PINES, B.Ya.; IVANOV, I.G.

Growing of single crystals of nickel, copper, and copper-nickel alloys in a vacuum melting furnace. Zav.lab. 29 no.5:588-589 '63. (MIRA 16:5)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Metal crystals—Growth)

PINES, B.Ya.; IVANOV, I.G.; SMUSHKOV, I.V.

Coefficients of partial diffusion and self-diffusion in alloys of the copper - nickel system. Fiz.tver.tela 4 no.7:1882-1890 Jl '62. (MIRA 16:6)

1. Kahar'kovskiy gosudarstvennyy universitet imeni A.M.Gor'kogo.
(Copper-nickel alloys) (Diffusion)

PINES, B.Ya.; SIRENKO, A.F.

Rate of diffusion creep in metals at premelting temperatures.
Fiz.met.i metalloved. 15 no.4:584-591 Ap '63. (MIRA 16:6)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M.Gor'kogo.
(Creep of metals)

PINES, B.Ya.; SIRENKO, A.F.

Concentration dependence of the creep rate and longevity under load at elevated temperatures in metallic alloys of the systems iron - carbon and iron - copper. Fiz.tver.tela 4 no.7:1901-1910 Jl '62. (MIRA 16:6)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.

(Creep of metals) (Iron-carbon-copper alloys)

KRISHTAL, M.A.; PINES, B.Ya., prof., retsenzent, ZHUKHOVITSKIY, A.A., red ; GORDON, L.M., red. izd-va; OBUKHOVSKAYA, G.P., tekhn. red.

[Diffusion processes in iron alloys] Diffuzionnye protsessy v zheleznykh splavakh. Moskva, Metallurgizdat, 1963 277 p. (MIRA 16:7)

1. Kafedra metallovedeniya i termicheskoy obrabotki Moskovskogo instituta stali i splavov (for Pines).
(Iron alloys--Metallography) (Diffusion)

PINES, B.Ya.; KUZNETSOVA, R.I.; DUBOVIK, M.F.

Development of submicroporosity in composite electrolytic films of the system Cu - Ni during heating and under load. Fiz.tver. tela 4 no.12:3409-3414 D '62. (MIRA 15:12)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Copper-nickel alloys)(Electrolysis)(Porosity)

PINES, B.Ya.; IVANOV, I.G.

Mechanical properties of alloys of the system copper-nickel at elevated temperatures. Fiz. tver. tela 4 no.8:2109-2115 Ag '62. (MIRA 15:11)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
(Copper-nickel alloys)
(Metals at high temperatures)

PINES, B.Ya.; GUMEN, N.M.

X-ray diffraction study of a cobalt ferrate subjected to thermomagnetic treatment. Kristallografiia 6 no.6:901-908 N-D '61. (MIRA 14:12)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.

(Cobalt ferrate)
(X-ray crystallography)

S/181/61/003/009/023/[illegible]
B[illegible]4 B[illegible]

18950

AUTHORS: Pines, B Ya., and Sivochuk V A

TITLE: Structural changes [illegible] temperature creeping of copper single crystals

PERIODICAL: Fizika tverd. tela, v. 3, no. 9, 1961, 2703 - [illegible]

TEXT: The authors tried to establish a difference in the deformation during creeping of copper just below its melting point and at lower temperatures. For this purpose, they made coarse-grained [illegible] plates from rolled copper sheet of [illegible] x [illegible] mm by annealing them [illegible] under a load of [illegible] g/mm² for about 30 minutes. From these plates monocrystalline samples of 20 x 60 mm were made by covering a large grain with paraffin and etching off the surrounding grains with nitric acid. The surfaces of the samples investigated coincided with the faces (100) or (111). The samples were loaded in the direction of the crystal axes [100] and [111]. The tests were made with a vacuum device described by B. Ya. Pines et al. in FMM, VII, no. 5, [illegible] 776, 1959. The structural changes were examined under a microscope and by X-ray diffraction studies. Negative Laue patterns

Card 1/3

S/181/61/003/[illegible]
B104/B102

Structural changes during ...

were obtained with a fine-focus X-ray tube (40 kv, 1.5 ma) using copper radiation. Most of the pictures were taken with a 0.3 mm slit. In some cases a microbeam of 50 μ was used. The sample surfaces were studied with an MIM-6 (MIM-6) microscope, and the microhardness was measured with a PMT-3 (PMT-3) instrument. The extensive results are discussed in deta...

Summing up: a) At comparatively high stresses (200 - 300 g/mm^2) one or two bands of glide planes were observed in samples elongated in the [10$\bar{1}$0] direction (creep rate 10^{-2} - 10^{-3}%/hr) and along the [$\bar{1}$120] direction (creep rate, 10%/hr). These samples had an indistinct and split spot in their Laue patterns. b) If the load applied did not exceed 50-70 g/mm^2, no essential structural change could be observed even after a comparatively strong deformation (~10%). Gliding tracks were not obtained, and the spot in the Laue pattern was distinct. Only local indentations did occur. There is thus only a creeping free of dislocations under these conditions which is a result of pure diffusion. It is not impossible that there is also a diffusion creeping at higher loads and lower temperatures which is veiled by structural changes. Ya. I. Frenkel' is mentioned. There are 7 figures...

Card 2/3

tables, and 11 references: 8 Soviet and ? n n-Soviet. The three references to English-language publications read as follows: P. Feltham et al. ... met. ?, no. ?, ?14, ????; D. J. McLean, Inst. Metals ?? ... ; J. Harper et al., Acta Met. 5, no. 11 ????.

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

SUBMITTED: April ?4, 19??

PINES, B.Ya.; SIRENKO, A.F.

Role of closed pores in the sintering of metal ceramic bodies. Izv. vys. ucheb. zav.; fiz. no. 1:23-28 '60. (MIRA 13:12)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
(Sintering) (Ceramic metals)

PINES, B.Ya., prof.

Sintering and diffusion creep of ceramic metal bodies. Zhur. VKHO 5 no. 2:173-180 '60. (MIRA 14:2)
(Ceramic metals) (Powder metallurgy)

S/120/61/000/001/047/062
E032/E114

AUTHORS: Pines, B.Ya., and Gretennik, I P.

TITLE: A High-Temperature Electron Diffraction Apparatus With Three Magnetic Lenses and an Evaporation Chamber

PERIODICAL: Pribory i tekhnika eksperimenta 1961, No.1, pp 156-160

TEXT: The electron diffraction apparatus is shown schematically in Fig.1. The electron gun is similar to that described by B Ya. Pines and A.I. Bublik in Ref.1. The cathode 1 is in the form of a 35° truncated cone. A hot tungsten filament is placed near the end of the cone. The massive anode 2 is also conical (140°) and the electrons pass through it via an axial aperture. The electron beam is focussed by the magnetic lenses 3 and 5. The lens 8 is used to alter the dispersion in the diffraction pattern. The specimen is adjusted in the beam by means of the attachment 6. The electron diffraction pattern can be observed on the fluorescent screen 10 through the window 9, or it can be recorded on photographic plates which can be inserted into the plate holder 11. The specimen is in the form of a thin film stretched over a tantalum

Card 1/ 3

S/120/61/000/001/047/[illegible]
E032/E114

A High-Temperature Electron Diffraction Apparatus With Three Magnetic Lenses and an Evaporation Chamber

ribbon containing a suitable aperture for the beam to pass through. The tantalum ribbon can be heated to any desired temperature by passing a current through it. The specimen chamber lies immediately above the evaporation chamber 7 which contains two evaporators. In this way films of various compositions can be obtained, and moreover their temperature can be adjusted as required. With all the three lenses in operation a resolution of 2.9×10^{-4} can be obtained in the image plane. Owing to the relatively high resolving power, the apparatus can be used to investigate high-temperature diffusion processes in alloys whose components have roughly equal lattice constants (B.Ya. Pines and I.D. Grobenny: Ref.4).

There are 3 figures, 1 table and 5 Soviet references.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet (Khar'kov State University)

SUBMITTED: December 2, 1959

Card 2/3

S/120/61/000/001/047/062
E032/E114

A High-Temperature Electron Diffraction Apparatus With Three Magnetic Lenses and an Evaporation Chamber

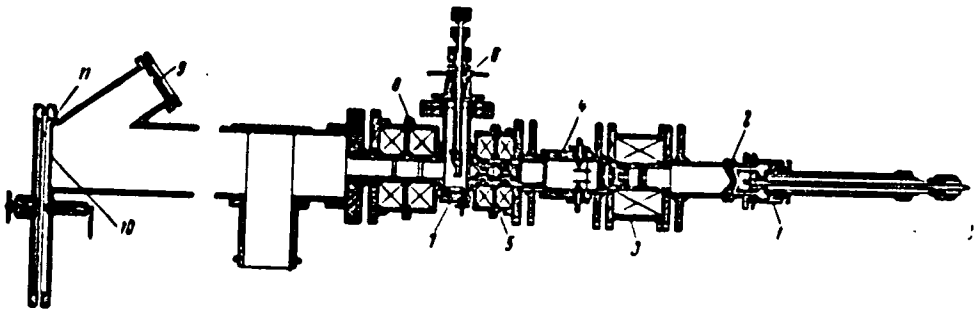


Fig. 1

Card 3/3

18 8200

23115
S/181/61/003/[illegible]
B130/B201

AUTHORS: Fines, B. Ya. and Kuznetsova, A. I.

TITLE: Change of sub-microporosity in electrolytic metal foils under heating and stress

PERIODICAL: Fizika tverdogo tela, v. 3, no. 5, 1961, 1475 - 1484

TEXT: Various molecular effects in metals and alloys under the effect of temperature and pressure point to pecularities of the mechanical properties and other macroscopic characteristics of solid bodies. In the present investigation, sub-microporosity was measured by using the small-angle scattering of X-rays (filtered CuK_α radiation), whereas the "double Bragg reflection" was found to be unsuited. 0.02-mm copper and nickel foils were electrodeposited from baths onto stainless or carbon steel and then detached. The copper foils were anneald at temperatures up to 1 [illegible]°C and under tensile stresses of 0.80 - 200 g/mm^2, and the nickel foils up to 11[illegible] and 0 - 330 g mm^2 in a hydrogen atmosphere. The device [illegible] was used for X-ray diffraction analysis. A one-hour annealing of Cu foils

Card 1/[illegible]

S/1 1, 61/0 3/0 ... 42
B136/B1 1

Change of sub-microporosity ...

at temperatures of up to 400°C augmented the scattering intensity far beyond the initial value, while higher temperatures caused it to drop. In addition, a change took place in the angular distribution of ... showed similar results. The scattering intensity attained a maximum at a temperature of 300°C. The integral scattering intensity changed in proportion to the sub-microporosity V (Figs. 5a, 5b). The heat resist... was found to increase with a rise of temperature. A parasitic ... reflect... effect occurs with specimens both subjected to and free from stress up to certain temperatures: its presence was checked by testing Cu and ... foils of the same thickness but not prepared electrolytically. The foils did not exhibit any appreciable change in the integral scattered radiation. Small-angle scattering effects are thus actually a consequence of ... porosity which, in annealed specimens, becomes visible also micr... The collimation error and the varying pore diameter were taken into account in interpreting the measurements. The former, however, was ... no effect upon the temperature dependence of the total sub-microporosity. It may be taken for granted that sub-microporosity in unstressed specimens is first augmented by annealing but eventually ... appears at high temperatures. In specimens under stress it increases ... a rise ...

Card 2/6

Change of sub-microporosity ...

and stress. Sintering effects are found in two classes of pore size between 1000 and 1100°C. The monotonic increase in the total porosity of previously annealed (900°C) Cu and Ni specimens with increasing temperature of the subsequent annealing under stress concerns chiefly the small pores at low temperatures, and the large ones at high temperatures. Experiments show that the distortions of the crystal lattice giving rise to this effect differ markedly from those in hammer-forged metal. The results found here for specimens annealed at high temperatures and under stress confirm the concept of the enlargement, due to the diffusion, of pore cracks in electrolytic metal foils. There are 9 figures and 8 references: 6 Soviet-bloc and 2 non-Soviet-bloc. The two most recent references to English-language publications read as follows: M. B. Webb a. W. W. Beeman. Acta Metallurgica, 7, no. 3, 1959. R. H. Heynaber, a. G. Brammer a. W. W. Beeman. J. Appl. Phys., 30, no. 5, 656, 1959.

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

SUBMITTED: September 30, 1960 (initially), January 2, 1961 (after revision)

Card 3/6

PINES, B.Ya.; CHAYKOVSKIY, E.F.

Investigating the kinetics of recrystallization of cold-worked iron. Fiz. met. i metalloved. 11 no. 1:34-39 Ja '61.
(MIRA 14:2)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M. Gor'kogo.
(Iron—Metallography) (Crystallization)

PINES, B.Ya.; IVANOV, I.O.

"Aftereffect" in samples of metals subjected to diffusion creep at high temperatures. Fiz. tver. tela 2 no.5:959-966 My '60. (MIRA 13:10)

1. Khar'kovskiy universitet.
(Creep of metals)

PINES, B.Ya.; SIRENKO, A.F.

Correlation between the rate of creep and the durability of metals under the effect of stress. Fiz. met. i metalloved. 10 no.3:382-389 S '60. (MIRA 13:10)

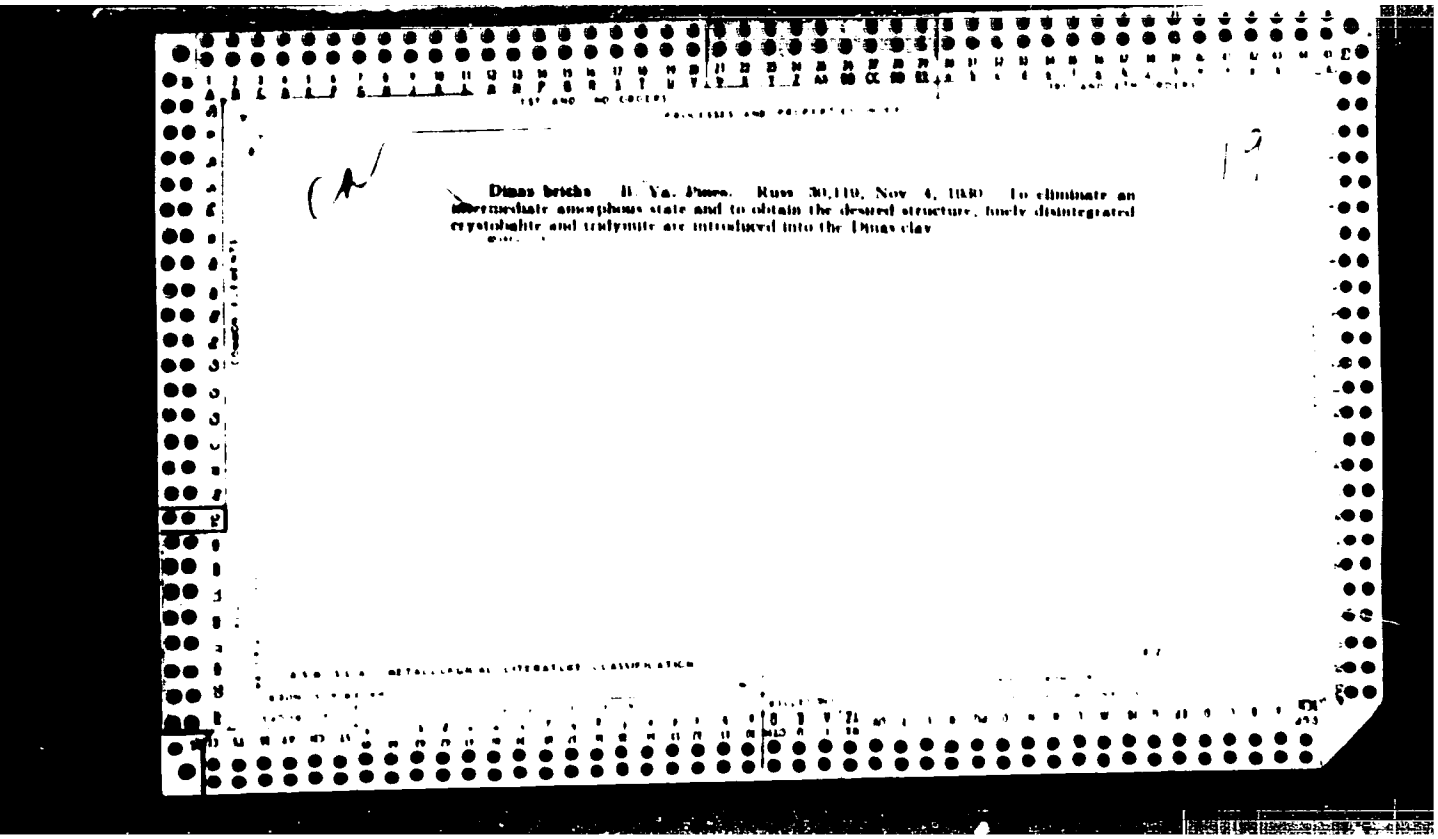
1. Khar'kovskiy gosudarstvennyy universitet im. A.M.Gor'kogo.
(Creep of metals) (Metals—Fatigue)

PINES, B.Ya.; SIRENKO, A.F.

