Internal Fields in the Orthorhombic
Modification of $BaTiO_3$

77108
SOV/70-4-6-9/31

that defines the field along the X axis in terms of equal dipoles p and coordinates x_i, y_i, z_i of i-th dipole, is reduced, substituting the three sums, for the sake of briefness, by h_{xx}, h_{xy}, h_{xz}. In cubic and tetragonal $BaTiO_3$, h_{xy}, h_{xz}, h_{yz}, are equal to zero. Using various calculation methods the authors proved that h_{xy} in "monoclinic" $BaTiO_3$ is vanishingly small relative to h_{xx} and can be disregarded, while h_{xx} remains about the same as in cubic $BaTiO_3$. Thus dipole moments p_k for each projection upon l(x,z) axis become defined by:

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$$\sum_{k=1}^{5} \{\delta_{lk} - (h_{ll})_{lk}\} \frac{p_k \cos \varphi_{kl}}{v} = \sum_{k=1}^{5} \frac{e_k}{a^3} (f_l)_{lk}$$

where k = 1,2 ... 5 is number of unlike atoms in the unit cell; e_k is charge of a k-type ion; a and c are edgelengths of monoclinic cells; $(f_1)_{ik}$ is structure factor whose magnitude equals the field intensity affecting i-th atom in the sublattice formed by k-type atoms; φ_{kl} is angle between l axis and k-type dipole;

Internal Fields in the Orthorhombic
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$$\delta_{ik} = \begin{cases} 0 & \text{for } k \neq i \\ \frac{1}{\alpha_i} & \text{for } k = i; \end{cases}$$

Spontaneous polarization is computed according to:

$$P_{s_l} = \sum_{k=1}^{5} \frac{p_k \cos \varphi_{kl}}{v} + \sum_{k=1}^{5} \frac{e_k \cdot s_{kl}}{v}$$

where s_{kl} denotes displacement of k-type atoms along l axis. The computed values (Table 2) are about the same as in tetragonal $BaTiO_3$. The computed spontaneous polarization proved to be equal to the experimental one. Ti atoms are subjected to the highest field intensity and Ba atoms to the lowest. The fields affecting both atoms and oxygen O_{II} are parallel to the polar axis and to the displacements of the respective atoms, while the fields affecting O_I and O_{III} are symmetrically inclined to the polar axis; they are under 29° to the displacement directions, and 9°30' to X and Z axes.

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Internal Fields in the Orthorhombic
Modification of $BaTiO_3$

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TABLE

ION	$E_i \cdot 10^{-4}$, v/cm			$P_s = 3.1 \cdot 10^{-6}$ k/cm² $P_{sx} = -2.2 \cdot 10^{-6}$ k/cm² $P_{sz} = 2.2 \cdot 10^{-6}$ k/cm²					
				$\frac{(P_{i\,el} + P_{i\,ion}) \cdot 100\%}{P_s}$		$\frac{P_{i\,el} \cdot 100\%}{P_s}$		$\frac{P_{i\,ic} \cdot 100\%}{P_s}$	
	E_x	E_z	$\lvert E \rvert$	x	z	x	z	x	z
Ba	−0,08	0,08	0,12	− 1,3	1,3	−1,3	1,3	0	0
Ti	−3,60	3,60	5,09	−15,0	15,7	−5,3	5,3	−9,7	9,7
O_I	−0,44	2,62	2,66	−12,3	57,1	−8,3	40,0	−4,1	7,2
O_{II}	−0,47	0,47	0,67	−13,8	13,8	−9,0	9,0	−4,8	4,8
O_{III}	−2,62	0,44	2,66	− 57,1	12,3	−40,0	8,3	−7,2	4,0

Assistance of the late G. I. Skanavi is acknowledged. There are 3 figures; 3 tables; and 11 references, 4 U.S., 3 Soviet, 2 German, 2 Danish. The U.S. references are: G. Shirane, H. Danner, R. Pepinsky, Phys, Ref., 105, 3, 856, 1957; J. C. Slater, Phys. Rev., 78, 748, 1950; S. Triebwasser, J. Phys. Chem. Solids, 3, 1/2, 53, 1957; H. H. Wieder, Phys. Rev., 99, 1161, 1955.

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Internal Fields in the Orthorhombic Modification of $BaTiO_3$

77108
SOV/70-4-6-9/31

ASSOCIATION: Physicochemical Institute imeni L. Ya. Karpov (Fiziko-khimicheskiy institut imeni L. Ya. Karpova)

SUBMITTED: September 16, 1959

Card 5/5

24(4), 5(1)

SOV/32-25-2-27/78

AUTHORS: Gol'der, G. A., Zhdanov, G. S., Levina, V. M., Novosel'skaya, G. N., Shugam, Ye. A.

TITLE: The Use of X-Ray Phase Analysis in Chemical Technology (Primeneniye rentgenovskogo fazovogo analiza v khimicheskoy tekhnologii)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 2, pp 181 - 182 (USSR)

ABSTRACT: The present paper lists the results of investigations carried out by the laboratories of the plants "Svobodnyy trud", Yaroslavl', GIPI-4, IRYeA, "Krasnyy khimik", Leningrad, Fiziko khimicheskiy institut im. L. Ya. Karpova (Physico-Chemical Institute imeni L. Ya. Karpov) and others. A standard domestic X-ray apparatus was used. Since the X-ray phase analysis has a low sensitivity for impurities, it should not be used for determining small amounts of impurities (less than 1-3%). 6 analyses of different substances are described: 1) A study of titanium dioxide aimed at determining the optimum production conditions of rutile. 2) In the case of a lead oxide it was found by X-ray analysis that the

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The Use of X-Ray Phase Analysis in Chemical Technology SOV/32-25-2-27/78

yellow substance did not correspond to the usual red tetragonal modification of PbO, but to the yellow rhombic modification, and that the color was due to a polymorphous change. 3) By means of X-ray analysis it was possible to simplify the production control of active pyrolusite of the GAP. 4) Examinations of domestic and foreign recording tapes were carried out to determine the dispersion degree of the iron oxide. 5) Moreover, the production of thiourea was controlled with regard to dicyan-diamide. 6) The X-ray analysis was also successfully used in the examination of luminophores, and can also be applied for the examination of other substances (e.g. catalysts).

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. L. Ya. Karpova (Scientific Research Institute of Physical Chemistry imeni L. Ya. Karpov)

Card 2/2

GOL'DER, G.A. [translator]; DUDAREV, V.Ya. [translator]; SOLOV'YEV,
S.P. [translator]; ZHDANOV, G.S., red.; LARIN, S.I., red.;
BELEVA, M.A., tekhn. red.

[Annihilation of positrons in solids] Annigiliatsiia pozitronov v tverdykh telakh; sbornik statei. Moskva, Izd-vo inostr. lit-ry, 1960. 228 p. (MIRA 15:3)
(Positrons)

ЖДАНОВ, Г.С.

