no. 5, 1966, 229-230

TOPIC TAGS: pulse oscillator, pulse generator, light pulse, nanosecond pulse, pulse multiplication

ABSTRACT: A description is given of a simple oscillator of short (10^{-8} sec) triple electrical and light pulses, suitable for adjusting of high speed scaling circuits, coincidence circuits, and for investigation of photomultiplier parameters. The advantage of such an oscillator is that it overcomes the shortcomings of its predecessors which are capable only of single pulse outputs, either electrical or light signals. The input oscillator of the system develops pulses of 50 V with a duration front of 10 to 15 nsec and sequence frequency from 1000 cps. Hydrogen dischargers are employed in the generator. The pulse shift is achieved by an alternating lag pattern having a magnitude of 0 to 0.5 μ sec. The width of the produced electrical pulses is 10 nsec, and that of light pulses, 50 nsec. Orig. art. has: 2 figures.

SUB CODE: 09,14/ SUBM DATE: 03Sep65/ ORIG REF: 005

STARTSEV, V.K.; SHOKIN, I.N.

Use of hexamethylenimine in the production of soda. Part 1.
Trudy MKHTI no.47:95-98 '64.

Use of hexamethylenimine in the production of soda. Part 2.
Ibid.:99-102 (MIRA 18:9)

05015-07 : 1/1000(1)/001 00(c) 00/00

ACC NR: AP6032079

SOURCE CODE: UR/0078/66/011/010/2312/2315

AUTHOR: Startsev, V. N.; Krylov, Ye. I.; Koz'min, Yu. A.

22
B

ORG: Laboratory of Rare and Rare Earth Nonferrous Metals

TITLE: Extraction of tetravalent titanium from hydrochloride solutions using tributylphosphate

SOURCE: Zhurnal neorganicheskoy khimii, v. 11, no. 10, 1966, 2312-2315

TOPIC TAGS: titanium, hydrochloride, tributylphosphate, titanium extraction

ABSTRACT: A study was made of the extraction of titanium (IV) from hydrochloride solutions using tributylphosphate (TBP). Measurements of the optical density of the solutions showed that when the amount of free hydrochloric acid in the solution is increased and the amount of titanium is maintained constant, or when the amount of titanium is increased and the amount of hydrochloric acid is maintained constant, the equilibrium of the reaction $H_2TiCl_6 \rightleftharpoons TiCl_6^{2-} + 2H^+$ is displaced toward the formation of complex $[TiCl_6]^{2-}$ ions. The same ratio for the distribution factor is maintained in relation to the amount of free hydrochloric acid and the amount of titanium in the solution: it increases with an increase in the

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UDC: 546.824'131:542.61

ACC NR: AP6032979

amount of complex $[\text{TiCl}_6]^{2-}$ ions in the solution. A comparison of the optical densities of the initial solution and the organic phase, as functions of HCl and the amount of titanium, seems to indicate that the titanium passes into the ester layer in the form of a complex hexachlorotitanic acid $[\text{TiCl}_6]^{2-}$ anion. Orig. art. has: 3 figures. [Based on authors' abstract]

SUB CODE: 07/ SUBM DATE: 19Dec64/ ORIG REF: 006/ OTH REF: 002/

Card 2/2 *HR*

STARTSEV, V.S.

[Through the Southern Urals and the trans-Ural plains] Po Ushnomu
Uralu i zaural'skim ravninam. Turistskie marshruty. Moskva, Geograf-
giz, 1953. 215 p. (MLRA 7:11D)

STARTSEV, V.S.

Chemical geography of Perm Province. Khim.geog. no.1:3-6 '61.
(MIRA 16:3)

1. Predsedatel' Prezidiuma Permskogo otdela Geograficheskogo
obshchestva SSSR.

(Perm Province--Geochemistry)

MAKSI'OVICH, G.A., prof., red.; BALKOV, V.A., dots., red.;
VASIL'YEV, B.V., dots., red.; GORBUNOVA, K.A., dots.,
red.; MATVEYEV, B.K., dots., red.; MIKHAYLOV, G.K.,
inzh., red.; OBORIN, V.A., dots., red.; PECHERKIN, I.A.,
dots., red.; STARTSEV, V.S., dots., red.; SHIMANOVSKIY,
L.A., inzh., red.