Mechanism of the long-period deformation of metals under load. Dokl. AN SSSR 134 no.5:1061-1064 O '60. (MIRA 13:10)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M.Gor'kogo. Predstavleno akademikom G.V.Kurdyumovym.

(Metals—Testing) (Deformations (Mechanics))



Dinas bricks B. Ya. Pines. Russ 30,110, Nov 4, 1940 To eliminate an intermediate amorphous state and to obtain the desired structure, finely disintegrated cryptohalite and tridymite are introduced into the Dinas clay

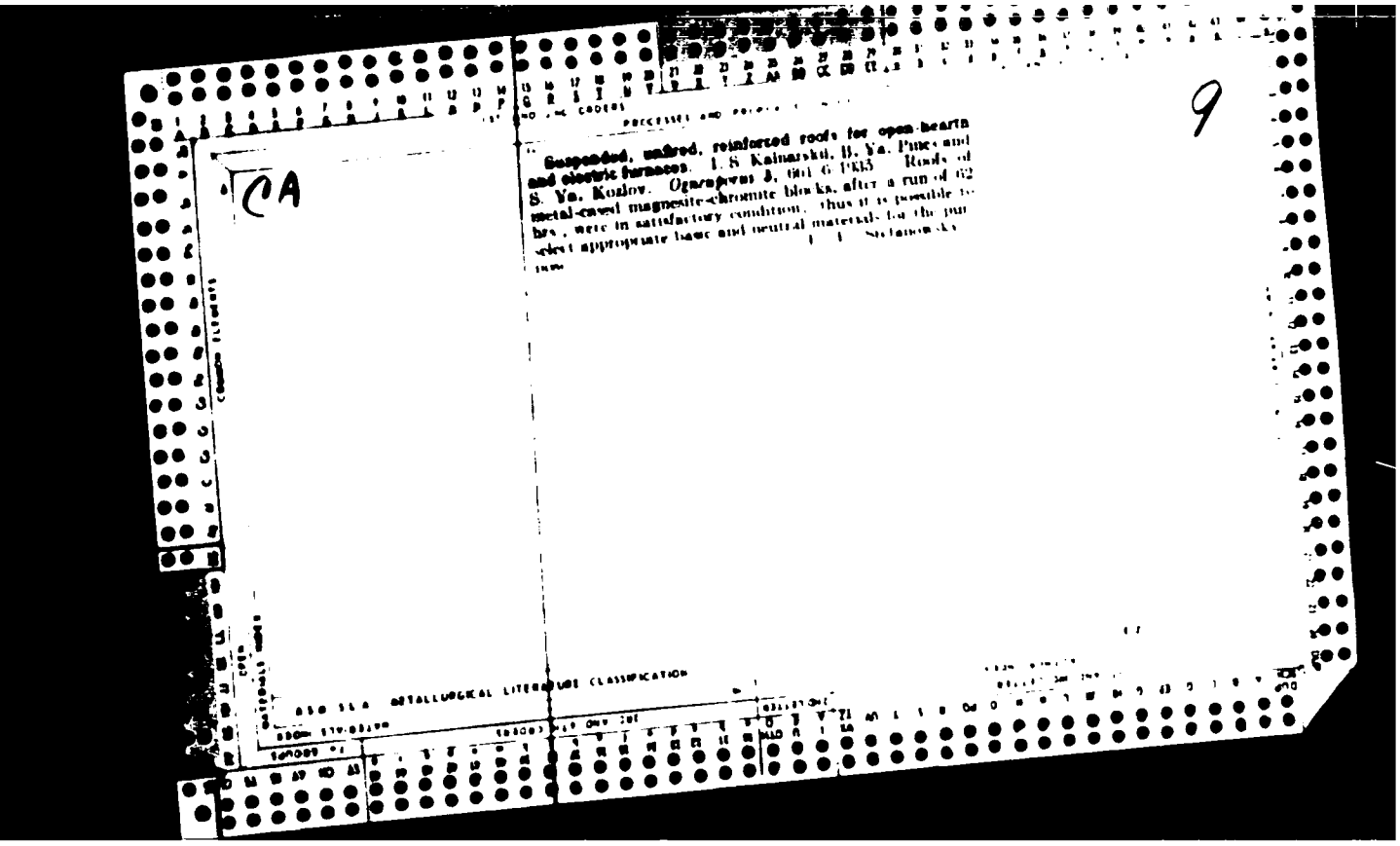
METALLURGICAL LITERATURE CLASSIFICATION

Pinos, N. Ya. Silica bricks with catalysts. *Stal*, 1931, (7-9) 76-84.—B. describes (1) silica transformations, (2) capability of transformation of natural quartzites, (3) influence of catalysts on the transformation, (4) the best structure of silica brick, (5) attempts to manufacture silica brick with added crystal nuclei, and (6) properties and durability of these brick.

Relation between cracking of anthracite coals during burning and their structure. B. Pinus. *Domez* 1938, No. 1 2, 41 7. An x-ray investigation of the distribution of impurities in anthracite was made with the view of finding a relation between these impurities and the behavior of anthracite in the blast furnaces of the Mariupolsk plant where it is mixed with coke to the extent of 6%. Cracking tests were made by suddenly heating samples of coal to 850-900° and keeping at this temp. for 10-45 min. out of contact with air. Cracking is due to the presence in the coal of inclusions along which the cracks occur. In the blast furnace the cracked coal breaks up easily under the prevailing conditions of temp. and pressure. Numerous x-ray photographs and 2 tables of numerical results are given. S. L. Madorsky

METALLURGICAL LITERATURE CLASSIFICATION

Pinus, B. Ya. Physicochemical Processes Occurring During Destruction of Refractories in Steel Casting Furnaces. ONTI, Leningrad, 1935. 107 pp. Reviewed in *Referat. Silikatliteratur*, 3, 3104 (1936). This book deals with (1) wear of silica brick in crowns of open hearth furnaces (structural changes of brick, role of the glass phase, mechanism of slag disintegration, and determination of the character of destruction from the appearance of the fracture); (2) quantitative characteristics of the wear of silica brick; (3) destruction of magnesite brick in open hearth furnaces (characteristics of MgO brick, its properties, destruction by slag, and reaction between periclase and slag); (4) destruction of silica brick and other refractories in Bessemer converters; (5) various types of destruction; and (6) crystallization of minerals in open hearth furnaces.



1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

3RD AND 4TH ORDERS

B-I-4

Hydromechanics of the [illegible] converter in relation to the attrition of the fireproof lining. [illegible] (Physikal. Z. Sowjetunion, 1935, 7, 189–212). —Vals. for the relative fluid velocities on the sides and bottom of the converter have been calc. with the aid of models and the theory of liquid vortices. Good agreement is obtained with data relative to the effective life of the linings of converters in the U.S.S.R., whence it is inferred that mechanical abrasion is the chief destructive factor. Recommendations as to the most economical construction are given. [illegible]

ASD-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

Artificial clay-like state of highly refractory minerals. B. Ya. Pines and E. I. Ter-Mikaelyants. *Ogneupory* 4, 74-84(1936).—By wet grinding in a ball mill plastic masses were obtained from dead burnt magnesite, chromite, quartzite, synthetic spinel and similar highly refractory materials. These masses had a low sintering point, beginning at 880°. Bricks made from them were better than the usual bricks made from similar minerals. These plastic masses may be used also as binding material and for hot repairs. E. E. Strianowsky

METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

ca

19

Determination of mechanical properties of refractories at high temperatures. D. Ye. Pimas and M. I. Ter-Mikaelyants. *Ogneupory* 4, 181-7(1936). A specially constructed device permits detns. up to 1700°. A SiC-C thermocouple was used for temp. measurements. With small cubes (1 cm.) even of nonhomogeneous materials (SiO_2) reliable data were obtained. Based on work done with $MgCO_3$, SiO_2, dunite, SiC, etc., it was found that softening under load corresponds not to the beginning of softening, but to an advanced stage of "flow" of the material. H K Stefanovsky

METALLURGICAL LITERATURE CLASSIFICATION

Pines, B. Ya., and Kushta, G. P. MINERALS FORMED BY THE REACTION OF OPEN HEARTH SLAGS WITH THE DOLOMITE HEARTH BOTTOM AT HIGH TEMPERATURES. Stal 1936, 7, 47-51. The reaction of dolomite with open hearth slags at high temperatures was investigated by (a) laboratory experiments and (b) analyzing samples from the hearth. The investigation included X-ray analysis, analytical determination of the free CaO, petrographic analysis, and determination of the refractoriness. Two kinds of slags were used in a, with 20% FeO and with 9% Fe_2O_3. Mixtures of 5 to 50% of slag with 95 to 50% of dolomite were heated to 1300° to 1650°C. The minerals formed were Ca_2SiO_4, $Ca_2Fe_2O_5$, $MgAl_2O_4$, $MgFe_2O_4$, and $MgCaSiO_4$. Free MgO (periclase) was always present; with less than 20% of slag, free CaO also occurred. Spinels were present with less than 30% of slag. Ca_2SiO_4 was present in the β form; this form is not stable at low temperatures and goes slowly over to the γ form. This process causes the disintegration of the dolomite hearth bottoms. The petrographic investigation showed that the grains of CaO and MgO are cemented by the silicates and spinels; this explains the primary hardening of the hearth bottoms by the action of slags. The agglomerations formed by this reaction are refractory even up to 1800°C. The wear of the hearth bottom is caused by a continued reaction with the slags, which converts the dicalcium silicate and ferrite into the monocalcium compounds which fuse at low temperatures and are washed away by the slags.

PINES, B. Ya.

Pines, B. Ya., and Bijyk, V. Ya. REACTIONS IN SOLID STATE BETWEEN MAGNESIUMOXIDE AND IRON OXIDE. Ukrain. Nauch-Issledovatel. Inst. Ogneuporov E. Kislotonporov, No. 37 35-58 (1936) - The properties of magnesite refractories are greatly affected by their iron oxide content. Various mixtures of iron and magnesium oxide were fired to different temperatures under oxidizing and reducing atmospheres; the mechanical strength of the products was then determined, and X-ray studies of the products were made. For the products fired in oxidizing atmosphere, the experiments show that magnoferrite ($MgO.Fe_2O_3$) was formed in the solid state from the components. X-rays show also the presence of this kind of crystal. The strength of magnesite brick increases only when the iron oxide particles are infolded by the MgO particles and do not touch each other. Otherwise the iron oxide particles sinter together and lower the strength of the product. X-rays showed that the brick fired in reducing atmosphere are composed of free MgO free FeO , and a solid solution The parameter of the solid solution depends on concentration. To produce magnesite brick of higher strength, firing first in an oxidizing atmosphere and then in a reducing atmosphere is recommended. It is important because the transformation of the ferric form of the iron into the ferrous oxide will increase the thermal stability of the brick.

Pinus, B. Ya. X-RAY METHOD FOR QUANTITATIVE DETERMINATION OF CRYSTALS IN REFRACTORY MATERIALS. ([illegible] Nauch. *Issledovatel. Inst. Ogneuporov & Kislotoupor.*) No. 37, 60-70 (1939). The sample in which the crystalline compound is to be determined is crushed and mixed with definite amounts of comparison material, and X-ray pictures of the mixtures are taken. Common salt was found to be good comparison material. Details of procedure are given. The mullite content of various technical mullites and sillimanites was determined in this way. For comparison purposes the mullite content was also determined analytically by disintegrating with hydrofluoric acid. X-ray determination always shows a somewhat higher mullite content than the chemical analysis, as HF dissolves part of the mullite. Analysis of pure mullite showed that solid solutions of mullite type are present in the silica-alumina system, and their chemical composition varies. The content of chromite, periclase or silicon carbide can be determined in refractories according to this method. The error in X-ray determination does not exceed 5%.

Pines, B. Ya., Bilyk, V. Ya., and Voronina, O. M. METHOD FOR DETERMINING THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS AT HIGH TEMPERATURES. (*Trudy Nauch. Issledovatel. Inst. Ogneuporov & Kislotouporov*, No. **37**, 81–111 ([illegible]).) The method of Wilkes (*J. Am. Ceram. Soc.*, **17** [6] 173 (1934)), used to determine the thermal conductivity of various refractories is described. The values for grog, magnesite, and American and Russian silicon carbide refractories are given in a table.

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

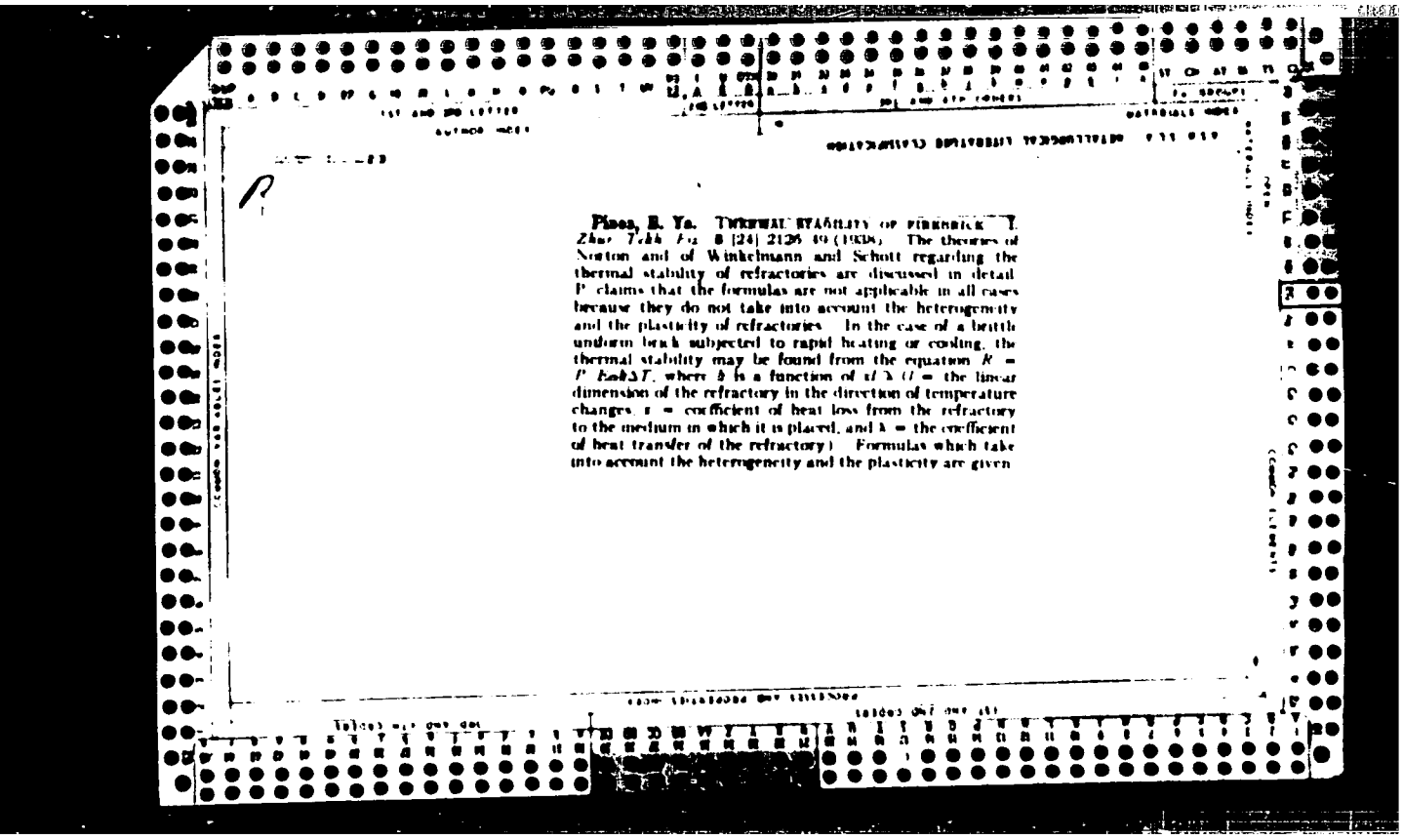
3RD AND 4TH ORDERS

Ca

19

X-ray investigation and evaluation of technological properties of quartzites. B. Ya. Pines and K. I. Doregol. *Ogneupory* 5, 683-12(1937). X-ray investigation showed that admixtures in quartzites are in a solid soln. in quartz crystals which results in a decrease in the size of the elementary cell of the latter. This is especially evident in silica brick with lime binder and does not take place when the binder is wet ground quartzite. Part of the Ca and Fe oxides enter into solid soln. in quartz. Some quartzites show an agglomeration of oriented crystals, but give no evidence of structural changes when heated to 700°. Other kinds show an increase in the amt. of grains when heated above 575°. F. L. Stefanowsky