PHASE I BOOK EXPLOITATION SOV/4164

Vsesoyuznoye soveshchaniye po splavam redkikh metallov. 1st, Moscow, 1957

Redkiye metally i splavy; trudy... (Rare Metals and Alloys; Transactions of the First All-Union Conference on Rare-Metal Alloys) Moscow, Metallurgizdat, 1960. 436 p. 3,150 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR. Institut metallurgii; USSR Komissiya po redkim metallam pri nauchno-tekhnicheskom komitete.

Ed.: I.N. Shapovalov; Ed. of Publishing House: O.M. Kamayeva; Tech. Ed.: P.G. Islent'yeva.

PURPOSE: This collection of articles is intended for metallurgical engineers, physicists, and workers in the machine-building and radio-engineering industries. It may also be used by students of schools of higher education.

COVERAGE: The collection contains technical papers which were presented and dis-
cussed at the First All-Union Conference on Rare-Metal Alloys, held in the In-
stitute of Metallurgy, Academy of Sciences USSR in November 1957. Results of
investigations of rare-metal alloys, titanium,and copper-base alloys with ad-
ditions of rare metals are presented and discussed along with investigations of
rhenium, vanadium, niobium,and their alloys. The effect of rare-earth metals
on properties of magnesium alloys and steels is analyzed. The uses of rhenium
as a dehydrating catalyst, electroplating material, and material suitable for
making plugs for automobile electrical systems are discussed. Also, the ef-
fect of the addition of certain elements on the properties of heat-resistant
steel is examined and alloys with special physical properties (particularly
semiconductive alloys) are discussed. No personalities are mentioned. Soviet
and non-Soviet references accompany some of the articles.

PART II. TITANIUM,AND COPPER-BASE ALLOYS WITH RARE-METAL ADDITIONS

Rare Metals (Cont.) SOV/4164

PART VI. ALLOYS WITH SPECIAL PHYSICAL PROPERTIES

PART VII. RESOLUTION

AVAILABLE: Library of Congress

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VK/wrc/sfm
10/14/60

EPEL'BAUM, V.A.; SEVAST'YANOV, N.G.; GUREVICH, M.A.; ZHDANOV, G.S.

Phases formed in the system chromium - boron in the region rich in boron. Zhur. strukt. khim. 1 no.1:64-65 My-Je '60.
(MIRA 13:8)

1. Nauchno-issledovatel'skiy fiziko-khimicheskiy institut imeni L.Ya.Karpova.
(Chromium) (Boron)

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

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

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

82594

S/070/60/005/004/004/012
E132/E360

18.1290
5.2610

AUTHORS: Zhuravlev, N.N., Zhdanov, G.S. and Kuz'min, R.N.

TITLE: The Atomic Structure of Certain Compounds of Bismuth and Antimony

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 4, pp. 553 - 562

TEXT: 1) Alloys of Bi and Sb with alkali and alkaline earth metals.

Bi-Rb27 has a diagram of state like that of Bi-K. There are two compounds Bi_2Rb and $BiRb_3$ which give maxima in the liquidus. There are probably two other compounds Bi_2Rb_3 and $BiRb_2$ formed in peritectic reactions. The first-mentioned compound Bi_2Rb is superconducting and has the Cu_2Ng structure. The semiconducting compound $BiRb_3$ is hexagonal with a = 6.42, c = 11.46 Å and has the $AsNa_3$ structure.

Bi-Cs27 shows two compounds Bi_2Cs and $BiCs_3$. $BiCs_2$ is formed in a peritectic reaction. Bi_2Cs is superconducting with the Cu_2Mg structure.

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S/070/60/005/004/004/012
E132/E360

The Atomic Structure of Certain Compounds of Bismuth and Antimony

structure. BiCs$_3$ is semiconducting and has the SbCs$_3$ structure (cubic) with a = 9.324 Å. For the Bi$_2$K, Bi$_2$Rb, Bi$_2$Cs series increasing cell size is linearly accompanied by increasing T$_k$ (temperature of onset of superconductivity).

Sb-Rb. SbRb has a complex structure and SbRb$_3$ is isomorpouns with BiRb$_3$ and has a = 6.29, c = 11.17 Å.

Bi$_3$Sr and Bi$_3$Ba. The former is cubic, Cu$_3$Au type, with a = 5.042 Å and the latter is tetragonal with a = 5.188 and c = 5.157 Å but is isostructural.

2) Alloys of Bi with group 8 transition metals.

Bi-Rh. 27 The compounds Bi$_2$Rh, BiRh and α, β and γ- Bi$_4$Rh appear to exist but "β-Bi$_4$Rh" has an orthorhombic cell (a = 11.52, b = 9.03, c = 4.24 Å) and a structure apparently analogous to Bi$_3$Ni. The composition is therefore probably Bi$_3$Rh.

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The Atomic Structure of Certain Compounds of Bismuth and Antimony

α-Bi_2Rh was reported isomorphous with Sb_2Co but this is uncertain.

Bi-Pd The phase diagram is largely known (Zh. Eks. Toor. Fiz., 32, 1305, 1957). The γ-phase near 50% by wt. Pd is hexagonal with a = 7.76, c = 5.86 Å and appears to be a superstructure of NiAs. Below 400 °C there is a eutectic decay to BiPd and $BiPd_3$. It may be Bi_3Pd_5.

Bi-Pt The phase diagram is known. There are the phases α- and β-Bi_2Pt and BiPt. Various differences in the value of T_k reported for BiPt are explained by the possibility of obtaining this compound in a defect state giving a 0.8% volume decrease in the unit cell.

No Bi-rich alloys of Ru, Os and Ir could be prepared.

3) Alloys of Sb with transition metals of group 8.

Sb-Co Besides Sb_2Co and SbCo a new compound Sb_3Co with a cubic As_3Co structure has been found.

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The Atomic Structure of Certain Compounds of Bismuth and Antimony

Sb-Rh. Three compounds have been found in this system and the general lines of the phase diagram are apparent.
Sb-Ir. 27 The existence of Sb_3Ir, Sb_2Ir and SbIr have been established. Sb_3Co, Sb_3Rh and Sb_3Ir are isomorphous. The structures of Sb_2Co, Sb_2Rh and Sb_2Ir are isomorphous and similar to that of α-Bi_2Rh. Such isomorphism does not pertain in the Sb_2M series. The superconducting transition temperatures of the various materials are tabulated and discussed in terms of their cell sizes.
There are 5 figures, 7 tables and 36 references: 5 English, 5 German and 26 Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova (Moscow State University im. M.V. Lomonosov)

SUBMITTED: February 23, 1960

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82509

5.4600(A)
24.7800

S/070/60/005/004/009/012
E132/E360

AUTHORS: Venevtsev, Yu.N., Zhdanov, G.S., Solov'yev, S.P., Bezus, Ye.V., Ivanova, V.V., Fedulov, S.A. and Kapyshev, A.G.