[Methods for studying karst; transactions] Metodika izu-
cheniia karsta; trudy. Perm', Permskii gos. univ.
Nos. 2, 4, 5, 10. 1963. (MIRA 17:12)

1. Vsesoyuznoye soveshchaniye po metodiike izucheniya
karsta.

ACCESSION NR: AP4034065

S/0126/64/017/004/0627/0629

AUTHORS: Volkenshteyn, N. V.; Romanov, Ye. P.; Starostina, L. S.; Startsev, V. Ye.

TITLE: Temperature dependence of the electrical conductivity of monocrytalline molybdenum

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 4, 1964, 627-629

TOPIC TAGS: molybdenum, electric conductivity, monocrytalline molybdenum, polycrytalline molybdenum, cryostat, copper molybdenum thermocouple, phonon, electron electron interaction

ABSTRACT: The authors studied the temperature dependence of monocrytalline Mo having a high degree of purity and a relative electrical resistance on the order of $R_{300\text{ K}}/R_{4.2\text{ K}} > 3500$, where 4.2K stands for liquid helium temperature. Test samples were obtained from a parent material of polycrytalline Mo rods 5 mm in diameter and 150 mm long, having a relative resistance of the order of 40. The approximate chemical composition was: 0.004% Fe, 0.001% Si, 0.0005% Ni, 0.0003% Mn and Al, 0.0002% Ca and Mg, 0.0001% Cu, and 0.0001% Na. Test specimens 4 mm in diameter and 25 mm long were placed in a cryostat. Temperature measurements were made with a dual copper-molybdenum thermocouple. The electrical resistance was

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ACCESSION NR: AP4034065

measured with a potentiometer set up with a galvanometer of sensitivity 5×10^{-8} volt/mm/m. The data showed that the temperature dependence of the relative resistance was linear at temperatures above 100K. From 40 to 80K it could be well approximated by the formula

$$\frac{R_T}{R_{0^\circ\text{C}}} = \frac{R_0}{R_{0^\circ\text{C}}} + aT + bT^2,$$

$\frac{R_0}{R_{0^\circ\text{C}}} \cong 1.8 \cdot 10^{-4}$; $a \sim 10^{-6} \text{ град}^{-2}$; $b \sim 10^{-11} \text{ град}^{-5}$, whereas in the range of 7 to 18K it was found to fit the formula

$$\frac{R_T}{R_{0^\circ\text{C}}} = \frac{R_0}{R_{0^\circ\text{C}}} + AT^2,$$

$$A = 1.5 \cdot 10^{-6} \text{ град}^{-2}.$$

It was inferred from the results that in monocrystalline Mo of high purity the electrical resistance was determined essentially by electron-electron interactions. For the sake of comparison the temperature dependence of the relative resistance of polycrystalline Mo was also plotted and was found to have a minimum at 26K. The authors thank V. A. Novoselov for his help in the experiments. Orig. art. has: 2 figures and 2 formulas.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography, AN SSSR); Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

Card 2/3

ACCESSION NR: AP4023404

S/0048/64/028/003/0540/0544

AUTHOR: Volkenshteyn, N.V.; Fedorov, G.V.; Startsev, V.Ya.

TITLE: Effect of magnetic order on the electric and galvanomagnetic properties of the rare earth metals Report, Symposium on Ferromagnetism and Ferroelectricity held in Leningrad 30 May to 5 June 1963

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.28, no.3, 1964, 540-544

TOPIC TAGS: rare earths, resistivity, Hall effect, rare earth resistivity, rare earth Hall effect

ABSTRACT: The authors point out that it would be desirable to measure the electrical conductivity and the Hall coefficient on the same pure samples of all the rare earths over a wide temperature range (down to liquid helium temperatures) under uniform conditions, and they assert that they have done this. Abstracter's note: No experimental details are given, nor any description of the techniques employed. The interest in measurements of this sort arises from the fact that, although the rare earths all have the same valence electron structure, the electric and galvanomagnetic properties vary greatly from one to another. Some of the results of the