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



Pines, B. Ya. THERMAL STABILITY OF REFRACTORIES. *Zhur. Tekh. Fiz.* 8 [24] 2126-49 (1938). The theories of Newton and of Winkelmann and Schott regarding the thermal stability of refractories are discussed in detail. P. claims that the formulas are not applicable in all cases because they do not take into account the heterogeneity and the plasticity of refractories. In the case of a brittle uniform body subjected to rapid heating or cooling, the thermal stability may be found from the equation $R = P \cdot E\alpha b \Delta T$, where b is a function of $\alpha l / \lambda$ (l = the linear dimension of the refractory in the direction of temperature changes, α = coefficient of heat loss from the refractory to the medium in which it is placed, and λ = the coefficient of heat transfer of the refractory). Formulas which take into account the heterogeneity and the plasticity are given

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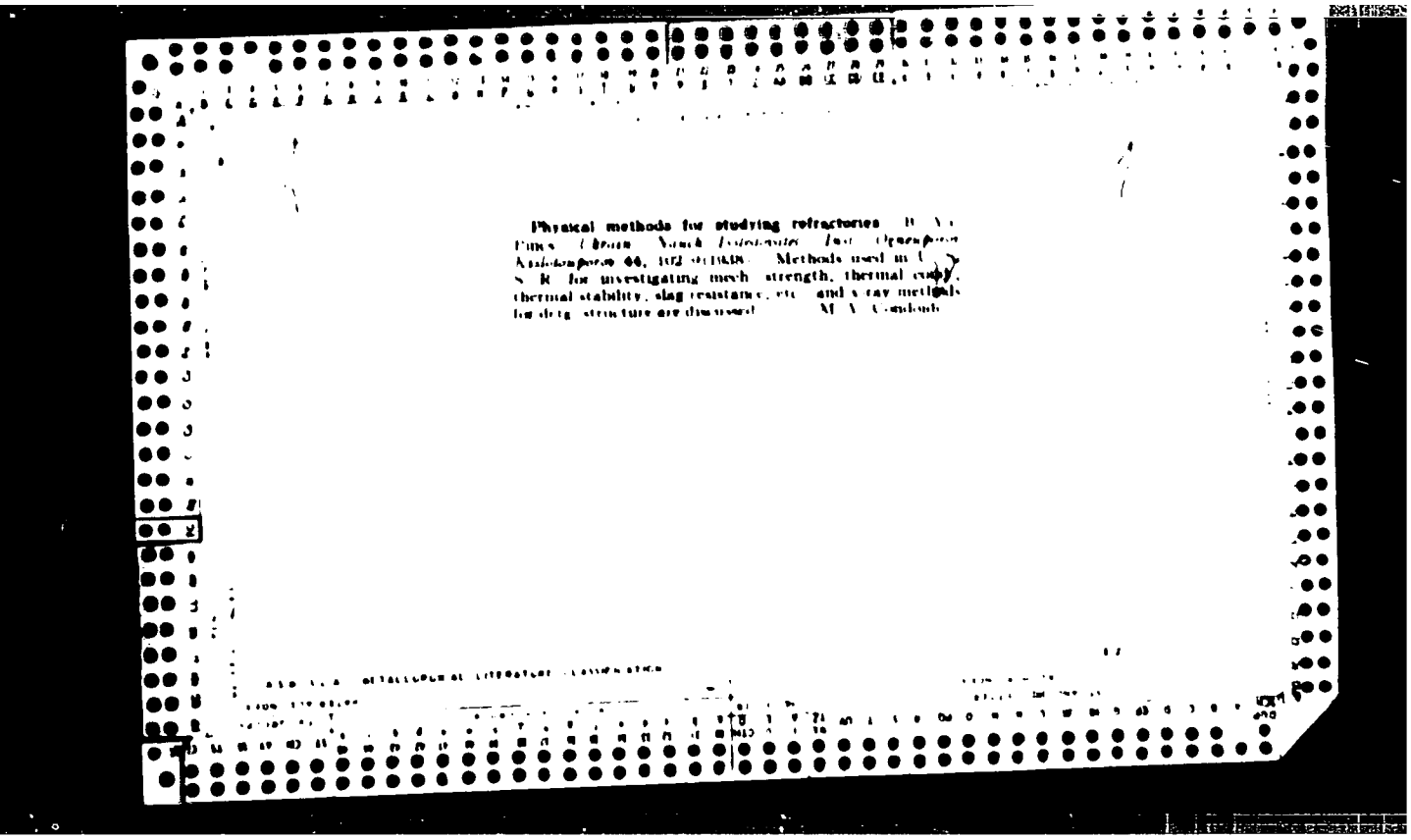
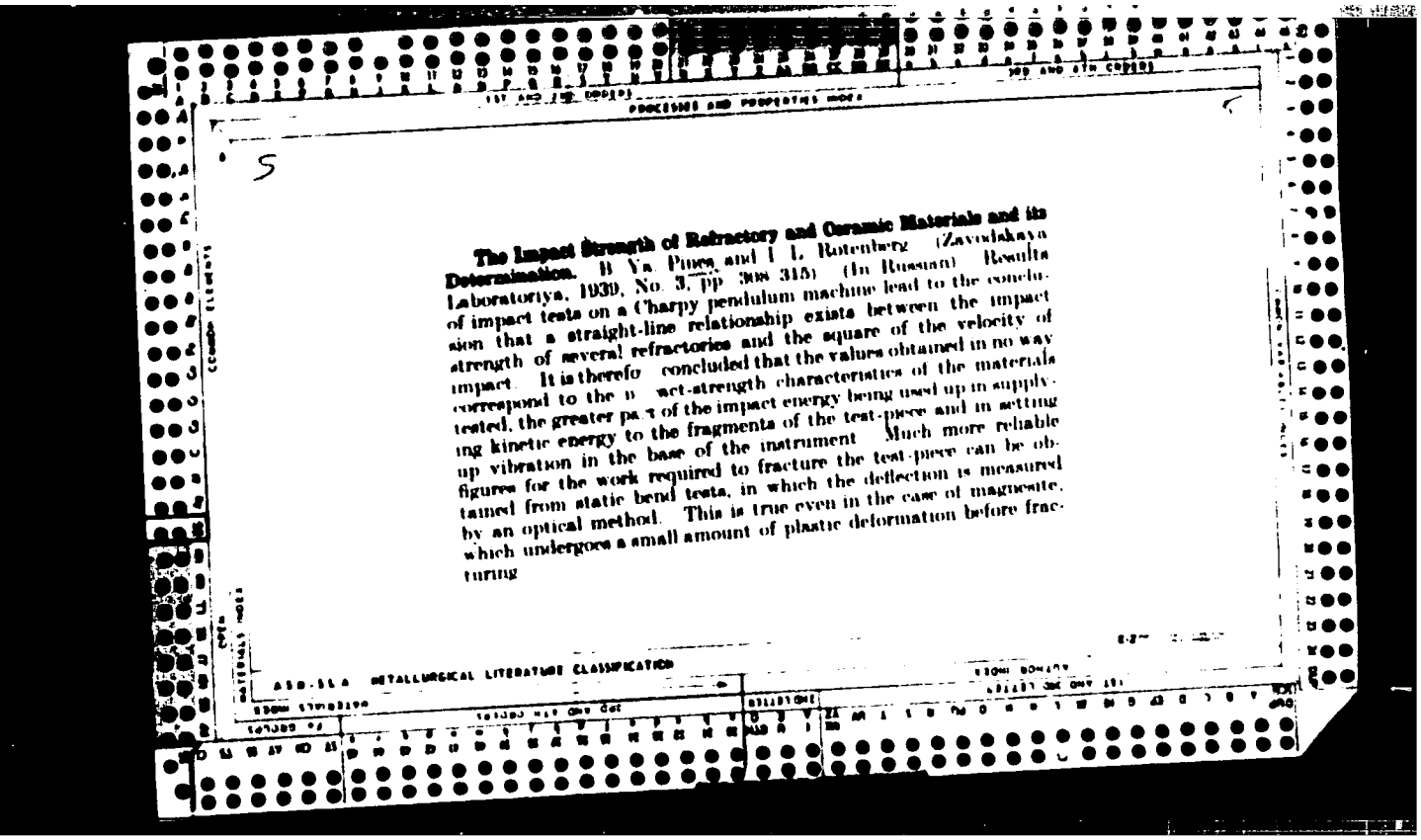


Physical methods for studying refractories [illegible] Methods used in U.S.S.R. for investigating mech. strength, thermal expan., thermal stability, slag resistance, etc. and x-ray methods for determining structure are discussed. M. V. Condrob



The Impact Strength of Refractory and Ceramic Materials and its Determination. B Ya Pines and I L Rotenberg (Zavodskaya Laboratoriya, 1939, No 3, PP 308-315) (In Russian) Results of impact tests on a Charpy pendulum machine lead to the conclusion that a straight-line relationship exists between the impact strength of several refractories and the square of the velocity of impact. It is therefo concluded that the values obtained in no way correspond to the w wet-strength characteristics of the materials tested, the greater pa t of the impact energy being used up in supplying kinetic energy to the fragments of the test-piece and in setting up vibration in the base of the instrument Much more reliable figures for the work required to fracture the test-piece can be obtained from static bend tests, in which the deflection is measured by an optical method This is true even in the case of magnesite, which undergoes a small amount of plastic deformation before fracturing

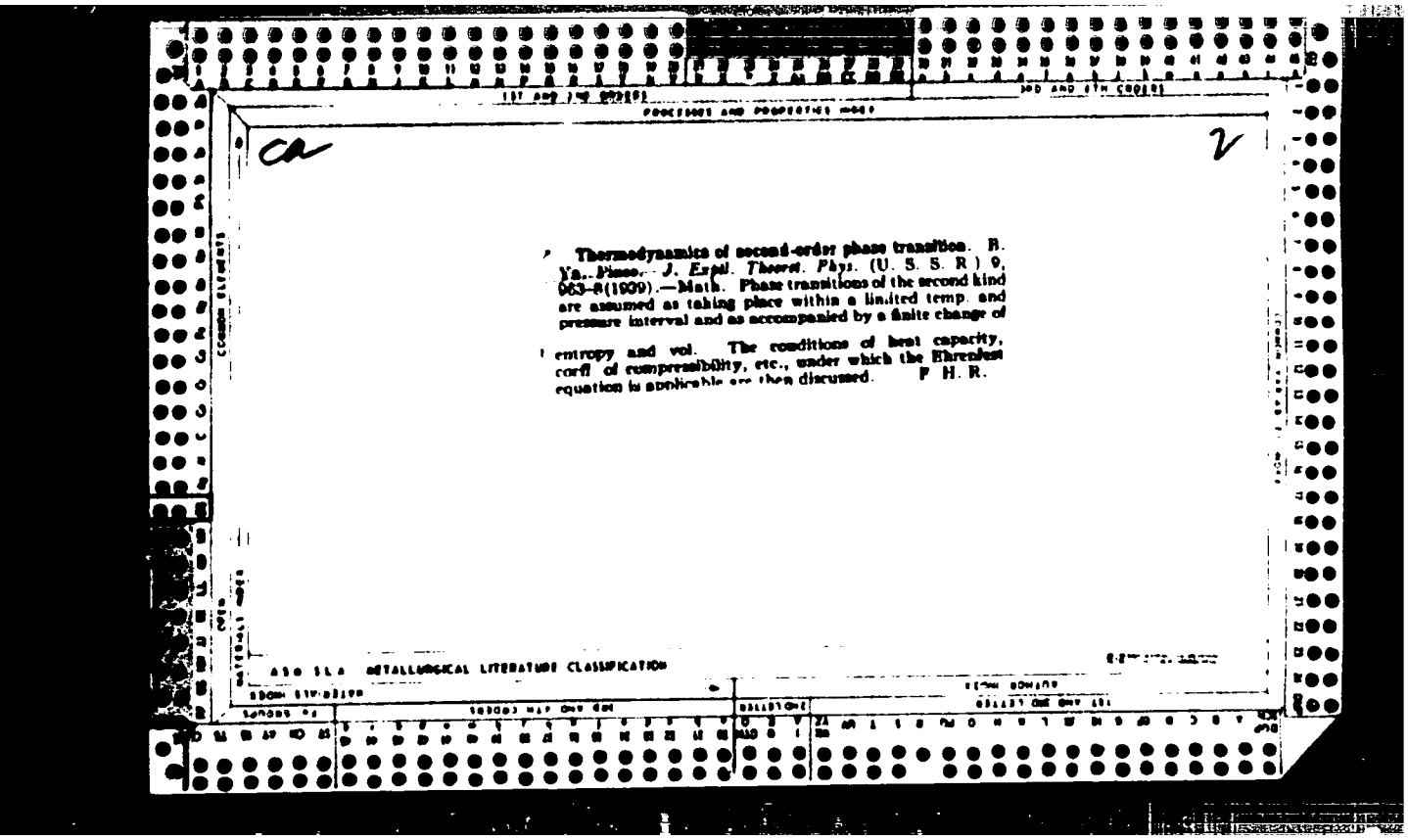
Ca

Thermal endurance of refractories II Experimental investigation of the thermal endurance of magnesite refractories B. Ya. Pines, A. Ya. Bilyk and G. P. Kushta. *J. Tech. Phys.* (U. S. S. R.) 9, 71-87 (1939); cf. *C. A.* 33, 7062[5]. Bricks heated to 850° were quenched in cold water and their strength was measured after various time intervals. The results are qual. and therefore the thermal endurance is calcd. from the mech. and thermal consts. of the material. The shear modulus, torsion stress at failure, elasticity modulus and the rupture modulus at bending, of magnesite with addns. of Fe_2O_3, SiO_2, Al_2O_3, etc., were detd. SiO_2 and Al_2O_3 lower all these properties and increase the plasticity of magnesite, owing presumably to the absence of glazy borders around and dendrites of magnoferrite within, the periclase grains of ordinary magnesites, which preclude an elastic deformation of these grains. In the presence of SiO_2, etc., the binder between the grains consists of forsterite and spinel crystals. Similar changes of the mech. properties of magnesite can be attained by addns. of BaO, SrO, TiO_2, Cr_2O_3, B_2O_3, $ZrSiO_4$, Na_2SiO_3 and Al Si clays. The apparent elasticity modulus and the ultimate tensile strength of chromomagnesite are also reduced by various oxides.