TITLE: Crystal Chemical Investigations of Substances with the Perovskite Type of Structure Which Has Special Dielectric Properties

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 4, pp 620 - 626

4

TEXT: In $BaTiO_3$ the dielectrically-active ion is the Ti but in $PbTiO_3$ it is the Pb ion. The $(Pb,Ba)TiO_3$ system may, therefore, be expected to show peculiarities where these two effects interact. The variation in structure, dielectric and piezoelectric properties is not continuous from one end-member to the other. Experimentally, solid solutions with 7, 9, 11, 14 and 24 wt. % $PbTiO_3$ showed anomalies not explicable as due to loss of PbO. $NaNbO_3$ undergoes several phase transitions in a short temperature interval. Dielectric and optical observations give transitions at 360, 470, 520 and 640 °C. X-ray data contradict all but the first of these. Polycrystalline material was

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S/070/60/005/004/009/012
E132/E360

Crystal Chemical Investigations of Substances with the Perovskite Type of Structure Which Has Special Dielectric Properties

studied by X-ray methods up to 700 °C and transitions at 360, 430, 470, 520 and 640 °C were found. Below 360 °C $NaNbNO_3$ is monoclinic with $a = c \neq b$ and $\beta > 90$°C. Above 360 °C it is monoclinic with $a = c = b$ and $\beta > 90$ °C (true symmetry orthorhombic). The transition from orthorhombic to tetragonal is not at 360 but at 430 °C. The X-ray method is no less sensitive than the optical and dielectric methods.
From an examination of solid solutions $BaTiO_3$ -(Ca,Sr)(Zr,Sn)O_3, it is concluded that, other things being equal, the Curie temperature of perovskite-type ferroelectrics is higher, the smaller is the period of the lattice and the higher is the polarisability of the active cation.
$BiTiO_3$ with added $Bi_2O_3.Cr_2O_3$ and $Bi_2O_3.Al_2O_3$ has been synthesised and specimens showed properties like those found in $BaTiO_3$ containing $Bi_4Ti_3O_{12}$.

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Crystal Chemical Investigations of Substances with the Perovskite Type of Structure Which Has Special Dielectric Properties

$BiFeO_3$ and specimens in the system $PbTiO_3$-$BiFeO_3$ have been synthesised. The former has a rhombohedral distortion ($a = 3.963$ Å, $\alpha = 89^{\circ}24'$) and a susceptibility about 80. At 200 °C the susceptibility has a maximum of about 1200. In the solid solution up to 70% by wt. of $BiFeO_3$ there is also a tetragonal modification. The Curie point of $BiFeO_3$ appears to be higher than that of $PbTiO_3$.

General methods for calculating the internal field have been developed for structures of any dipole configurations. These have been applied to the orthorhombic structure of $CaTiO_3$. Here, the internal electric field is zero at the Ti sites. There are 29 references: 2 Japanese (in English), 8 English, 2 international, 1 Swiss, 1 German and 15 Soviet.

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82509

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E132/E360

Crystal Chemical Investigations of Substances with the Perovskite Type of Structure Which Has Special Dielectric Properties

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-Chemical Institute imeni L.Ya. Karpov)

SUBMITTED: February 23, 1960

Card 4/4

85994

5.4600 1273, 1241, 1153

S/070/60/005/005/018/026/XX
E132/E160

AUTHORS: Vorontsova, L.G., Zvonkova, Z.V., and Zhdanov, G.S.

TITLE: An X-ray Determination of the Crystal Structure of Diparatolyldisulphide

PERIODICAL: Kristallografiya, 1960, Vol.5, No.5, pp.698-703

TEXT: The unit cell of crystals of $CH_3.C_6H_4.S--S.C_6H_4.CH_3$ is monoclinic, space group $P2_1-C_2^2$, with a = 14.86, b = 5.77, c = 7.69 Å, β = 94°, Z = 2, $d_{obs.}$ = 1.24 and $d_{calc.}$ = 1.19. V.A. Koptsik has detected a piezoelectric effect in single crystals. The 010 Patterson projection was calculated to locate the heavier S atoms. The interpretation of the various S-S peaks was better accomplished from the P(x, ½, z) section calculated with 763 reflexions. The 010 Fourier projection was calculated using the signs from the S atoms and showed 7 carbon atoms resolved and 7 very blurred. The model of the structure thus found (where the choice of S positions might have been made from three possibilities) was confirmed by an a priori electron density projection with signs derived from an application of the method

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S/070/60/005/005/018/026/XX
E132/E160

An X-ray Determination of the Crystal Structure of Diparatolyldisulphide

of statistical inequalities. Seven stages of refinement were then carried out giving the following (x,z) atomic parameters:

S_1 (0.202, 0.141); S_2 (0.273, 0.127); C_3 (0.985, 0.327);
C_5 (0.815, 0.331); C_7 (0.029, 0.158); C_8 (0.329, 0.346);
C_9 (0.373, 0.359); C_{10} (0.413, 0.510); C_{12} (0.456, 0.825);
C_{14} (0.318, 0.478). y S_1-S_2 = 0.307; S_2-C_{12} = 0.240;
S_2-C_{10} = 0.296.

The pairs C_1 and C_2, C_4 and C_6, C_{11} and C_{13} are not resolved in this projection as they are less than 0.7 Å apart. The S_1-S_2 distance was found to be 2.06 ± 0.02 Å from the three-dimensional line synthesis P(0.071, y, 0). The final reliability factor for the $F(h0\ell)$ layer was R = 0.26. The bond angles at the S atoms are 107°. The planes of the benzene rings are at 94° to each

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S/070/60/005/005/018/026/XX
E132/E160

An X-ray Determination of the Crystal Structure of Diparatolyldisulphide

other. The dipole moment of 2.49D is in agreement with the structure found.

There are 4 figures, 3 tables and 21 references: 4 Soviet, 7 English, 1 Belgian, 5 Scandinavian and 4 international.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova (Physico-Chemical Institute imeni L.Ya. Karpov)

SUBMITTED: February 23, 1960

Card 3/3

S/070/60/005/005/006/017
E132/E360

AUTHORS: Solov'yev, S.P., Venevtsev, Yu.N. and
Zhdanov, G.S.