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ACCESSION NR: AP4023404

measurements are discussed in the present paper. With respect to temperature dependence of resistivity, the rare earths divide themselves into two groups. In La,Ce, Pr,Nd and Yb there is no region in which the resistivity is a linear function of temperature. The curve for Nd is given; it is smooth and concave to the temperature axis. In Sm,Gd,Tb,Dy,Ho,Er and Tu the resistivity depends linearly on temperature throughout the paramagnetic region, and the curve has a sharp bend at the paramagnetic-antiferromagnetic transition point. The behavior of Eu (curve given) is very peculiar: there is no linear region (up to 300°K), and the peculiarity at the transition point is very marked, there being even a small region in which the resistivity decreases with increasing temperature. This behavior is tentatively ascribed to changes in the conditions of scattering and in the energy spectrum of the current carriers. The Hall emf in all the rare earths is proportional to the induction throughout the paramagnetic and antiferromagnetic regions. In some of the metals the current carriers are holes, and in others they are electrons. The number of carriers per atom varies widely, from 0.17 (holes) in Eu to 3.5 (electrons) in Lu. The behavior of the Hall emf in the ferromagnetic region is very complex. Orig.art.has: 7 figures and 1 table.

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ACCESSION NR: AP4023404

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals, Academy of Sciences, SSSR)

SUBMITTED: OO

DATE ACQ: 10Apr64

ENCL: OO

SUB CODE: PH

NR REF SOV: 003

OTHER: 006

Card 3/3

ACCESSION NR: AP4019206

S/0056/64/046/002/0457/0459

AUTHORS: Volkenshteyn, N. V.; Startsev, V. Ye.

TITLE: Some features of the temperature dependence of electrical resistance of gadolinium and ytterbium at low temperatures

SOURCE: Zhurnal eksper. i teor. fiz., v. 46, no. 2, 1964, 457-459

TOPIC TAGS: gadolinium, ytterbium, electric resistance, low temperature electric resistance, electric resistance temperature dependence, electron electron interaction, conduction electron scattering, spin wave scattering, phonon scattering

ABSTRACT: In order to find how the special electron structure of rare earth metals affects the nature of the temperature dependence of their electric resistivity, the resistance of gadolinium in the magnetically ordered state was measured and compared with that of ytterbium, which did not undergo a magnetic-ordering transition over

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ACCESSION NR: AP4019206

the entire investigated temperature range (1.5--20.3K). The empirical formula fitting the experimental curve is

$$R(T)/R(0^{\circ}\text{C}) = R_0/R(0^{\circ}\text{C}) + aT + bT^2 + cT^5$$

with different values of the constants for the two metals in two temperature ranges (1.5--4.2 and 12--20.3K). The terms proportional to the different powers of the temperature correspond to conduction-electron scattering by electrons, phonons, and spin waves. It is concluded that at helium temperatures the conduction electrons are scattered in ferromagnetic gadolinium by spin waves, this type of scattering being absent in nonferromagnetic ytterbium at the same temperature. "The authors are grateful to S. V. Vonsovskiy for his constant interest in this work and to Ye. A. Turov for useful discussions. Orig. art. has: 2 figures and 1 formula.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics

Card

2/52

VOLKENSHTEYN, N.V.; ROMANOV, Ye.P.; STAROSTINA, I.S.; STARTSEV, V.Ye.

Temperature dependence of the electric resistance of a single
crystal of molybdenum. Fiz. met. i metalloved. 17 no.4:627-
629 Ap '64. (MIRA 17:8)

1. Institut kristallografii AN SSSR i Institut fiziki metallov
AN SSSR.

L 15039-65 EWT(m)/EPF(c)/EWP(t)/EWP(b) Pr-4 AFWL/SSD/AS(mp)-2/ESD(gs)/ESD(t)
JD/JC/MLK S/0000/64/000/000/0079/0085

ACCESSION NR: AT4048697

AUTHOR: Volkenshteyn, N. V.; Fedorov, G. V.; Galoshina, E. V.; Startsev, V. Ye.