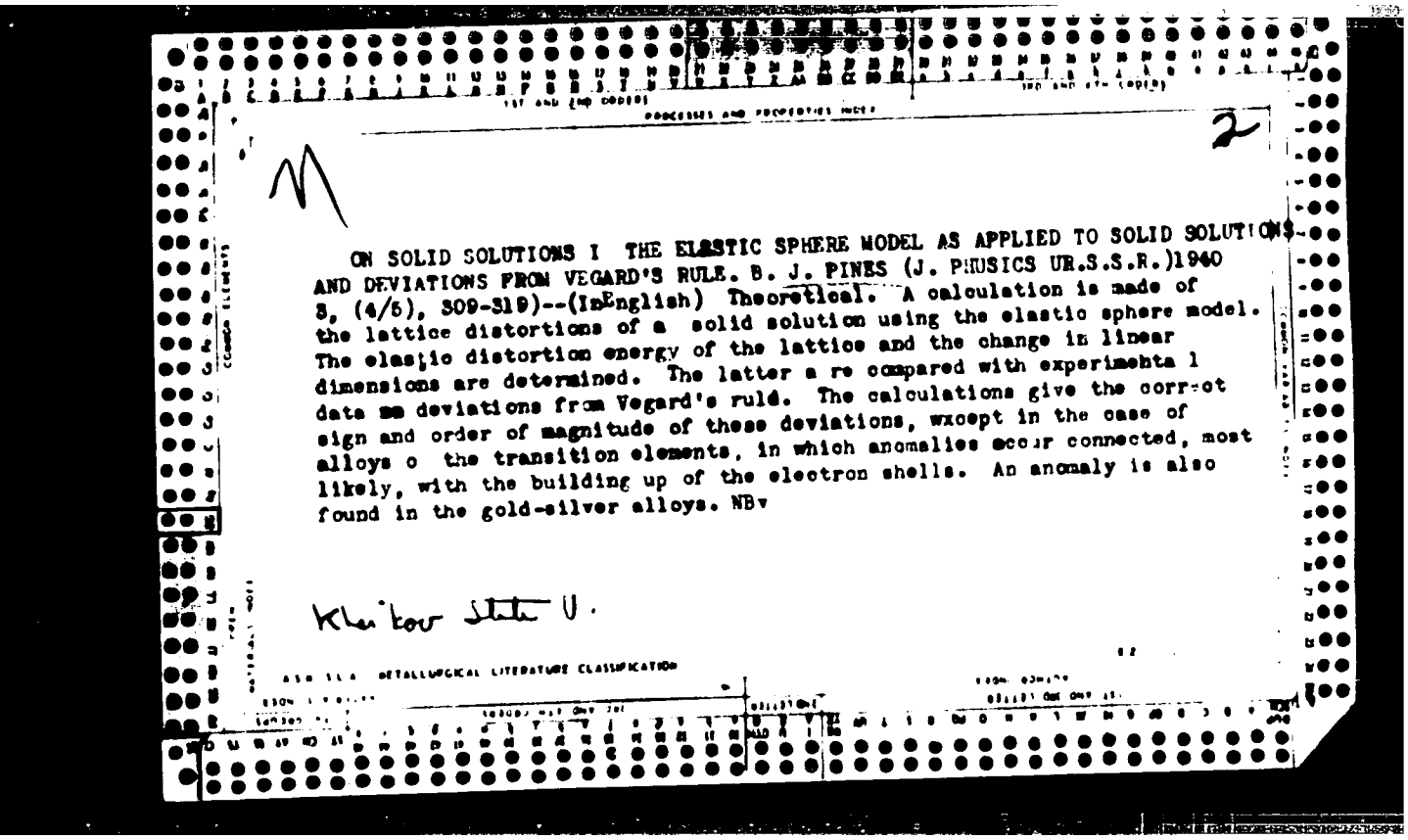
[illegible]

18

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



Thermodynamics of second-order phase transition. B. Ya. Pines. *J. Exptl. Theoret. Phys.* (U. S. S. R.) 9, 963–8(1939).—Math. Phase transitions of the second kind are assumed as taking place within a limited temp. and pressure interval and as accompanied by a finite change of entropy and vol. The conditions of heat capacity, coeff. of compressibility, etc., under which the Ehrenfest equation is applicable are then discussed. P. H. R.



2

ON SOLID SOLUTIONS I THE ELASTIC SPHERE MODEL AS APPLIED TO SOLID SOLUTIONS AND DEVIATIONS FROM VEGARD'S RULE. B. J. PINES (J. PHUSICS UR.S.S.R.)1940 3, (4/5), 309-319)--(In English) Theoretical. A calculation is made of the lattice distortions of a solid solution using the elastic sphere model. The elastic distortion energy of the lattice and the change in linear dimensions are determined. The latter a re compared with experimenta l data on deviations from Vegard's rule. The calculations give the corr-ect sign and order of magnitude of these deviations, wxcept in the case of alloys o the transition elements, in which anomalies occur connected, most likely, with the building up of the electron shells. An anomaly is also found in the gold-silver alloys. NBv

Kharkov State U.

On Solid Solutions. I. A Model of Elastic Spheres Applied to Solid Solutions, and the Deviation from Vegard's Law. B. Ya. Pines (*Zhur. Eksper. Teoret. Fiziki*, 1941, **11**, (1), 147–158). [In Russian]. Lattice distortion in a solid solution has been calculated with the aid of a model made up of elastic spheres. The change in lattice dimensions of a disordered solid solution has been evaluated for a series of binary systems. Comparison of the quantities calculated with experimental data has shown that the proposed method of computation enables the sign and order of magnitude of the departure from Vegard's law to be determined for many binary metallic systems. The method is not applicable, however, to alloys of the transition metals, or to gold-silver alloys. D. A.

Khar'kov State U.

METALLURGICAL LITERATURE CLASSIFICATION

On the Energy of Mixing and the Energy of Ordering of Solid Solutions.
B. Ya. Pines (*Zhur. Eksper. Teoret. Fiziki*, 1941, **11**, (6), 725-727). [In Russian] A calculation of the potential energy of a solid solution. D. A.

Kharkov State U.

METALLURGICAL LITERATURE CLASSIFICATION

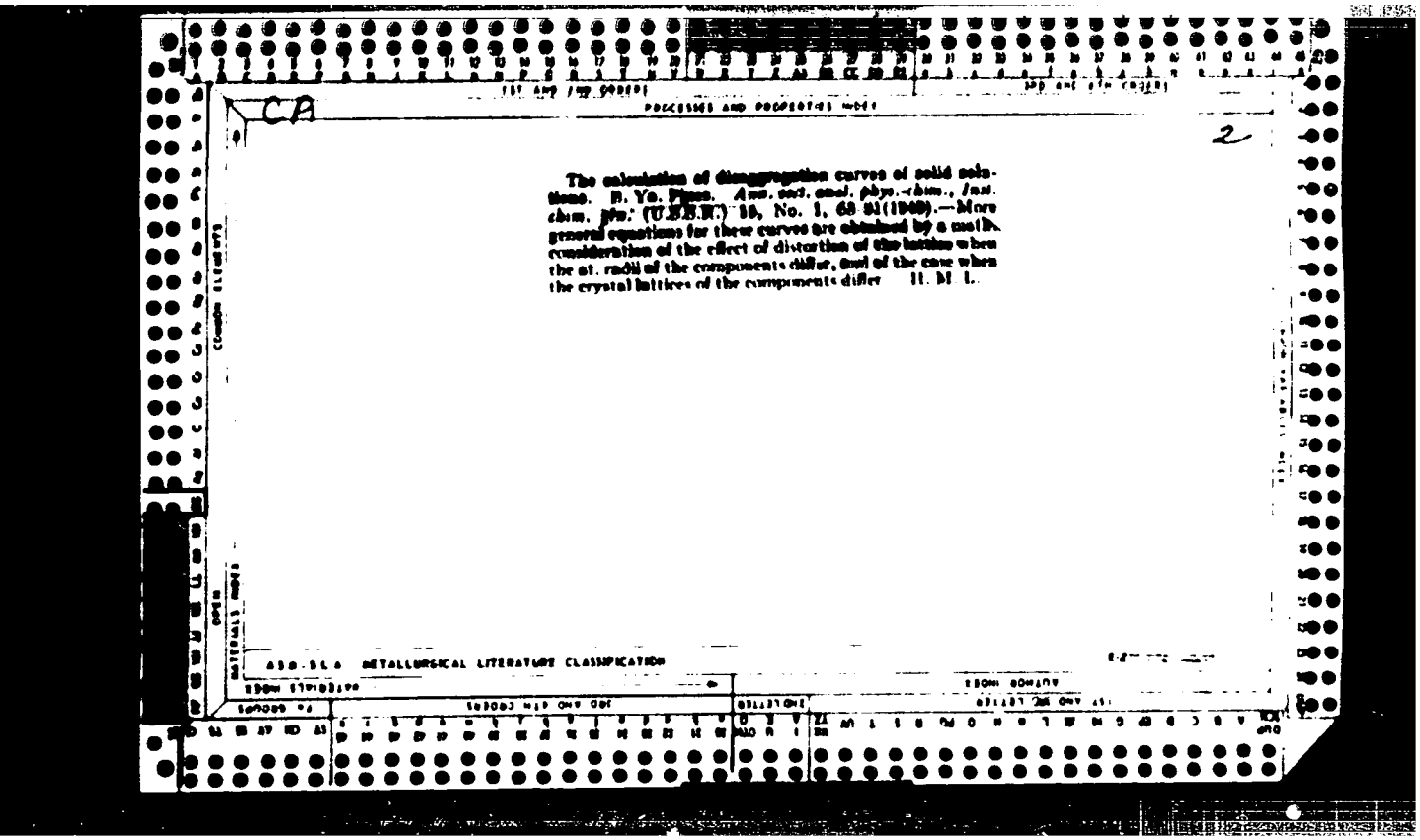
On the Calculation of the Simplest Binary Equilibrium Diagrams. B. Ya. Pines (*Zhur. Tekhn. Teoret. Fiziki*, 1943, 13, (11-12), 411-417). [In Russian]. P. gives approx. equations for the decomposition curves representing phase changes, and explains the relations between the const. from which the simplest types of equilibrium diagram are obtained. —N. A.

METALLURGICAL LITERATURE CLASSIFICATION

N

2

On the "Energy of Mixing" and the "Energy of Ordering" in Solid Solutions. R. Ya. Pines (*Izvest. Sekt. Fiz.-Khim. Anal.*, 1943, **16**, (1), 64-67). [In Russian]. A formula is derived for calculating the potential energy of a solid solution, taking into account the energy of interaction of every atom with all the remaining atoms in the lattice. [illegible]



CA

2

The calculation of disaggregation curves of solid solutions. B. Ya. Pines. *Ann. sect. anal. phys.-chim., Inst. chim. phys.* (U.S.S.R.) 10, No. 1, 65-81 (1938).—More general equations for these curves are obtained by a mathematical consideration of the effect of distortion of the lattice when the at. radii of the components differ, and of the case when the crystal lattices of the components differ. H. M. L.

METALLURGICAL LITERATURE CLASSIFICATION

M

1

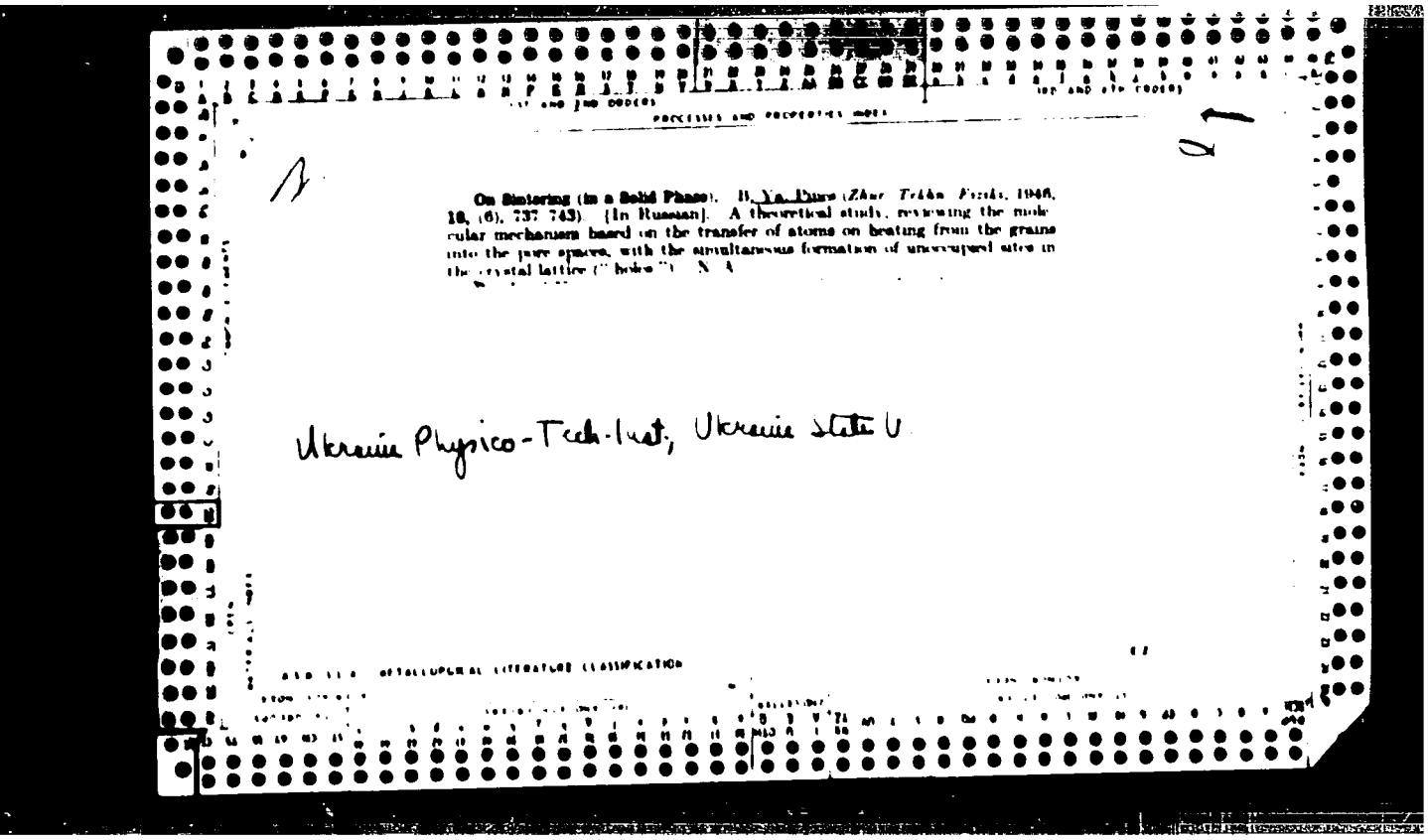
*Internal Stresses in a Deformed Single Crystal. B. Pines (Zhur. Eksper. Teoret. Fiziki, 1946, 16, (12), 496-500). (In Russian.) P. explains the experimental results obtained on rock salt (which show the existence of tension on one side of the slipping plane, and of residual compression stresses on the other) by considering that the magnitude of local deformation (slip) along the slipping plane decreases in the direction of the slip. As a result of such a slip, tension (compression) stresses are built up in the parts of the crystal adjacent to the slipping plane which after the removal of external force lead to the formation of residual stresses. A method for the calculation of these stresses has been put forward, and it is suggested that the other phenomena accompanying the process of slipping, viz., distances between slipping planes, work hardening, bending of the lattice planes, &c., might be treated in a similar way. V. K.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PINES, B. Ya.

"Critical Cooling Rate and Quenching of Alloyed Constructional Steel," Stal', No.5, pp. 413-416, 1945

Evaluation B-60430



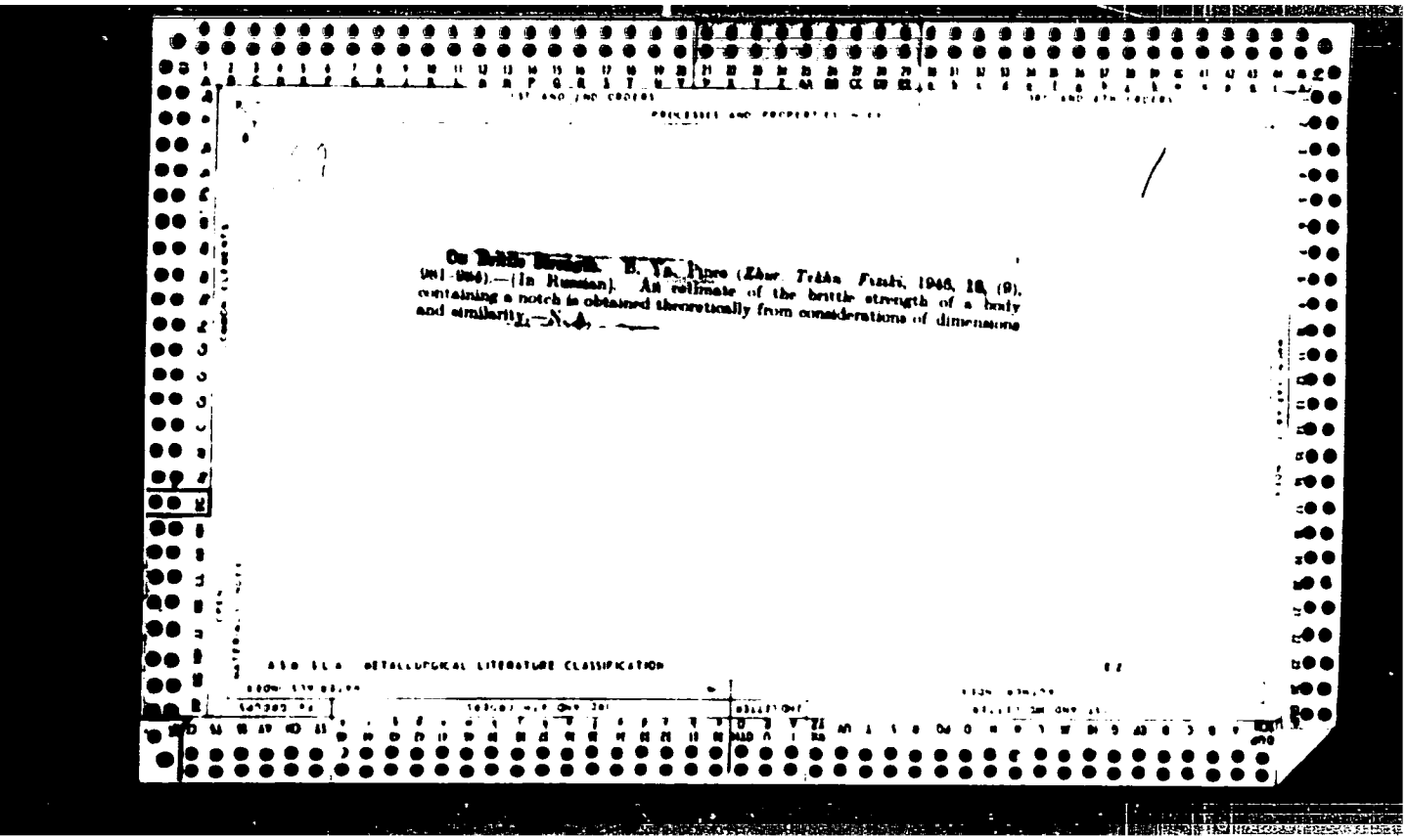
On Sintering (in a Solid Phase). B. Ya. Pines (*Zhur. Tekhn. Fiziki*, 1948, 18, (6), 737-743). [In Russian]. A theoretical study, reviewing the molecular mechanism based on the transfer of atoms on heating from the grains into the pore spaces, with the simultaneous formation of unoccupied sites in the crystal lattice (" holes "). N. A.