TITLE: On a Method of Calculating the Internal Fields in
Complex Dipole Structures

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 5,
pp. 718 - 725

TEXT: A method is proposed for calculating the internal field in complex dipole structure. In general, the problem comes down to the solution of a system of linear equations with 3m unknowns, where m is the number of atoms in the elementary cell. If the symmetry of the structure is taken into account the number can be decreased to 3n where n is the number of complexes and where n is less than m. Ewald's method can be successfully applied to calculating all the structure sums necessary for estimating the fields. The method is generally applicable in all cases where the structure has been determined. The calculation of the structure sums enables the idealisation of the structure to be avoided as these sums can be calculated in any case. Sometimes, however, in spite of the methods

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E132/E360

On a Method of Calculating the Internal Fields in Complex Dipole Structures

available for reducing the tediousness of the calculation of the fields in real structures, the number of unknowns may be too big to enable the system of equations obtained to be solved by hand methods. This raises no difficulty as modern computing machines can deal with such systems of equations with extreme speed. In fact, the systematic calculation of the fields in real antiferroelectric crystals and in other structures is best done by a machine appropriately programmed.
There are 1 figure and 14 references: 5 Soviet, 1 Swiss, 5 English and 3 German.

ASSOCIATION: Fiziko-khimicheskiy institut imeni L.Ya. Karpova (Physics-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: March 1, 1960

Card 2/2

87803

S/070/60/005/006/001/009
E132/E360

24,2140 (1072,1158,1160)

AUTHORS: Kuz'min, R.N, and Zhdanov, G.S.

TITLE: X-ray Structure Analysis of the Superconducting Compound β-Bi$_3$Rh

PERIODICAL: Kristallografiya, 1960, Vol. 5, No. 6, pp. 869 - 876

TEXT: There are three compounds in the Bi-Rh system: Bi$_4$Rh with three modifications (low temperature α, intermediate temperature β and high temperature γ); Bi$_2$Rh has two modifications, α and β; BiRh has only one form. Crystals of β-Bi$_3$Rh were obtained as needles very suitable for X-ray analysis by pouring of the liquid from a partly solidified melt. The crystals were orthorhombic with $a = 9.027 \pm 0.006$ Å, $b = 4.24 \pm 0.02$, $c = 11.522 \pm 0.008$, $d_{obs} = 10.7$ g/cm^3, $d_{calc} = 11.0$, $Z = 4$.

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X-ray Structure Analysis of the Superconducting Compound β-Bi_3Rh

The space group might be Pnma or Pn2a. Using Patterson projections a trial set of atomic positions was derived and an a-c Fourier projection was calculated. The final atomic positions are (x,y,z) :- Bi_I (0.402, 0.25, 0.180); Bi_{II} (0.102, 0.75, 0.089); Bi_{III} (0.201, 0.75, 0.386); Rh (0.402, 0.75, 0.018). The R-factor for the hoℓ zone is 19.8% neglecting any temperature factor. It is concluded that the space group must be $Pnma = D_{2h}^{16}$. The general similarity of this compound with Bi_3Ni suggests that the structure proposed for the latter is probably correct. The coordination polyhedra round the three Bi atoms are different. Bi_I has 12 neighbours,

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S/070/60/005/006/001/009
E132/E360

X-ray Structure Analysis of the Superconducting Compound β-Bi_3Rh

Bi_{II} 11 and Bi_{III} 12. The coordination number of the Rh atom is 9 and the Rh atoms lie in seven-cornered polyhedra and occur in zig-zag chains. The shortest distance between Bi atoms is 3.48 Å. Acknowledgments are made to N.N. Zhuravlev, I.S. Berezin and B.M. Shchedrin. There are 7 figures, 4 tables and 11 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: April 8, 1960

Card 3/3

84996

24.7800 (1142,1144,1162)

S/048/60/024/010/005/033
B013/B063

AUTHORS: Solov'yev, S. P., Venevtsev, Yu. N., Zhdanov, G. S., and Ivanova, V. V.

TITLE: Method of Calculating Inner Electric Fields in Complicated Dipole Structures and Their Application to $CaTiO_3$

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 10, pp. 1191 - 1194

TEXT: A general method is suggested for calculating the inner electric fields in complicated structures, in which there may take place both parallel and antiparallel ionic displacements in an arbitrary direction. This method, which was applied to the calculation of fields in $CaTiO_3$ type crystals, constitutes a generalization of the methods that are used for calculating the fields in piezoelectric substances of an ABO_3-type structure, and proceeds from the respective structure model of the compound concerned. A total of six different cases were examined. The calculation was made at the vychislitel'nyy tsentr MGU (Computer

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Method of Calculating Inner Electric Fields in Complicated Dipole Structures and Their Application to $CaTiO_3$

S/048/60/024/010/005/033
B013/B063

Center of MGU) with the computer "СТРЕЛА" (Strela). The calculation of the fields in $CaTiO_3$ shows that the distribution of fields in this compound depends only little on the polarizability of Ca ions. It is all the more dependent, however, on the effective ion charge, up to the change of the signs of the fields acting upon the oxygen ions, although the qualitative picture remains unchanged. The fields acting upon Ca ions are only little varied in this connection. In all of the six cases examined the fields are considerably smaller than is the case with the piezoelectric ABO_3 compounds. In this case, as may be seen from the structure symmetry, the field acting upon the Ti ions is exactly vanishing. In $BaTiO_3$ and $PbTiO_3$ (Refs. 8 and 9), on the contrary, fields of maximum strength act upon the Ti ions. The basic difference between the fields in $CaTiO_3$ and in the piezoelectric ABO_3 compounds related to it, is connected with the fact that in the latter the octahedra are greatly deformed, while they are nearly ideal in $CaTiO_3$. The relationship

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Method of Calculating Inner Electric Fields in Complicated Dipole Structures and Their Application to $CaTiO_3$

S/048/60/024/010/005/033
B013/B063

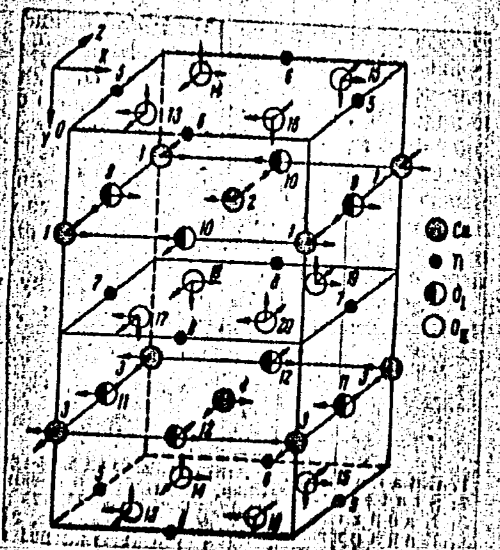
between the anomaly of dielectric properties and the deformation of BO_6 octahedra can be also observed in the case of such ABO_3 compounds as are, e.g., $PbZrO_3$, $PbHfO_3$, $NaNbO_3$. It can be stated that the presence of a deformation of B - O is an indispensable prerequisite for an antipiezoelectric phase transition. The authors thank N. P. Trifonov, collaborator of the computer center of MGU for his assistance in the computations. The present paper was read at the Third Conference on Piezoelectricity, which took place in Moscow from January 25 to 30, 1960. There are 1 figure and 12 references: 4 Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