TITLE: Temperature dependence of the electrical and galvanomagnetic properties of rare earth metals

SOURCE: Vsesoyuznoye soveshchaniye po splavam redkikh metallov, 1963. Voprosy* teorii i primeneniya redkozemel'nykh metallov (Problems in the theory and use of rare-earth metals); materialy* soveshchaniya. Moscow, Izd-vo Nauka, 1964, 79-85

TOPIC TAGS: rare earth metal, rare earth electrical property, rare earth galvanomagnetic property, rare earth magnetic property, Hall effect, rare earth atomic structure

ABSTRACT: The electrical resistance and Hall effect are excellent indicators of the characteristics of the electronic structure of solid bodies. The present paper describes simultaneous measurements of the electrical resistance and the Hall effect for a large group of highly purified rare earth metals. The electrical resistance of neodymium, europium, gadolinium, terbium, dysprosium, holmium, erbium and ytterbium was measured by a common potentiometer in a metal cryostat at temperatures between room and 4.2K. The electrical resistance differed significantly from that of the usual metals with low resistance. The temperature relationships could be used to divide the rare

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earth metals into four groups. The first group contains neodymium and ytterbium, which do not show a linear relationship in the above-mentioned temperature interval. The second group includes dysprosium, holmium and erbium, which show breaks in the curves and low resistance maxima when passing from the paramagnetic into the anti-ferromagnetic condition. The third group contains gadolinium and terbium, which show a sharp break when passing from the paramagnetic to the anti-ferromagnetic condition, with a linear relationship in the paramagnetic field. Europium has a special place among the rare earth metals. It shows a sharp drop in electrical resistance below the point of passage from the paramagnetic into the anti-ferromagnetic condition. The detailed behavior of europium requires further investigation. Analysis of the curves for all the rare metals shows that the specific electrical resistance at equivalent temperatures is higher than for metals in the first group of the periodic table. The Hall effect was measured with a DC potentiometer in a cryostat for europium, holmium, erbium and dysprosium, the authors being the first to measure the Hall effect of europium and holmium. Temperature variations did not change the Hall effect. On the basis of these tests and publications by C. J. Kevan, S. Legvold and G. S. Anderson, it can be seen that all the rare earth metals may be divided into a "light" group (up to gadolinium) and a "heavy" group, in both of which the conductivity depends on the electronic bonding. The paper further describes

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the variations of the Hall effect depending on the temperature, induction and other factors. Scandium should be noted specifically. The 99.86% pure scandium tested contained 0.04% Cu, less than 0.01% Mo, 0.03% Fe, 0.016% N₂, 0.034% O₂, 0.001% H₂ and 0.008% Cd which was distilled under a vacuum. The specific electrical resistance of scandium is very high and exceeds that of copper and calcium. The resistance drops linearly with temperature to the temperature of liquid helium. Paramagnetic susceptibility was also found by the Faraday method. This did not depend on the magnetic field, but rather on the temperature, decreasing as the temperature rose. In conclusion it is noted that the appearance of one electron in the 3d-shell alters the physical properties of scandium in comparison with the other metals. Orig. art. has: 7 figures.

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VOLKENSHTEYN, N.V.; STARTSEV, V.Ye.

Characteristics of the temperature dependence of the electric resistance of gadolinium and ytterbium at low temperatures. Zhur. eksp. i teor. fiz. 46 no.2:457-459 F '64. (MIRA 17:9)

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AUTHOR: Volkenshteyn, N. V.; Starostina, L. S.; Startsev, V. Ye.;
Romanov, Ye. P.

TITLE: Investigation of the temperature dependence of the electrical conductivity
of molybdenum and tungsten monocrystals in the low temperature regions

SOURCE: Fizika metallov i metallovedeniye, v. 18, no. 6, 1964, 388-894

TOPIC TAGS: molybdenum, tungsten, monocrystal, polycrystalline molybdenum,
polycrystalline tungsten, electrical conductivity, Debye characteristic tempera-
ture

ABSTRACT: The temperature dependence of the electrical resistance of high puri-
ty molybdenum and tungsten monocrystals and of polycrystalline samples of these
metals was measured in the 4.2-300 K temperature range. The crystallographi-
cally perfect mo. crystals were obtained by zone melting, using electron bom-
bardment heating. The characteristic Debye temperature was calculated for the
temperature interval of 10-100 K. The experimental R(T) curves compared
favorably with the theoretical Block-Gruneisen and Wilson curves. The effect of

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