Ukranian Physico-Tech. Inst., Ukranian State U.

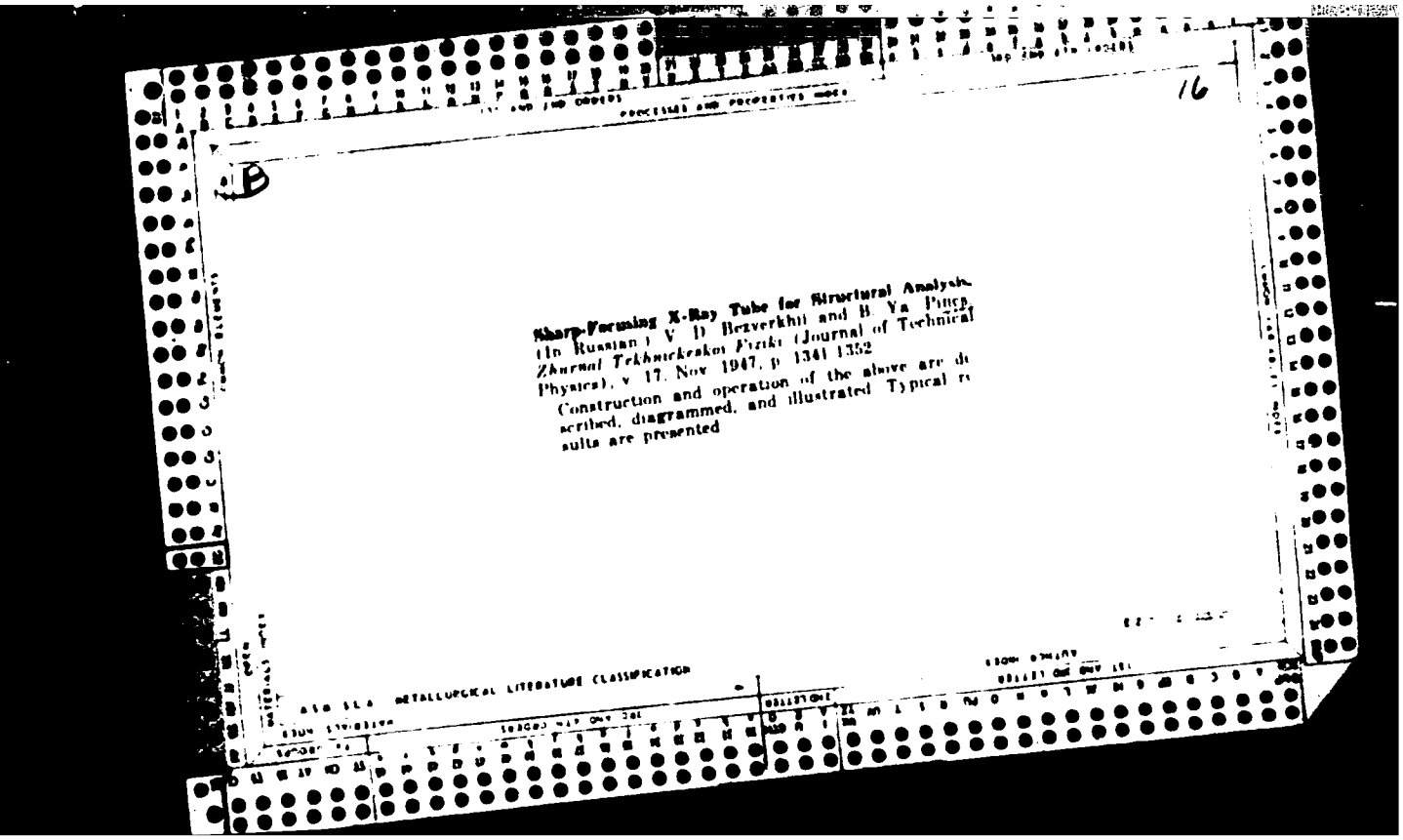
PINES, B. Ya.

"On Viscous Rupture," Zhur. eksper. i teoret. fiz., 16, No.8, 1946

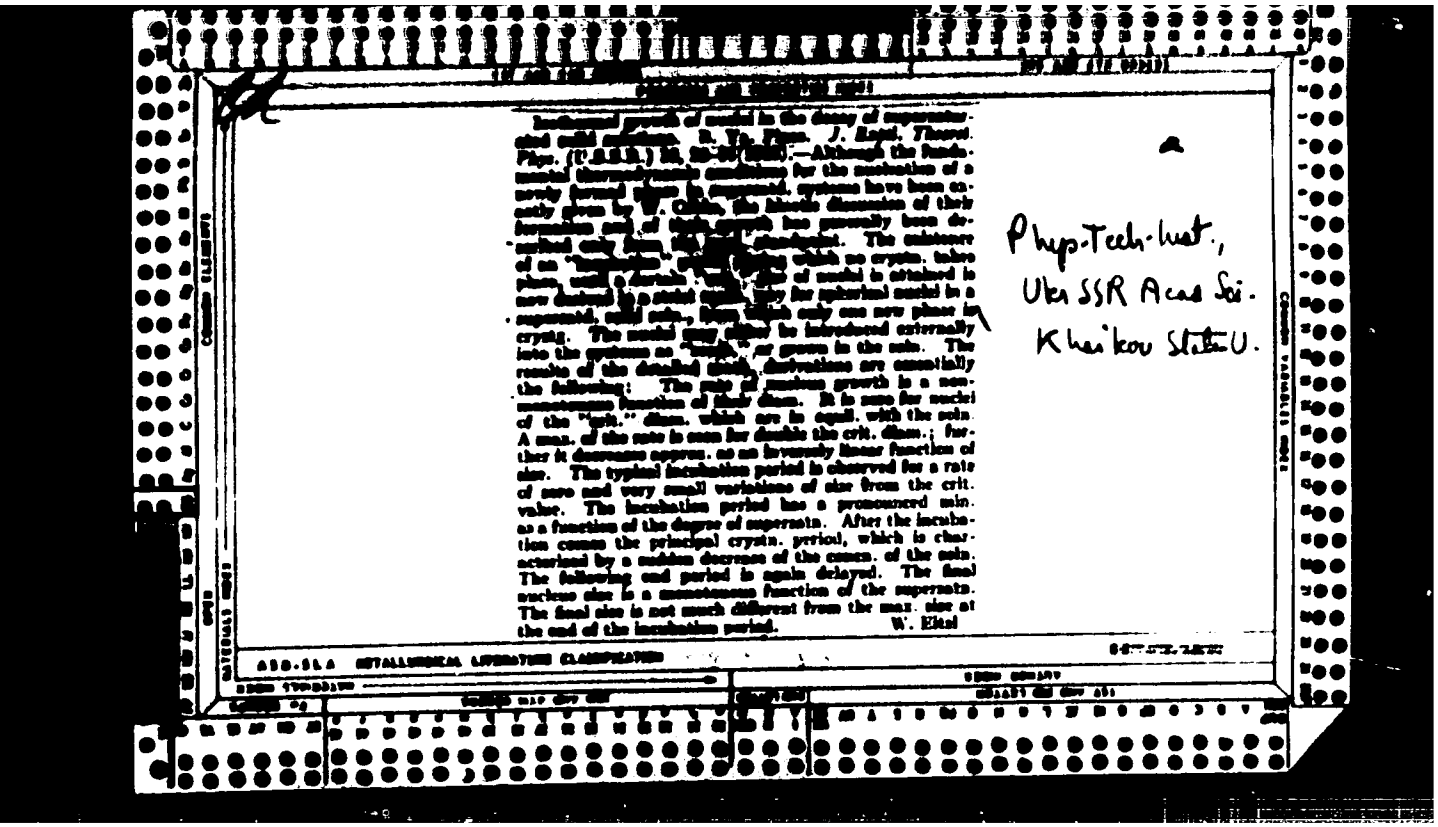
Phys.Tech. Inst., AS UkrSSR



On Brittle Strength. E. Ya. Rivo (*Zhur. Tekhn. Fiziki*, 1946, **16**, (9), 981–986).—(In Russian). An estimate of the brittle strength of a body containing a notch is obtained theoretically from considerations of dimensions and similarity.—N. A.

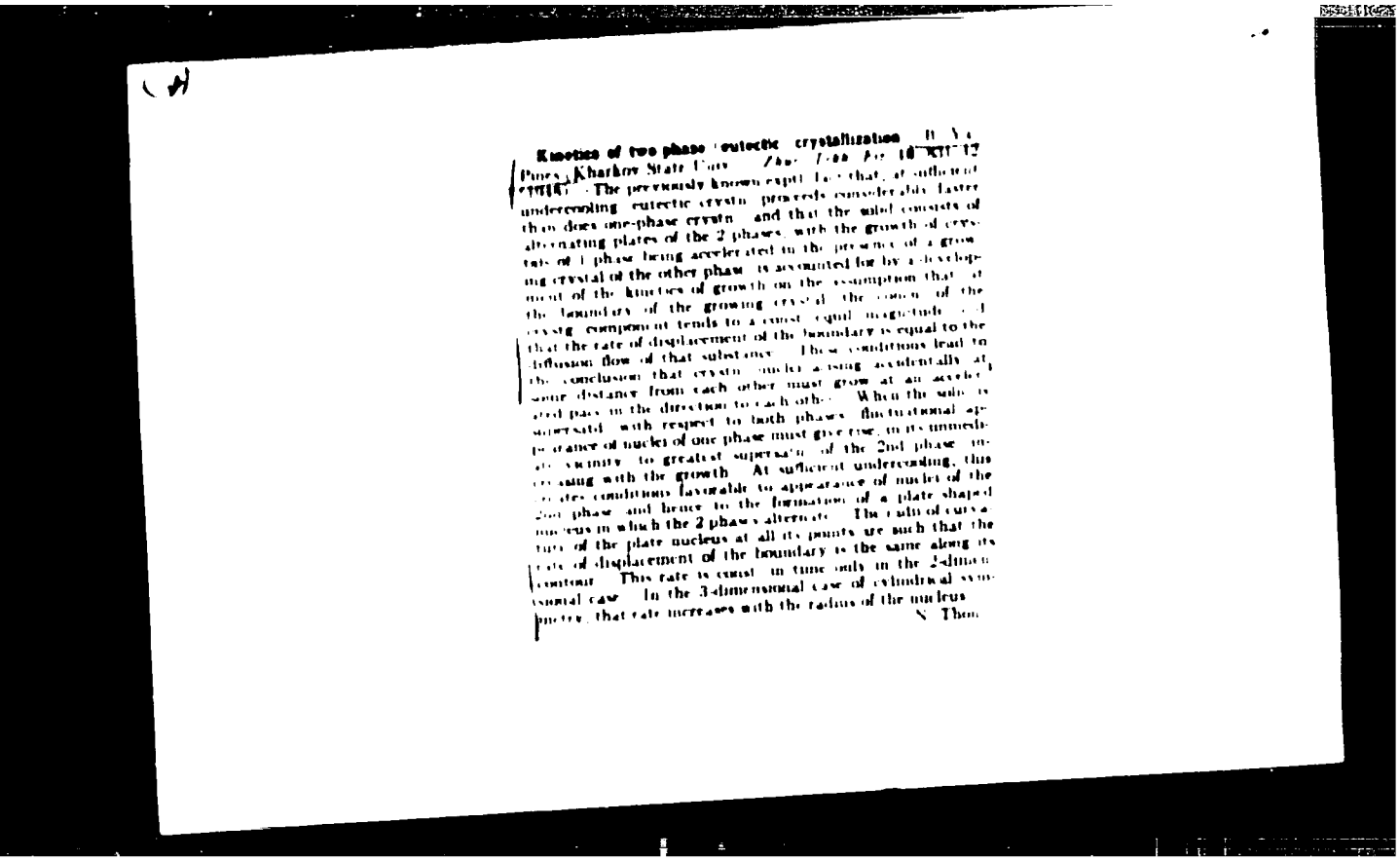


Sharp-Focusing X-Ray Tube for Structural Analysis
(In Russian) V D Bezverkhii and B Ya Pines
Zhurnal Tekhnicheskoi Fiziki (Journal of Technical Physics), v 17, Nov 1947, p 1341-1352
Construction and operation of the above are described, diagrammed, and illustrated Typical results are presented



Phys-Tech. Inst.,
Ukr SSR Acad Sci.
Kharkov State U.

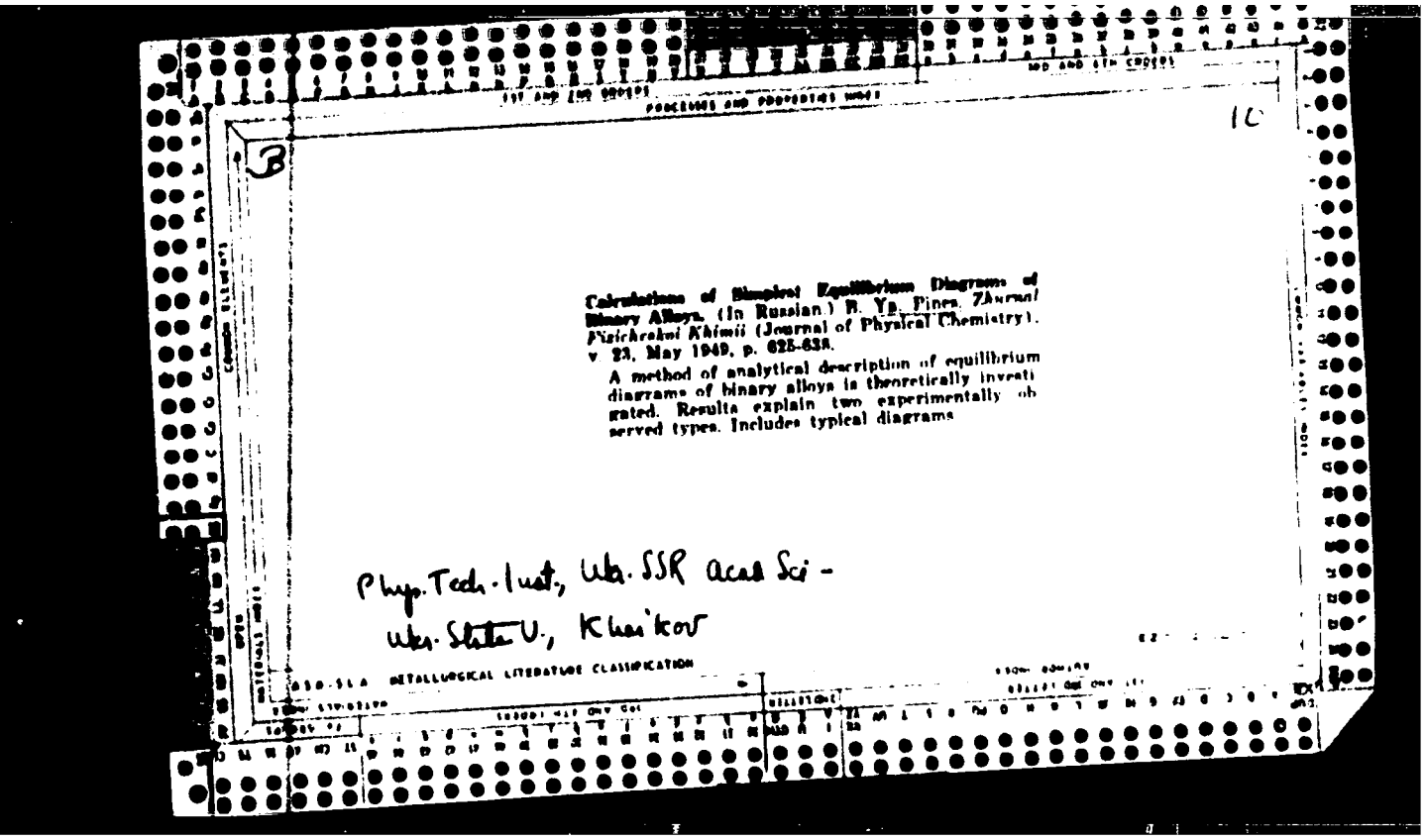
PINES, B. Ya.