Card 3/4

30

84996
S/048/60/024/010/005/033
B013/B063



Legend to Fig.:
The $CaTiO_3$ unit cell

Card 4/4

S/053/60/071/01/09/011
B006/B011

AUTHOR: **Zhdanov, G. S.**

TITLE: **Sergey Tikhonovich Konobeyevskiy** (On His Seventieth Birthday)

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol. 71, No. 1, pp. 161-165

TEXT: S. T. Konobeyevskiy, Soviet physicist and X-ray expert, Corresponding Member of the Academy of Sciences of the USSR, celebrated his 70th birthday on April 27, 1960. He graduated from the yestestvennoye otdeleniye fiziko-matematicheskogo fakul'teta Moskovskogo universiteta (Natural Sciences Department of the Branch of Physics and Mathematics of Moscow University) in 1913, at the time when the X-ray diffraction analysis of matter (Laue, Bragg, Yu. V. Vul'f) was being developed. Professor N. Ye. Uspenskiy and young Konobeyevskiy were the Russian pioneers working on the interpretation of diffraction patterns. In 1920, the two scientists held a sensational lecture at the meeting of the Fizicheskoye obshchestvo im. P. N. Lebedeva (Society of Physics imeni P. N. Lebedev) on the diffraction patterns of rolled metals. The theory of phenomena had been developed by Konobeyevskiy. In the following years he was head of the

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...y gosudarstvennyy universitet (Moscow

...its he was awarded two Lenin orders, the

...er, and several medals. His ... are

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Sergey Tikhonovich Konobeyevskiy (On His Seventieth Birthday)

S/053/60/071/01/09/011
B006/B011

listed under bibliography. There are 1 figure and 48 Soviet references.

✓

Card 3/3

PHASE I BOOK EXPLOITATION SOV/5614

Zhdanov, German Stepanovich

Fizika tverdogo tela (Solid-State Physics) [Moscow] Izd-vo Moskovskogo univ., 1961. 500 p. Errata slip inserted. 10,000 copies printed.

Ed.: G. S. Gol'denberg; Tech. Ed.: G. I. Georgiyeva.

PURPOSE: This handbook is intended for students of physics at schools of higher education and schools of higher technical education.

COVERAGE: The book constitutes a summary of lectures on solid-state physics which the author gave from 1948 at the Moskovskiy inzhenerno-fizicheskiy institut (Moscow Engineering Physics Institute) to students specializing in the physics of metals, and from 1954 at Moskovskiy universitet (Moscow University) to students of solid-state physics. It has been approved as a textbook by the Ministry of Higher and Secondary Special Education of the USSR.

Card 1/9

The author was for many years director of the Crystal Structure Laboratory of the Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov). The book reflects his scientific activity at that institute and, according to his Preface, gives a fuller presentation of data on the atomic and electron structure of matter and the forces of interatomic and intermolecular interactions than is the case in the majority of handbooks and monographs on solid-state physics. The author thanks the following persons: Academician N. V. Belov, Professor V. I. Arkharov, Professor K. P. Belov, Professor M. I. Zakharova, Professor V. A. Fabrikant, reviewers; the author's scientific coworkers, Aspirants V. V. Zubenko, V. Ya. Dudarev, S. P. Solov'yev, N. V. Rannev; senior laboratory assistants S. Fleyer, P. F. Kirsanova, L. D. Osipova; and G. S. Gol'denberg, editor of the Izdatel'stvo Moskovskogo Universiteta (Moscow University Publishing House). The references are arranged in the Bibliography according to chapter and chapter sections. There are 354 references, mostly Soviet and English.

Card 2/9

USSR (cont.)

ALIKHANOV, R. A., Institute for Physical Problems imeni S. I. Vavilov, Academy of Sciences USSR, Moscow - "Neutronographic study of $NiCO_3$" (Section J-2)

BELOV, N. V., Associate Director, Institute of Crystallography, Academy of Sciences USSR, Moscow "Magnetic (ferromagnetic) space group symmetry" (C-6)

BELOV, N. V., NERONOVA, N. N., Both Institute of Crystallography, Academy of Sciences USSR, Moscow, DONNAY, J. D. H., Johns Hopkins University, Baltimore, Md., and DONNAY, G. H., Geophysical Laboratory, Carnegie Institution, Washington, D. C. "Tables of magnetic space groups, II. Special positions" (C-6)

BOROVIK-ROMANOV, A. S., Institute for Physical Problems imeni S. I. Vavilov, Academy of Sciences USSR - "Antiferromagnetic resonance in carbonated of transition elements" [sic] (M-16)

BOROVIK-ROMANOV, A. S., ALEYSASYAN, G. G., BUDASHEVSKIY, O. Ye. - "Piezomagnetic effect in antiferromagnets" (M-18)

KONDORSKIY, Ye. I., Head, Magnetism Laboratory, Moscow State University - (1) "The electrical and galvanomagnetic properties of thin films at very low temperatures" (M-5); (2) "On the connection between the spontaneous magnetization of current carriers and the Nernst-effect in ferromagnetic metals" (M-4); "The exchange interaction and magnet [illegible] (M-15)

LOBACHEV, B., and VAYN[illegible], B., Institute of Crystallography, Moscow - "Electron diffraction study of thiourea CO $(NH_2)_2$"

LYASHENKO, B. G., Central Scientific Research Institute of Metallurgy, Moscow - "The problem of the influence of spontaneous magnetization on crystal structure and phase state of alloys" (M-8)

LYASHENKO, B. G., LITVIN, D. F., PUZEY, I.M., ABOV, Yu. G. Central Scientific Research Institute of Metallurgy, Moscow - "Neutron diffraction investigation of order-disorder in the alloys 'Ferrum-nickel and ferrum-cobalt'" (J-1)

OZEROV, R. P., KOGAN, V. S., [illegible], Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Neutron diffraction study of the structure of solid hydrogen and deuterium" (C-8)

PINSKER, Z. G., Institute of Crystallography, Academy of Sciences USSR, Moscow - "Results and progresses of electron diffraction analysis" (C-11)

PUZEY, I. M., Scientific Research Institute of Metallurgy, Moscow - "Magnetic anistropy in monocrystals of Ni-Fe-Co alloys" (M-9)

SHUR, Yakov S., Scientific Research Institute of Metallurgy, Moscow - "Some problems of the physics of high coercive materials" (M-17)

SMOLENSKIY, G. A., Institute of Semiconductors, Leningrad - "Some investigations of non-metallic ferro and antiferromagnetics" (M-13)

VAYNSHTEYN, B. K., Institute of Crystallography, Academy of Sciences USSR - "Development of electron diffraction method" (C-11)

YAMZIN, I. I., BELOV, N. V., NOZIK, Y. Z., Institute of Crystallography, Moscow - "Atomic and magnetic structures of magnese ferrite" (J-2)

VONSOVSKIY, S. V., Institute of the Physics of Metals, Academy of Sciences USSR, Sverdlovsk. A member of the IUPAP Commission on Magnetism. See paragraph 1 of Comment for a complete listing of members of the Commission. "Some investigations of Soviet physics on the theory of ferromagnetism for the last years" (Invited paper. Section M-11)

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paper to be submitted for the IUPAP Intl. Conference on Magnetism and Crystallography, Kyoto, Japan, 23-30 Sep 1961

FEDULOV, S.A.; VENEVTSEV, Yu.N.; ZHDANOV, G.S.; SMAZHEVSKAYA, Ye.G.

X-ray and electric investigation of solid solutions in the system $PbTiO_3$ - $SrSnO_3$. Fiz. tver. tela 3 no. 3:959-963 Mr '61.
(MIRA 14:5)
(Lead titanate) (Strontium stannate) (Solutions, Solid)

20021

S/070/61/006/001/002/011
E032/E314

9,2181 (2303,1144)
24,7800 (1142,1385,1136)

AUTHORS: Solov'yev, S.P., Venevtsev, Yu.N., Zhdanov, G.S. and Ivanova, V.V.

TITLE: Calculation of Internal Electric Fields in Perovskite Crystals ($CaTiO_3$)

PERIODICAL: Kristallografiya, 1961, Vol. 6, No. 1, pp. 78 - 85

TEXT: In a previous paper (Ref. 13) the present authors gave an account of a general method for the calculation of internal fields in structures having an arbitrary dispostion of dipoles. The aim of the present paper is to apply this method to the calculation of fields in the antiferro-electric dipole structure of $CaTiO_3$, using a model based on the real structure reported by Kay and Baily in Ref. 14. In the method described by the present authors in Ref. 13, it is assumed that the polarisabilities and effective ion charges are known. The polarisabilities of Ca and O ions were taken from the book by Kittel' (Ref. 15) ($\alpha_{Ca} = 1.1 \cdot 10^{-24}$ cm^3 ,

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20024

S/070/61/006/001/002/011
E032/E314

Calculation of Internal Electric Fields ....

$\alpha_0 = 2.4 \times 10^{-24} cm^3$). It is further assumed that the effective charges of the ions in $BaTiO_3$ are approximately equal to one-half of the total ion charges. In order to estimate the effect of the assumed magnitude of the charges and polarisabilities on the field distribution six different variants of the calculation were carried out, in which the charges and polarisabilities were varied within reasonable limits. The results obtained are summarised in Table 3, which gives the internal fields in $CaTiO_3$. The first five variants are based on the real structure of $CaTiO_3$, shown in Fig. 2. For comparison, variant 6 is based on values of the f and h sums calculated for undispersed positions of the ions. All the calculations were carried out on the electronic computer "Strela" at the Computation Centre of MGU.

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20024

S/070/61/006/001/002/011
E032/E314

Calculation of Internal Electric Fields ....

Acknowledgments are expressed to N.P. Trifonov and A. Tel'nova of the Computation Centre of MGU, who carried out the numerical calculation on the "Strela" computer. There are 2 figures, 3 tables and 17 references: 7 Soviet and 10 non-Soviet.

ASSOCIATION: Fizikokhimicheskiy institut im. L.Ya.Karpova (Physicochemical Institute im. L.Ya. Karpov)

SUBMITTED: March 1, 1960

Card 3/5

20024

S/070/61/006/001/002/011
E032/E314

Calculation of Internal Electric ....

Table 3: 1 - Variants; 2 - $E\cdot10^{-8}$, V/cm; 3 - Projection Axis;
CGSE = esu

$E\cdot10^{-8}$ в/см 2	Ось проекции 3	Варианты					
		1	2	3	4	5	6
		$\frac{1}{2}\alpha_{Ca}:\alpha_O$ $e_{Ca}=1{,}0$ $e_{Ti}=2{,}0$ $e_O=-1{,}0$	$2\alpha_{Ca}:\alpha_O$ $e_{Ca}=1{,}0$ $e_{Ti}=2{,}0$ $e_O=-1{,}0$	$\alpha_{Ca}:\alpha_O$ $e_{Ca}=0{,}5$ $e_{Ti}=2{,}5$ $e_O=-1{,}0$	$\alpha_{Ca}:\alpha_O$ $e=e_{Ti}=1{,}5$ $e_O=-1{,}0$	$\alpha_{Ca}=1{,}1\cdot10^{-24}$ см³; $\alpha_O=2{,}4\cdot10^{-24}$ см³; $e_{Ca}=1{,}0$ CGSE; $e_{Ti}=$ $=2{,}0$ CGSE; $e_O=-1$ (CGSE) — esu	
E_{Ca}	X Y Z	−0,0708 0 0,494	−0,136 0 0,751	−0,0072 0 0,517	−0,0720 0 0,001	−0,0846 0 0,557	−0,0072 0 0,422
E_{Ti}	X Y Z	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
E_{O_I}	X Y Y	0,767* 0 0,0215	0,876* 0 0,302	2,053* 0 −0,409*	−0,477 0 0,080	0,792* 0 0,0906	0,856* 0 −0,0714*
$E_{O_{II}}$	X Y Z	0,470* −0,875 −0,0066	0,546* −0,892 −0,085	0,928* −1,887 −0,570	0,0578* 0,134* 0,519	0,489* −0,880 −0,0258	0,544* −0,942 −0,520

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20024

S/070/61/006/001/002/011
E032/E314

Calculation of Internal Electric Fields .....

Fig. 2:

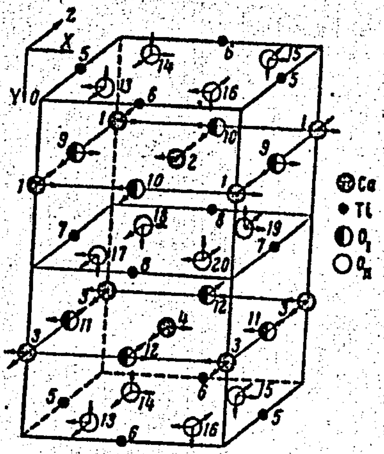

Рис. 2. Элементарная ячейка $CaTiO_3$.

Card 5/5

SOLOV'YEV, S.P.; [redacted]; ZHDANOV, G.S.

X-ray diffraction study of phase transitions in $NaNbO_3$. Kristallografiia 6 no.2:218-224 Mr-Ap '61. (MIRA 14:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Sodium niobate) (X rays--Diffraction)

22791

S/070/61/006/003/002/009
E021/E435

24.7100(1160,1136,1143)

AUTHORS: Venevtsev, Yu.N., Bondarenko, V.S., Zhdanov, G.S., Chkalova, V.V. and Stember, N.G.