Kinetics of two phase eutectic crystallization [illegible]

Pines, Kharkov State Univ [illegible]

[illegible] The previously known experimental fact that, at sufficient undercooling, eutectic crystn proceeds considerably faster than does one-phase crystn and that the solid consists of alternating plates of the 2 phases with the growth of crystals rate of 1 phase being accelerated in the presence of a growing crystal of the other phase is accounted for by a development of the kinetics of growth on the assumption that at the boundary of the growing crystal the concn of the crystg component tends to a const equal magnitude and that the rate of displacement of the boundary is equal to the diffusion flow of that substance. These conditions lead to the conclusion that crystn nuclei arising accidentally at some distance from each other must grow at an accelerated pace in the direction to each other. When the soln is supersatd with respect to both phases fluctuational appearance of nuclei of one phase must give rise, in its immediate vicinity, to greatest supersatn of the 2nd phase increasing with the growth. At sufficient undercooling, this creates conditions favorable to appearance of nuclei of the 2nd phase and hence to the formation of a plate shaped nucleus in which the 2 phases alternate. The radii of curvature of the plate nucleus at all its points are such that the rate of displacement of the boundary is the same along its contour. This rate is const in time only in the 2-dimensional case. In the 3-dimensional case of cylindrical symmetry that rate increases with the radius of the nucleus [illegible]. Then



Calculations of Simplest Equilibrium Diagrams of Binary Alloys. (In Russian.) B. Ya. Pines. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry). v. 23, May 1949, p. 625-638.

A method of analytical description of equilibrium diagrams of binary alloys is theoretically investigated. Results explain two experimentally observed types. Includes typical diagrams

Phys. Tech. Inst., Ukr. SSR Acad Sci - Ukr. State U., Kharkov

The polymerization of ethylene at high pressure in the presence of phosphoric acid at 250-300°. [illegible] and M. Pines. *J. Gen. Chem.* (U. S. S. R.) 6, [illegible] (1936). $CH_2:CH_2$ was polymerized by the [illegible] at 250°, 275° and 300° in the presence of H_3PO_4 by the method previously described. The gaseous products were analyzed and the liquid products were fractionated, and each fraction was analyzed. Essentially the same products were obtained at each of the 3 temps. The lower boiling liquid fractions consisted principally of olefins, cycloparaffins and paraffins; the higher boiling fractions of aromatic hydrocarbons and olefins. When $CH_2:CH_2$ was polymerized at 330° without H_3PO_4, no aromatic products were found. The amt. of cracking observed was insignificant. Lewis W. Butz

CA

1951

Calculated and experimental equilibrium diagrams for simple binary systems. Ya. E. Geguzin and B. Ya. Pines (Phys.-Tech. Inst., Acad. Sci. Ukr. S.S.R., Khar'kov). *Doklady Akad. Nauk S.S.S.R.* 75, 207-08(1950). Equations involving the m.p. of each of the 2 metals, the heats of mixing, U_l and U_s, in the liquid and solid solns., and the concns. of the liquid and solid solns. were used to predict the shapes of the liquidus and solidus curves of 20 diagrams. Good agreement was obtained for Cu-Ni by assuming U_l = U_s = 3.1 × 10⁻¹ erg/atom and for Ni-Co by assuming $U_l = U_s = 0$. For Ag-Pb $\Delta U = (U_l - U_s) \times 10^{13}$ ergs/atom = 0.57; for Ag-Au ΔU = 0.08; and for Cu-Pt ΔU = 0.84 (−0.84?). The ΔU value for Au-Pd, 0.85, indicated that a point of equal concn. must exist at 0.90 Pd. The temp. of the point of equal concn. was calcd. within 20° of the exptl. value for Fe-Pd, Fe-V, Rb-K, Ni-Pd, Fe-Cr, Sb-As, Cs-K, and Cs-Rb. The calcd. value was 180° high for Au-Cu and 200° low for Au-Ni. The disagreement probably resulted because of lattice strain. For the eutectic systems Sn-Ge, Al-Ge, Cd-Tl, and Au-Nb the values of $U_s \times 10^{13}$ ergs/atom were 0.85, −0.30, 1.28, and 1.4, resp. A. C. L.

C. A.

2

Energy of mixing of binary metallic systems. Ya. I. [illegible]gusin and B. Ya. Pines (Phys. Tech. Inst., Acad. Sci. Ukr. S.S.R., Khar'kov). *Doklady Akad. Nauk S.S.S.R.* 75, 535-8(1950). The energies of mixing in the systems Pb-Sn, Bi-Cd, Bi-Sb, Bi-Sn, and Pb-Bi were detd. from the heat of fusion and the heat capacity in the region of liquid plus solid. These quantities were measured by a high-temp. adiabatic calorimeter which permitted successive measurements of heat capacity throughout the range from solid to liquid in a single test, and at the same time detd. the heat of fusion. The exptl. complete heat of fusion, Q_c, was the sum of Q_0, the heat consumed in heating the alloy in the liquid-plus-solid region, and Q_0, the heat used in the phase change. To det. the energy of mixing it was necessary to know Q_0 as a function of concn. Q_0 was detd. from the observed dependence of heat capacity of the solid and liquid phases on concn. From the calcd. values of Q_0 were detd. U_0^L, the energy of mixing in the liquid phase, and U_0^B, the energy of mixing in the solid phase, on the assumption that the potential energy of the soln. can be expressed as $N[(U_{AA}/2)(1-a)^2 + U_{AB}\,2a + U_{BB}(1-a)]$, where a is the concn. and U_{AA} and U_{BB} are the potential energies of like atoms. In the Pb-Sn system $U_0^L = 1.0 \times 10^{-13}$ erg/mol. and $U_0^B = 1.3 \times 10^{-13}$. In the Bi-Cd system $U_0^L = 0.27 \times 10^{-13}$ and 0.15×10^{-13}. In the Bi-Sb system $U_0^L = 0.56 \times 10^{-13}$; the latter value was affected by nonequil. conditions. In the Bi-Sn system $U_0^L = 0.55 \times 10^{-13}$ and $U_0^B = 2.65 \times 10^{-13}$. In the Pb-Bi system $U_0^L = -1.1 \times 10^{-13}$ and $U_0^B = +8 \times 10^{-13}$. These values predicted liquidus and solidus lines in good agreement with expt. except for the solidus of the Bi-Sb system. The U_0^L values agreed with reported short-range order in liquid Pb-Sn and Bi-Sn but did not agree with that in Pb-Bi alloys. The energy of mixing detd. alternatively from the "jump" in heat capacity during heating through the solidus and liquidus lines agreed well with the former value in the Pb-Sn and Bi-Sn systems but not in the Bi-Cd system because of nonequil. conditions. A. G. Guy

PA 193T67

USSR/Metals - X-Rays Oct 51

"X-Ray Method of Determining Local Composition in Alloys of Variable Concentration," V. S. Kogan, B. Ya. Pines

"Zhur Tekh Fiz" Vol XXI, No 10, pp 1244-1254

Authors refer to their previous work ("Zhur Eksper i Teoret Fiz" Vol XVIII, No 3, 1948) in which they described these techniques. Their method is based on measurements of absorption of monochromatic x-radiation. Describe equipment used. Process measurements of various concns. Authors

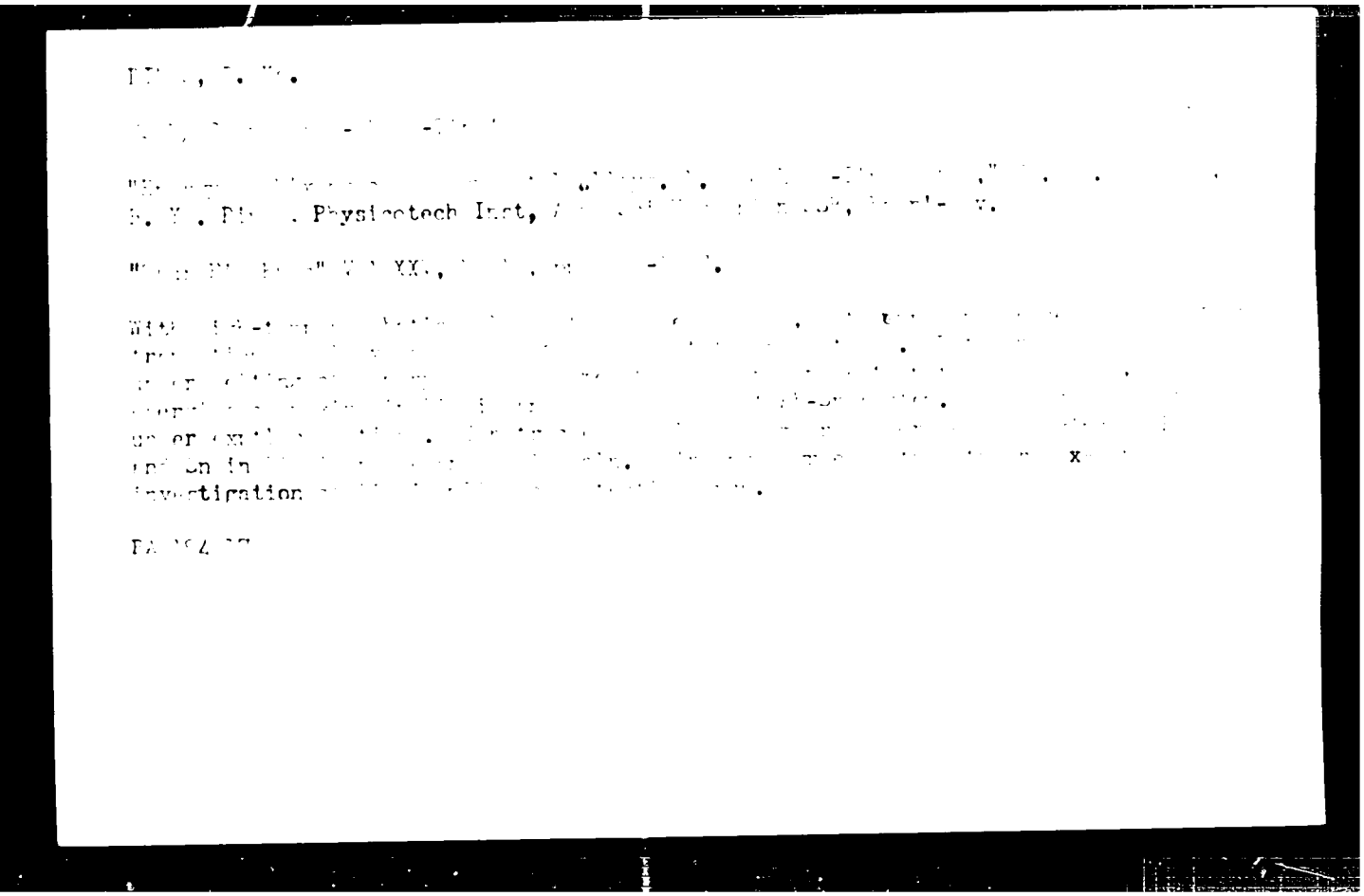
193T67

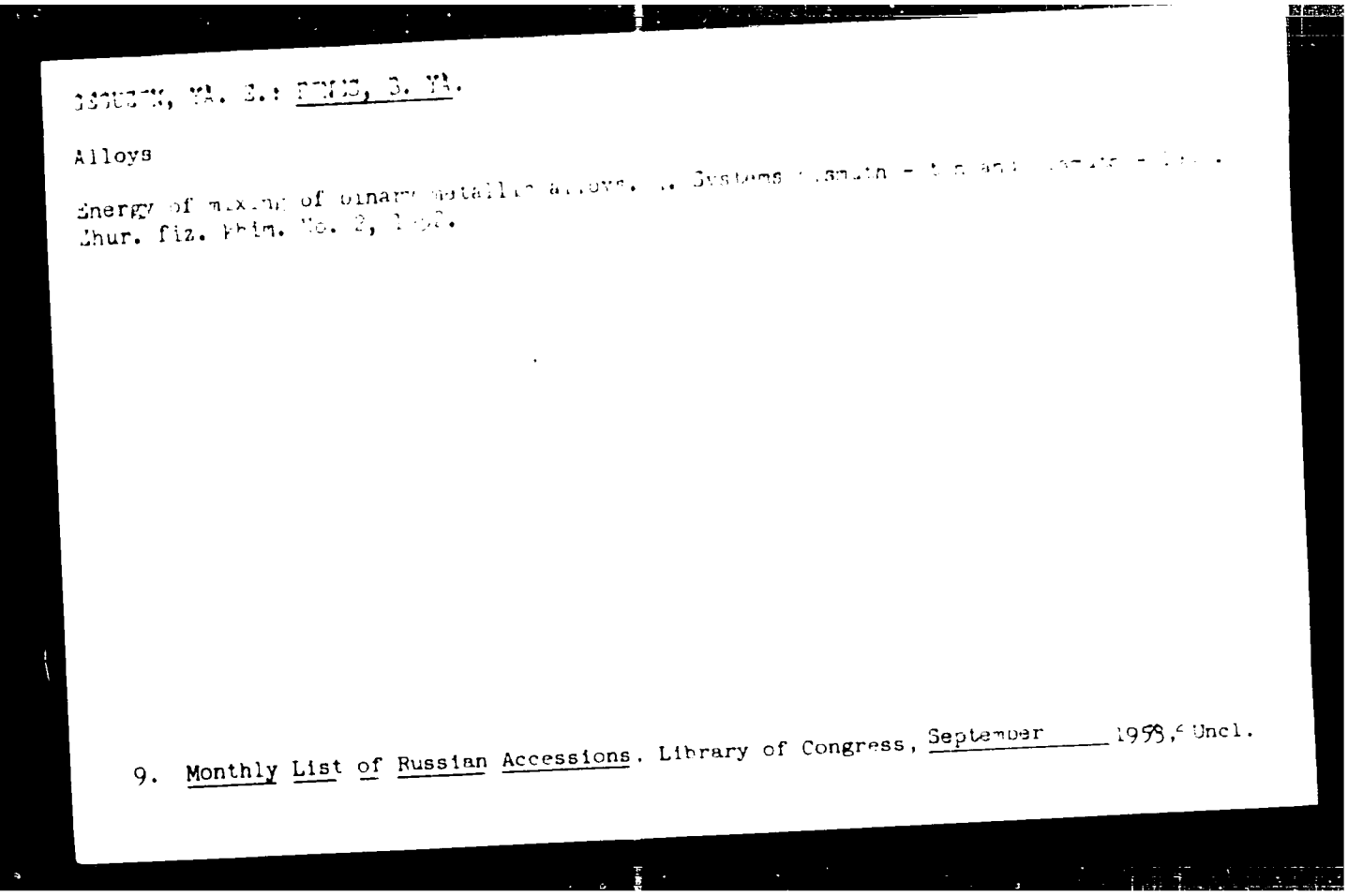
USSR/Metals - X-Rays (Contd) Oct 51

thank A. A. Lupandina and L. F. Yakimenko for laboratory assistance. Submitted first 10 Apr 50, later 25 Jun 50.

193T67

PINES, B. YA.





[illegible], M. E.: [illegible], B. M.

Alloys

Energy of mixing of binary metallic alloys. [illegible]
Zhur. fiz. khim. No. 2, [illegible].

9. Monthly List of Russian Accessions. Library of Congress, September 1958, Uncl.

PINES, B. Ya.