TITLE: Anomalous changes in the lattice parameters, the dielectric and piezoelectric properties of (Ba, Pb)TiO_3 solid solutions

PERIODICAL: Kristallografiya, 1961, Vol.6, No.3, pp.375-380

TEXT: Samples were prepared from chemically pure titanium dioxide and barium and lead carbonates. X-ray investigations showed that solid solutions of (Ba, Pb)TiO_3 had a tetragonal-distorted cell of the perovskite type. Results of precision measurements on the parameter of the cell are given in Fig.1, where changes in lattice parameters and volume are plotted against weight % $PbTiO_3$. The curves are not continuous and there are sharp changes at 5.5, 9.2, 11.2 and 13.5% $PbTiO_3$. Fig.1a shows the periods of the crystal lattice c and a; Fig.1б shows c/a; Fig.1B shows the volume v of the elementary cell against weight % $PbTiO_3$. The results of measurements of the dielectric constant ε against temperature (°C) are shown in Fig.2 (the numbers on the curves correspond to the % $PbTiO_3$). The values of

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22791

Anomalous changes ...

S/070/61/006/003/002/009
E021/E435

the dielectric constant at the Curie point ϵ_{max} are plotted against concentration (wt.%) $PbTiO_3$ in Fig.3. There are sharp maxima at 5.5, 9.2, 11 and 13.7% $PbTiO_3$. The curves in Fig.2 enable the Curie point and the positions of the second and third phase transformations to be found. On the basis of these measurements, the phase diagram at the $BaTiO_3$ rich end can be drawn (Fig.4). The change in the piezo-modulus d_{33} with composition is shown in Fig.5. There are maxima at 5.5, 11.2 and 13.5 wt.% $PbTiO_3$. The obtained data agree in many respects with those of previous work when commercially pure materials were used. The results, as well as published data, lead to the conclusion that the observed anomalies are characteristic of the solid solutions of $(Ba, Pb)TiO_3$ and they may be due to the differences in the properties of the barium and lead titanates. A change in the type of ferroelectrically active cations probably takes place in the concentration range of 11.2 to 1.35 wt.% $PbTiO_3$ when the second and the third phase transitions, which are characteristic for barium titanate, ceased to exist. Other observed anomalies are also attributed to the differences in the properties of the titanates of barium and lead. Acknowledgments are expressed to Senior

Card 2/7

22791

Anomalous changes ... S/070/61/006/003/002/009
E021/E435

laboratory assistant B.G.Nikolov, Technician I.I.Moreva, Engineer V.A.Ulitin and Laboratory assistant G.V.Bazhanova for their assistance. There are 5 figures and 9 references: 4 Soviet-bloc and 5 non-Soviet-bloc. The three references to English language publications read as follows: H.D.Megaw, Proc. Phys.Soc., 58, 133, 1946; G.Shirane, F.Jona, R.Pepinsky, Proc.IRE, 43, 12, 1738, 1955; B.Joffe, R.S.Roth, S.Marzullo, J.Res.Nat.Bur. Standards, 55, 5, 239-254, 1955.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya.Karpova (Institute of Physics and Chemistry imeni L.Ya.Karpov)

SUBMITTED: August 24, 1960

X

Card 3/7

CHETKINA, L.A.; GOL'DER, G.A.; ZHDANOV, G.S.

X-ray diffraction study of dihalogen derivatives of anthraquinones. Kristallografiia 6 no.4:628-629 Jl-Ag '61. (MIRA 14:8)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova i Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova.

(Anthraquinone) (X-ray crystallography)
(Halogen compounds)

OZEROV, R.P.; KOGAN, V.S.; ZHDANOV, G.S.; KUKHTO, O.L.

Crystalline structure of solid hydrogen isotopes. Kristallografiia 6 no.4:631-632 Jl-Ag '61. (MIRA 14:8)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova i Fiziko-tekhnicheskiy institut AN USSR.
(Hydrogen--Isotopes) (Crystallography)

26646
S/070/61/006/005/004/011
E132/E560

15.2640
x4.7200 (1144,1160)

AUTHORS: Fedulov, S.A., Venevtsev, Yu.N., Zhdanov, G.S. and
Rez, I.S.

TITLE: X-ray crystallographic and electrical studies of specimens of the system $PbTiO_3$-$BaZrO_3$

PERIODICAL: Kristallografiya, 1961, Vol.6, No.5, pp.681-685

TEXT: Hitherto the system $PbTiO_3$ - $BaZrO_3$ has hardly been studied. The $PbTiO_3$ synthesized had a tetragonally-distorted perovskite structure with a = 3.899 and c = 4.155 Å giving c/a = 1.065. The $BaZrO_3$ was cubic with a = 4.190 Å. These agree with previously published data (Ref.6: H. Megaw, Proc. Phys. Soc., 58, 133, 1946). Fig.1 shows the variation of cell dimensions with composition for intermediate compositions in the continuous series of solid solutions obtained. The volume changes without discontinuity. The two phases appeared to co-exist over the composition range 37.5 to 40% (by weight). At the high $PbTiO_3$ end of the composition range, measurements of the dielectric constant were hindered by the high conductivity. The log of the conductivity was a linear function of 1/T (the absolute temperature). The

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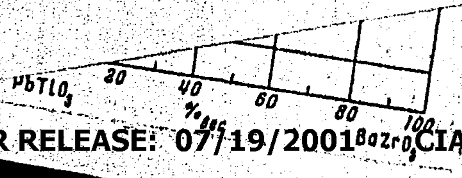
26646
S/070/61/006/005/004/011
E132/E560

X-ray crystallographic and ...

dielectric constant was measured at 500 kc for the compositions 20-25% $BaZrO_3$ and at 1 kc otherwise. Fig.4 shows the variation of d.c. with temperature for various compositions of material. The existence of a two-phase region between the ferroelectric (tetragonal) and the paraelectric (cubic) modifications is not new but has been found also in $PbTiO_3$-$BaTiO_3$. This is expressed in the spreading of the maxima in the curves of d.c. against T and corresponds to the statistical distribution of the cations in the two phases. This statistical distribution gives rise to strains in the crystal lattices and as a result the ferroelectric-paraelectric transformation takes place over a finite temperature interval. The rhombohedral phase found by T. Ikeda (Ref.1. J.Phys. Soc. Japan., 14, 2, 168, 1959) was not encountered. The absence of a piezoelectric effect in the range from 40-42.4% also confirms that there was no rhombohedral phase in this case. Work reported by others on the system $PbZrO_3$-$BaTiO_3$ is contradictory. Acknowledgments are expressed to Ye.G. Smazhevskaya and N. A. Kabalkina for their assistance. There are 6 figures and 11 references, 6 Soviet and 5 non-Soviet. The English-language

Card 3/4

Card 2/4



26651
S/070/61/006/005/009/011
E032/E114

15 2450
24,7200(1144,1160)

AUTHORS: Fedulov, S.A., Venevtsev, Yu.N., Zhdanov, G.S., and Smazhevskaya, Ye.G.