USSR/Physics - Monochromatic X-ray May/Jun 52
Sources

"Sharp-Focus X-ray Tubes and Powerful Monochromators," B. Ya. Pines, Khar'kov State U imeni A. M. Gor'kiy

"Iz Ak Nauk SSSR, Ser Fiz" Vol 16, No 3, pp 333-338

Condensation of a report heard at the conference on powerful monochromatic x-ray sources, held at Khar'kov 24-26 Jan 52. States that the realization of sharp focus in an x-ray tube leads

232T101

to a considerable shortening of exposure during x-raying (more than 10 t'mes), during which the total elec capacity of the tube is lowered, but the specific capacity (per unit area of focal spot) turns out to be strongly increased; that is, sharp-focus tubes possess strong "illuminating power." Mentions monochromators made from plastically "double-sharp bent" crystals with toroid surface.

232T101

232T102

PINES, B. Ya.

USSR/Physics - Monochromatic X-ray Sources May/Jun 52

"Sharp-Focus X-ray Tube With Regulable Size of the Focal Spot," V. S. Kogan, B. Ya. Pines, Khar'kov State U imeni A. M. Gor'kiy

"Iz Ak Nauk SSSR, Ser Fiz" Vol 16, No 3, pp 339-343

Report heard at the conference on powerful monochromatic x-ray sources, held at Khar'kov 24-26 Jan 52. Authors discuss the attainment of

232T102

focal spots less than 0.005 sq mm in area by means of regulated positioning of the filament 0.15 mm in diam (diam of the aperture in the cathode cone is 0.5 to 0.6 mm). X-ray pictures by subject tube are distinguished by resolution of the K_{α}-doublet in all lines, eve for small exposures (several minutes).

232T102

PINES, B. Ya.

USSR/Physics - Monochromatic X-ray Sources May/Jun 52

"Employment of the Sharp-Focus Tube for Operation in Impulse Regime," A. I. Bublik and B. Ya. Pines; Khar'kov State U imeni A. M. Gor'kiy

"Iz Ak Nauk SSSR, Ser Fiz" Vol 16, No 3, pp 350-[illegible]

Report heard at the conference on powerful monochromatic x-ray sources, held at Khar'kov 24-26 Jan 52. V. V. Avgust participated in this report. Subject operation is important

232T104

For investigating those processes of structural variations that occur in time. In this connection tubes with higher power or rotating or oscillating anodes were employed before the appearance of subject sharp-focus tubes (which permit shortening the time of exposure without increase of power). Now even better is subject impulse (rapid) x-ray tube.

232T104

"An X-ray Tube with an Especially Large and Short Linear Focus and Some of Its Applications," A. I. Bublik, B. Ya. Pines, Khar'kov State U imeni A. M. Gor'kiy

"Iz Ak Nauk SSSR, Ser Fiz" Vol 16, No 3, pp 359-[illegible]

Length of focus is 22 mm and the distance from focus to tube's fovea is 12 mm, which permits use of x-ray beams with angular

232T105

convergence greater than 50°. This large convergence enables one successfully to photograph single crystal samples according to the method of converging beam, the exposure being several times shorter than required to obtain x-ray photographs of rotation. Subject method is especially advantageous for photographing microcrystals, making it convenient for studying structure of alloys and metals.

232T105

PINES, B. YA.

CII

Adsorption, surface tension, and the energy of mixing for binary metal alloys. B. Ya. Pines. *Zhur. Tekh. Fiz.* 22, 1908-19(1952); cf. *C.A.* 47, [illegible].—Math. The surface tension and the adsorption were detd. for binary disordered alloys by means of an approx. calcn. in which the potential energy of the alloy is represented as the sum of the relative potential energy of neighboring atoms. The consts. which det. the properties of the system are the coeff. of surface tension of the components and the energy of mixing. When the differences in the coeff. of surface tension and the energy of mixing are small, adsorption is weak, but when they are large it is strong. Formulas are given which give a qual. description of adsorption and surface tension in both cases.

J. Royer Leach

PINES, B. Ya.

The "interphase surface tension" of metals and alloys. B. Ya. Pines. Zhur. Fiz. Khim., 26, 1985-2004(1952).—Contrary to the evaluations of the "interphase surface tensions" (σ) on the boundary of two condensed phases, e.g. a solid and a liquid, of pure materials $\sigma'_{1,1}$; (b) on the boundary of differently oriented (crystallographically) grains of polycrystals, $\sigma_{a,a'}$; (c) on the boundary of solns. of various concns., that are in thermodynamic equil., $\sigma_{x,y}$. In order to make this last concept more precise the adsorption effect on the boundary of the solns. is computed. The usual evaluation of $\sigma'_{1,1}$ from the ratio of the heat of melting to the heat of evapn. leads to an error in the order of magnitude and actually leads to $\sigma_1 < \sigma_2$. More correct and complete formulas are derived for $\sigma'_{1,1}$ that take into consideration also the d. differences in the phases. The significance of the difference in the consts. $\sigma'_{1,1}$ and $\sigma_1 - \sigma_2$ is shown for the process of crystn., i.e. how these values indicate the facilitating of the formation of nuclei inside the old phase in comparison to the formation at the boundary. For $\sigma_{a,a'}$ formulas are derived for the cubic system for simple, body-centered, and face-centered unit cells of the lattices. $\sigma_{a,a'}$ can have the same order of magnitude as surface energy, but for small α and α' it approaches zero as a function of $(\alpha - \alpha')^2$. For a polycrystal with a random orientation of the grains the av. of surface energy σ is 2 orders of magnitudes larger than $\sigma_{a,a'}$. For the same cubic crystals formulas are given that allow calcn. of σ_{max}, i.e. the surface tension on the boundary towards a vacuum, as a function of the indexes h,k,l of the external faces of the crystals. The problem of the interphase adsorption is investigated, and formulas are derived for the equil. surface concns. at the boundary of solns. At the point of equal concn. and at the point of max. asymmetry of the dissocn. curve of the solns. of the concd. component, the interphase surface tension approaches zero. At the eutectic point appears the interphase surface tension on the boundary of the low-temp. phases: $\sigma_{II,III}$ is a max. If the soly. in the low-temp. phases II and III is small, then $\sigma_{II,III} > \sigma_{I,II} + \sigma_{I,III}$.

Werner Jacobson

[redacted]

Alloys

[redacted]

[redacted]

USSR

Phase transition in changing the thickness of thin metal films. A. I. Dubilk and B. Ya. Pines (A. M. Gor'kii State Univ., Kharkov). *Doklady Akad. Nauk S.S.S.R.* 97, 215–18(1953).—In order to study the phase transitions between massive metals and their thin films, electron-diffraction studies were made with evapd. thin films of Be, V, Cr, Ni, and Cu for a thickness range from 10^{-7} to 10^{-4} cm. The electron diffraction patterns show that the structure of the film depends on the rate of evapn. in formation of the film. For films of thickness $\sim 10^{-7}$ lines are observed that are due to phases unstable at room temp. for massive samples (e.g., β-Be). The stability of such phases is discussed.

J. Rovtar Leach

PINES, B. Ya.

Self diffusion and viscous flow (sintering and creep) in pressed metal powders. Ya. E. Geguzin, L. O. Marikon, and B. Ya. Pines (A. M. Gor'kii State Univ., Kharkov). Doklady Akad. Nauk S.S.S.R. 87, 577-80(1952).—It had been shown by P. (C.A. 41, 6784) that the equil. concn. of vacancies, C_0, in a metal is decreased by a compressive stress, P, an amt., $\delta C = (P\Omega^3/kT)C_0$, where Ω is the lattice spacing. Therefore a difference in vacancy concn. would exist between the end and sides of a rod of length L and radius R subjected to simultaneous longitudinal tension, P_1, and sidewise compression, P_2. A flow of vacancies of atoms would occur that would cause a rate of elongation $(1/l)(\Delta L/L) = D\Omega^3(P_2 - P_1)/(kT\lambda R) = (P_2 - P_1)/\eta$, where l is the time, D is the self diffusion coeff., λ is a certain linear distance dependent on the concn. gradient, and η is a coeff. of viscosity. An analogous relation between η and D holds for sintering of metal powders. Exptl. data were obtained on 20–40-μ powder of electrolytic Cu and of Fe reduced from scale. Pressing was done in a mold 4.2 mm. in diam. and 7.8 mm. high, and pressures up to 6 kg./sq. cm. were maintained and sintering H$_2$ was done at temps. of 900° (Cu) and 1100° (Fe). $[(\Delta V/V)_t - (\Delta V/V)_0]$ increased linearly with increasing maintained pressure, P, where V is the vol. The "Laplace pressure" on the pore surfaces was 5.7 kg./sq. cm. for Cu and 2.9 for Fe. The viscosity was independent of pressure. The deduced values of self-diffusion coeff. were 10^{-9} sq. cm./sec. for Cu and 10^{-9} for Fe. Distortions in the cryst. lattice of the powder caused these values to be high. From the temp. dependence of viscosity the activation energy for diffusion was calcd. to be 36,000 cal./mole for Fe and 12,000 for Cu. A. G. Guy

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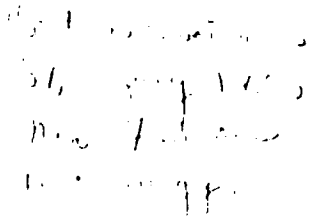
PINES, B. Ya.



Equilibrium diagram of the system indium-lead

PINES, B.YA.

Micromethods of phase analysis of alloys. V. S. Kolesnikov and B. Ya. Pines (*C.R. Acad. Sci., U.R.S.S.*, 1932, **87**, 967–969). [illegible] analysis of alloys by the *X*-ray method of varying composition alloy is supplemented at temp approaching the m.p. by measurements of the electrical resistance of specially prepared specimens. The specimens are in the form of thin wires (diam. ~0·5 mm.) immersed in heated oil baths. The measurement of p.d. across the wire at a given current allows the determination of the resistance. The measurements can be extended to temp. at which a liquid phase appears (solidus) and even to temp. of complete liquefaction (liquidus) due to the fact that the thin wire maintains its form under forces of surface tension and surface oxide film. The positions of both solidus and liquidus curves correspond to discontinuities on the sp. resistance–temp. curve. S. K. LACHOWICZ.

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P. H X-ray tube with particularly long and sharp ruled focus. [illegible], A. A. Gusiyatkov, and B. Ya. Pines. *Trudy Fiz. Otdel., Fiz.-Mat. Fakul'teta* [illegible] 129-32 (1953); *Referat. Zhur., Khim.* 1954, No. 50388; cf. *C.A.* 47, 3109d.—The length of focus of the tube is 22 mm., width 0.2 mm., distance from focus to window 13 mm., angle of convergence 50°. This permits one to photograph mono-crystals without disturbing the crystals. M. Hosch

(2)

Pines, B. Ya.

USSR

Adsorption and surface tension in a ternary metal alloy. B. Ya. Pines. *Zhur. Tekh. Fiz.* 23, 68-73(1953); cf. *ibid.* 22, [illegible](1952).—The approximations used earlier for a binary system are extended to the calcn. of the adsorption and surface tension of a ternary system bounded by a vacuum. The relation of these values to temp. and concn. is given. The adsorptions of the various components are not independent of one another. The surface tension of the ternary alloy is not additive even in the absence of adsorption.
J. Rovtar Leach

62

Phys. B. Ya

V

CH

Surface tension of binary alloys lead-tin, bismuth-lead, bismuth-tin, and bismuth-cadmium. R. V. Bakradze and B. Ya. Pines. *Zhur. Tekh. Fiz.* 23, 1548–58(1953).—The surface tension σ of Pb-Sn alloys was measured by the method of balancing an Fe ring immersed in the liquid in vacuum. The wetting angle of the alloy on Fe, necessary for the calcn. of σ, was detd. optically. The σ of Bi-Cd, Bi-Sn, and Bi-Pb alloys was measured by the method of max. pressure of H bubbles. The σ increased linearly with temp. The dependence of σ on concn. was not linear and (with exception of Bi-Pb at 850°) σ is lower than the additive value. The results are at an av. temp. in agreement with values calcd. by a previously established formula (cf. preceding abstr.). They are in poorer agreement at lower and higher temp.; thus wrong values are given of $d\sigma/dT$, especially in Bi-Cd and Pb-Sn alloys poor in the strongly adsorbed component (Bi or Pb). This is attributed to the fact that internat. distances in the surface layer included in the formula are different from the distances in the vol. Oxidation of the surface leads to a decrease of σ and an increase of $d\sigma/dT$. The values become normal when the surface is reduced again. — S. P.

PINES, B. Ya

USSR.

Self diffusion and heterodiffusion in heterogeneous porous bodies. B. Ya. Pines and Ya. E. Geguzin. *Zhur. Tekh. Fiz.* 23, [illegible]).—A central wire of Ni was surrounded by 6 wires of Cu (or vice versa), the bundle was inserted in a Cu tube and slightly drawn down to insure good contact between the metals. Other investigated pairs were Fe-Cu, Fe-Ni, and Ag-Ni. The assembly was heated in H, or in vacuum at 1040°. Micrographs show that the inner Ni wire increases in diam. and the Cu wires decrease. The Cu wires become porous. Gradually the whole assembly is baked together. If the central wire is Cu, the pores appear in the center and the outer wires increase in diam. Thus Cu diffuses into Ni with a speed at 1040° in vacuum of 1.3×10^{-9} sq. cm./sec. and in H of 2.3×10^{-9} sq. cm./sec., but Ni does not diffuse into Cu. The observed porosity is explained by an increase in the number of vacancies and considered as a proof of the vacancy theory of diffusion. It is shown theoretically that the diffusing atoms will be those of the component with the lower latent heat of evapn. S. R.

(1)

PINES, B. Ya.

USSR

The kinetics of the sintering of pressed metallic powders. B. Ya. Pines and Ya. E. Geguzin. *Zhur. Tekh. Fiz.* 23, 2078-82(1953).—Dilatometric detns. of contraction were made on samples that had been sintered stepwise to det. the relation between sintering of pressed metal powders and time and temp. It was shown that isothermal contraction in the initial stage increases linearly with time, t. For longer periods of sintering it is proportional to $t^{1/2}$. The kinetics of the sintering process are explained on the basis of the distortion of the lattice. J. Rovtar Leach

PINES, B.Ya., GEGUZIN, Ya.Ye., MAKHONIN, V.M.

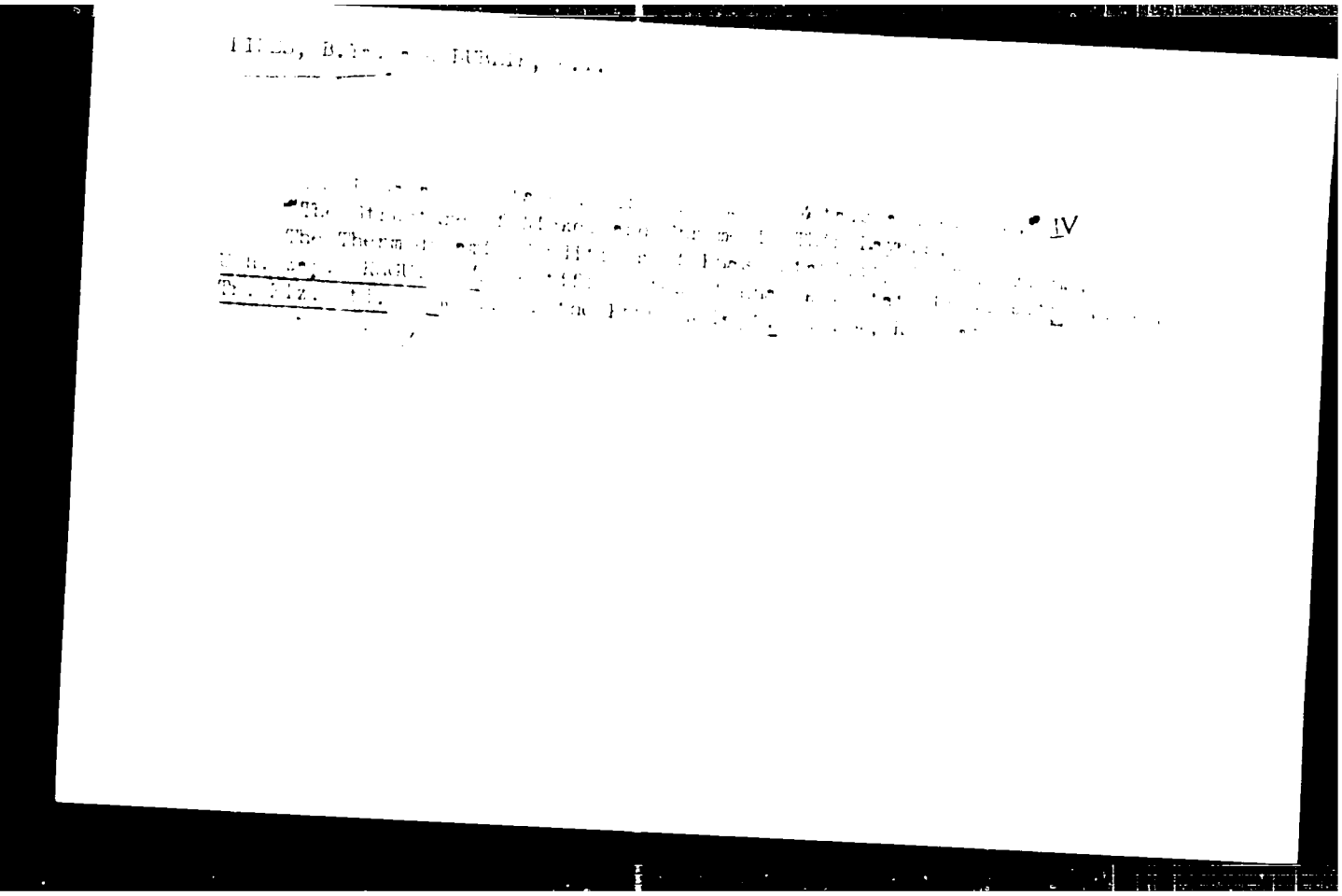
"Laws Governing the Sintering of Compact Metallic Powders," Uch. zap. KhGU, V. 48, Tr. Fiz. otd., No. 4, Kh. St. Univ. publication.

PINES, B.Ya., GAL'PERINA, L.I., GEGUZIN, Ya.Ye.

"Thermal Effects During the Sintering of Metallic Powders," Uch. Zap. KHGU, V. 48, Tr. Fiz. otd., No. 4, Kh. St. Univ. publication.

PINES, B.Ya., GEGUZIN, Ya.Ye., SMUSHKOV, I.V.

"Microstrains in a Crystal Lattice and the Sintering of Metallic Powders," Uch. zap. KhGU, V. 48, Tr. Fiz. otd., No. 4, Kh. St. Univ. publication.



PINES, B.Ya., GEGUZIN, Ya.Ye., MARKON, L.O.

"Viscous Stream and Self-Diffusion (sintering and creep) in Crystalline Bodies in Compact Metallic Powders," Uch. zap. KHGU, V. 4E, Tr. Fiz. otd., No. 4, Kh. St. Univ. publication.

PINES, B. Ya., GEGUZIN, Ya. Ye. and SMUSHKOV, I. V.

"Microtension in the Crystal Lattice and Calcining Metallic Powders". Uch. Zap. Khar'kovsk. Un-Ta, T. 49, Fiz. Otd. Fiz.-Matem. Fak., Vol. 4, pp 111-117, 1953.

Studied structural changes during the calcining process by means of X-ray analysis of samples of compressed powder of electrolytic copper and of nickel powder. The samples were calcined at various temperatures for various periods of time in a deoxygenated atmosphere. Analysis indicates that at temperatures below 400° for copper and below 700° for nickel, microtension is totally removed, and therefore these temperatures have no effect on the calcining process. (RZhKhim, No. 4, 1955)

SO: Sum No 884, 9 Apr 1956

PINES, B. Ya.

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Impulse sharp-focus X-ray tube for structure analysis. V. V. Avyrent, A. I. Babak, and B. Ya. Pines. *Uchenye Zapiski Khar'kov. Univ.* 49, *Trudy Fiz. Otdel., Fiz.-Mat. Fakul'teta* 4, 133-8(1953); *Referat. Zhur., Khim.* 1954, No. 60289.—Structural details are given. M. Hosch

EL

SMW

(2)

PINES, B. Ya.

V Nonequilibrium states in thin films of metals and alloys. III. Electronographic study of thin cobalt films. A. I. Bublik, B. I. Vyazmitinova, and B. Ya. Pines. *Uchenye Zapiski Khar'kov. Univ.* 49; *Trudy Fiz. Otdel. Fiz-Mat. Fakul'teta* No. 4, 139-50(1953); cf. *C.A.* 49, 7949e.— Data are given for an electronographic study of free, thin Co films that were obtained by evapn. and condensation of the metal *in vacuo*. A structural change in the films was detd. in relation to the evapn. rate and thickness of the film. The thickness was measured by an optical-interference method. A disordered at. distribution was noted in films resulting from slow evapn. Interference max. were absent on the electronograms. With rapid evapn. (several secs.) there was a well-ordered distribution of atoms. Thus, in the cases of both V and Be (*ibid.* 39, No. 3, 75(1952)), the relation of structure to the thickness of the film is shown. In very thin films ($2 - 3 \times 10^{-7}$ cm.) Co occurs in an "amorphous" state. Two clearly defined diffusion rings are present on the electronogram. In films with a thickness of $\sim 10^{-6}$ cm. the structure of Co corresponds to the β-modification (face-centered cubic). Hexagonal Co is observed in films that are thicker than 10^{-6} cm. In the thickness range from 4×10^{-7} to 8×10^{-7} cm. there are lines on the electronograms that do not correspond to the known Co modifications. IV. Structure of nickel and chromium in thin layers. Thermodynamic conditions for phase stability in thin films. A. I. Bublik and B. Ya. Pines. *Ibid.*—Data are given for an electronographic study of thin Ni and Cr films, obtained by evapn. the metal *in vacuo*. Just as with Co, in Ni and Cr films that are deposited by rapid evapn. there is a relation between the structure and the thickness. In films with a thickness of $>6 \times 10^{-7}$ cm. the same crystal structure is obtained as with massive samples. With thicknesses of $\leq 4\text{-}6 \times 10^{-7}$ cm. another structure is observed; with Ni it is hexagonal and with Cr it is complex cubic similar to α-Mn. On the electronograms for films deposited by slow evapn. of the metal, the interference max. are enlarged. Thermodynamic conditions for phase equil. in thin layers are considered, and here the "crit. thickness" l° is possible, below which modification 2 becomes stable. l° is detd. by the relation: $l^\circ = (\Omega_1 - \Omega_2)/(F_2 - F_1)$ (1), where Ω_1 and Ω_2 are surface energies, F_1 and F_2 are "vol." free energies of the two phases. By taking into account the interaction between the nearest neighbors, equation 1 has the form: $l^\circ = d_2(1 - Z_1^\circ/Z_2^\circ) - d_1(1 - Z_1'/Z_2') + \epsilon d_2(1 - Z_0^\circ/Z_0')|/\epsilon|1 - (T/T^\circ)|$ (2), where Z_0 and Z_0 are vol. and surface coördination quantities, d is the distance between at. layers parallel to the surface, ϵ is the relation of the latent heat of phase transition to heat of evapn., T° is the temp. of phase transition for massive samples. According to a calcn. on the basis of equation 2, when the metal in a massive sample has a face-centered cubic lattice, the formation of a body-centered lattice in the thin film is very improbable. The reverse situation is very probable. The formation of a hexagonal lattice in the thin film is also possible, if the metal has a face-centered cubic lattice in the massive sample. Through *Referat. Zhur., Fiz.* 1955, No. 4775. Marjorie Ketner

CH

(2)

PINES, B. YA.

11 Jan 53

USSR/Metallurgy - Metal Powders, Sintering

"Distortions of a Crystal Lattice and Sintering of Metal Powders," L. I. Gal'perina, Ya. Ye. Geguzin, B. Ya. Pines, I. V. Smushkov, Khar'kov State U imeni A. M. Gor'kiy

DAN SSSR, Vol 88, No 2, pp 269-268

Studies processes of removing stresses and distortions in sintering of pressed metal powders by X-ray examination of specimens after various heat treatments and by measuring heat capacity. Experiments were conducted with powders of Cu, Ni and Fe. Results are presented graphically and analyzed. Presented by Acad D. S. Belyankin 14 Nov 52.

PA 249T24

PINES, B. Ya.

FD-600

USSR/Physics - Crystal lattice constants

Card 1 1 : Pub 153-16/22

Author : Pines, B. Ya. and Kaluzhnikova, N. V.

Title : Problem of the accurate determination of crystal lattice constants from the x-ray analysis of polycrystals

Periodical : Zhur. tekh. fiz. 24, 3 -3 9, Feb 1 54

Abstract : Because of controversies in the determination of the lattice constants, the authors attempt to verify experimentally the different formulas. They found that in avoiding errors it suffices to make two pictures, the second one after rotating the specimen 180°. G. V. Kurdyumov's formulas agree in the first approximation with the experiments. 4 references.

Institution :

Submitted : July 19, 1945

PINES, B. Ya.

USSR/Physics - X-rays focusing adjustment

FD-

Card 1/1 : Pub. 153-19/22

Author : Pines, B. Ya. and Mazel, Ye. A.

Title : Modification of the sharp focusing x-ray tube with adjustable size of focal spot

Periodical : Zhur. tekh. fiz. 24, 326-328, Feb 1954

Abstract : Describe a design that is an improvement over the former one of V. S. Kogan and B. Ya. Pines (Izv AN SSSR, ser. fiz. 16, No 3, (195)). The cathode of the tube is designed for a rigid fixing of the focusing camera in such a manner that the specimen, film and focal spot are located on the focusing circle. The pictures were as good as those taken with a sharp focusing tube. 4 references.

Institution :

Submitted : July 19, 1953

PINE, B. Ya. FD-60[illegible]

USSR/Physics - Crystallography of micro-stresses

Card 1/1 : Pub. 153-[illegible]

Author : B. Ya. Pine and N. G. Bereznyak

Title : Determination of microstresses in plastically deformed polycrystalline bodies

Periodical : Zhur. tekh. fiz. [illegible], 3[illegible]-336, Feb 1954

Abstract : Apply the method of harmonic analysis to the determination of the structural changes that occur during plastic deformations of polycrystalline specimens of W and Ta (Warren and Averbach, J. Appl. Phys., 21,595 (1950)). Found that the diffusion of lines of the x-ray pattern after deformation is due to the effect of microstructures. 6 references, including 4 foreign.

Institution :

Submitted : July 3, 1953

FD-1019

USSR/Physics - Electronograph

Card 1/1 : Pub. 153 - 23/24

Author : Pines, B. Ya., and Bublik, A. I.

Title : High-temperature electronographs

Periodical : Zhur. tekh. fiz., 24, 1139-1145, Jun 1954

Abstract : Describes a high-temperature electronograph of simple design (without magnetic lenses) for obtaining electronograms of specimens found at high-temperatures, in the form of thin plates and in the form of massive slides. The thin plates are of finely crystalline aluminum and other substances, practically single-crystals. Five references all USSR (Z. G. Pinsker, B. K. Vaynshteyn, V. D. Bezverkhiy).

Institution : -

Submitted : July 19, 1954

FD-1051

USSR/ Metallurgy - Diffusion in alloys

Card 1/1 : Pub. 153 - 22/23

Author : Pines, B. Ya.

Title : Phenomena of diffusion in metals and alloys

Periodical : Zhur. tekh. fiz., 24, 1521-1540, Aug 1954

Abstract : Following the microscopic theory of vacancies of A. F. Ioffe (Fizika kristallov, 1929) and the sub-diffusion theory of Ya. I. Frenkel' (Vvedeniyev teoriyu matallov, GTTI, Moscow-Leningrad 1950) on the diffusive displacement of atoms in a crystalline lattice, the author evaluates in the simplest cases the velocity of diffusion in crystalline bodies consisting of atoms of two kinds. Considers the molecular mechanism of diffusion, internal and external diffusion, the growth of nuclei, recrystallization, and systems with nonequilibrial number of vacancies. Ten references, e.g. B. Ya. Pines, Uchenyy zapiski Khar'kovskogo universiteta, Tr. fiz.-mat fak. [Sci. Notes of Kharkov Univ., Works of Phys.-Math. Fac.], 3, 65, 1952.

Institution : --

Submitted : 25 February 1954

PINES, B. YA.
USSR/Physics
Card 1/1

Authors : Pines, B. Ya.

Title : Sintering, creep, relaxation, recrystallization and other phenomena resulted by self-diffusion in crystalline bodies.

Periodical : Usp. Fiz. Nauk. 52, Ed. 4, 501 - 559, April 1954

Abstract : It is known that a large group of processes which were previously considered to have no connection with self-diffusion are actually the result of this phenomenon. These processes are: sintering, diffusion creep, relaxation, recrystallization, surface creep of atoms etc. Especially evident in these processes is the self-diffusion in simple bodies consisting of homogeneous atoms (e.g. metals). But in the case of more complex bodies (especially alloys) we have a continuous increase in the number of facts indicating the role of self-diffusion in phenomena in which self-diffusion was never taken into consideration. Processes of hetero-diffusion are closely connected with self-diffusion. Thirty six references. Tables, graphs.

Institution : ....

Submitted : .... Evaluation B-80678

PINES, Boris Yakovlevich; KUZNETSOVA, Ye.B., redaktor; AKHLAMOV, S.N., tekhnicheskiy redaktor.

[Sharp focus x-ray tubes and applied x-ray structural analysis] Ostrofokusnye rentgenovskie trubki i prikladnoi rentgenostruktu-rnyi analiz. Moskva, Gos. izd-vo tekhniko-teoret. lit-ry, 1955. (MLRA 9:11)
267 p.
(X-rays)

FD-3177

PINES B Ya

USSR/Physics - Solid State

Card 1/1 Pub. 153-7/21

Author : Pines, B. Ya.

Title : On the growth of "embryonic" fissures which determine the brittle strength of bodies

Periodical: Zhur. tekh. fiz., 25, No 8 (August), 1955, 1399-1404

Abstract : The author's purpose is to offer a theoretical explanation of the process of the "preparatory" growth of fissures in a loaded body. He states that a theory is needed which will retain the hypothesis of embryonic fissures even after it was established that the limit of brittle strength during a rupture was a function of the time of loading or that the "longevity" of a sample (time of existence in the unbroken state) was a function of the applied stress. The author theorizes that the growth of the fissures is caused by the formation of counter stresses which appear along the edges of the fissures.

Submitted : March 13, 1955

PINES B.YA.

15323* Microdeformations in the Crystal Lattice of Alpha-Iron in the Case of Quenched and Tempered Steel. O mikrodeformatsiiakh reshetki α-Fe v zakalennoi i otpushchennoi stali. (Russian.) B. Ya. Pines. *Doklady akademii nauk* SSSR, v. 103, no. 4, Aug. 1, 1955, pp. 601-604. 62

Series of equations for values of epsilon, and other phases. Table, graphs. 5 ref.

Khar'kov State U. im. A. M. Gor'kiy.

137-1958-1-161

Pines, B. Ya

Translations from: Referativnyy zhurnal Metallurgiya, 1958, Nr 1, p 55 (USSR)

AUTHOR: Pines, B. Ya.

TITLE: X-ray Investigation of Ceramics (Primeneniye rentgenovskikh luchey dlya issledovaniya keramicheskikh materialov)

PERIODICAL: V sb.: Fiz.-khim. osnovy keramiki. Moscow, Promstroyizdat, 1956, pp 5.. -54..

ABSTRACT: A review of methods of using X-rays to determine microscopic inhomogeneities of bodies, their chemical and phase composition and atomic structure. The principles employed in determining electron density ... and the functioning of diffractometers and ionization chambers are briefly described. The use of diffractometers for X-ray structure analysis instead of the customary photographic method of producing X-ray pictures ... time and increases the accuracy of determination of the phase composition of ceramics fourfold or fivefold.

S. G.

1. Ceramic materials--X-ray analysis 2. Crystals--Electron density--Determination 3. Ionization chambers--Applications 4. Diffractometers--Applications

Card 1/1

PINES, B.Ya.

On the theories of sintering. Fiz.met.i metalloved. 2 no.2:380-384 '56. (Sintering) (MLRA 9:9)

PINES, B. Ya.

E-6

USSR / Diffusion. Sintering.

Abs JOur : Ref Zhur - Fizika, No 4, 1957, No 9342

Author : Pines, B.Ya., Sukhinin, N.I.

Title : Certain Laws of Mechanical Strength in Bodies Produced by Sintering Powdered METals.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 2076 - 2085

Abstract : The breaking strength p of single-component metal-ceramic specimens of plastic metals (for example, those made of pure copper powder), obtained by isothermal sintering at different durations, diminishes almost libearly with the increasing porosity. The value of p is not determined uniquely by the porosity, but depends also on the annealing temperature. When the annealing temperature is sufficiently high (1,000° in the case of copper), the values of p extrapolated to zero porosity agree with the tensile strength of cast specimens. In the case of binary mixtures

Card : 1/2