TITLE: High-temperature X-ray and thermographic studies of bismuth ferrite

PERIODICAL: Kristallografiya, 1961, Vol.6, No.5, pp. 795-796

TEXT: In previous papers, Ref.1 (I.S. Rez. Tezisy dokl. Tret'yego soveshchaniya po segnetoelektrichestvu, "Abstracts of the Third Conference on Ferroelectrics", Izd-vo AN SSSR, p.51, 1960) and Ref.2 (Yu.N. Venevtsev, G.S. Zhdanov, S.P. Solov'yev, Ye.V. Bezus, V.V. Ivanova, S.A. Fedulov, A.G. Kapyshev, Kristallografiya, Vol.5, 4, 620, 1960) the present authors et al. reported the existence of the compound $BiFeO_3$ with perovskite type structure, and suggested that this compound is a ferroelectric having a higher Curie temperature than lead titanate. The Curie temperature of $BiFeO_3$ and also of the solid solutions belonging to the system $PbTiO_3$-$BiFeO_3$ cannot be determined from dielectric measurements owing to the high conductivity of the specimens. The present authors have therefore carried out high

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Card 1/4

26651

S/070/61/006/005/009/011
E032/E114

High-temperature X-ray and .....

temperature X-ray and thermographic studies of $BiFeO_3$. Specimens were prepared from a mixture of Bi_2O_3 and Fe_2O_3 by heating them to 800 °C for one hour and subsequently repeating this process. The X-ray photographs were obtained with copper radiation and the ВРКД-114 (VRKD-114) camera (designed at the Physicochemical Institute imeni L. Ya. Karpov). The synthesized specimens consisted of a single phase and had a rhombohedral distorted cell of the perovskite type with $a = 3.963$ Å and $\alpha = 89° 24''$. The latter is in agreement with the results reported in Ref.2 (room temperature). Fig.1 shows the variation of a and α with temperature. Analysis of the X-ray photographs obtained led to the conclusion that at 700 °C the $BiFeO_3$ began to decompose and weak lines belonging to a second phase appeared. The decomposition is an irreversible process. The thermographic study was carried out with the aid of the УКТА-58 (UKTA-58) apparatus. Fig.2 shows the thermogram obtained for $BiFeO_3$. It follows from the form of the differential curve (Д), the contraction curve (У) and the weight-loss curve (В) that up to about 850 °C no phase transformations occur in the specimen. In the temperature ranges

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S/070/61/006/005/009/011
E032/E114

High-temperature X-ray and .....

875-930 °C, 970-1030 °C and 1030-1090 °C endothermic effects were observed and there was an appreciable contraction of the specimen which became noticeable immediately after the endothermic effect near 875-930 °C. It is concluded that the Curie temperature of $BiFeO_3$ should be greater than or equal to 850 °C. $BiFeO_3$ can therefore be used as a basis for ferroelectric solid solutions with high Curie temperatures. In addition, this substance will be useful in the development of materials which have both magnetic and ferroelectric properties. Acknowledgments are expressed to V.I. Rivkin and Yu.M. Toropov for assistance in the thermographic studies.
There are 2 figures and 4 Soviet references.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova
(Physicochemical Institute imeni L.Ya. Karpov)

SUBMITTED: January 20, 1961

Card 3/4

S/070/61/006/006/002/008
E132/E135

AUTHORS: Zhdanov, G.S., and Kuz'min, R.N.

TITLE: The structures of the compounds of the isomorphous group MSb_2, namely: $CoSb_2$, $RhSb_2$, $IrSb_2$ and α-$RhBi_2$

PERIODICAL: Kristallografiya, v.6, no.6, 1961, 872-881

TEXT: By X-ray single-crystal methods the structures of the above compounds have been determined. The dimensions of the unit cells were found to be as shown in Table 1, and the atomic parameters (space group $P2_1/c$ - arsenopyrite structure) as shown in Table 4. The probable errors in the atomic parameters are about 0.020. The metal atoms are each surrounded by six Sb atoms in a distorted octahedron. The Sb-atoms are 4-coordinated (in distorted tetrahedra) each by 3 metal atoms and one Sb atom. The interatomic distances of nearest and second nearest neighbours are listed. I.M. Rumanova and B.K. Vaynshteyn are mentioned in the article.

There are 6 figures, 5 tables and 21 references: 13 Soviet-bloc and 8 non-Soviet-bloc. The four most recent English language references read as follows:

Card 1/2

The structures of the compounds of ... S/070/61/006/006/002/008
E132/E135

Ref.8: D. Harker, J.S. Kasper. Acta crystallogr., Vol.1, 70-75, 1948.
Ref.10: W.H. Zachariasen. Acta crystallogr., 5, 68-73, 1952.
Ref.14: W. Cochran, M. Woolfson. Acta crystallogr., 8, 1-12, 1955.
Ref.18: T. Rosengvist. Acta Metallurgica, Vol.1, 6, 761-763, 1953.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im.
M.V. Lomonosova (Moscow State University imeni
M.V. Lomonosov)

SUBMITTED: September 4, 1961

Card 2/~~4~~ 2

VENEVTSEV, Yu.N.; SOLOV'YEV, S.P.; ZHDANOV, G.S.

Methods for the X-ray diffraction study of small deformations of cubic primary cells. Zav.lab. 27 no.9:1112-1115 '61. (MIRA 14:9)

1. Nauchno-issledovatel'skiy fiziko-khimicheskiy institut imeni L.Ya. Karpova.

(Electric batteries) (X-ray--Diffraction)

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

Neutron diffraction study of the crystalline structure of solid hydrogen and deuterium. Zhur. eksp. i teor. fiz. 40 no.4:1022-1026 Ap '61. (MIRA 14:7)

1. Fiziko-tekhnicheskiy institut AN Ukrainskoy SSR i Fiziko-khimicheskiy institut imeni L.Ya. Karpova.
(Neutrons--Diffraction) (Low temperature research)
(Hydrogen crystals) (Deuterium crystals)

32304
S/020/61/141/004/010/019
B103/B101

21.2400 also 2408

AUTHORS: Serebryanskiy, V. T., Epel'baum, V. A., and Zhdanov, G. S.

TITLE: The constitution diagram of the aluminum boron system

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 4, 1961, 884 - 886

TEXT: The Al - B system was studied, since literature data as to its constitution diagram are contradictory. A contact-free high temperature thermal analysis (up to 2800°C) was obtained by means of the BHTA-1 (VNTA-1) apparatus devised by N. A. Nedumov (ZhFKh, 34, 184 (1960)). Pressed rodlets of 5 g were prepared from Al (purity 99.99%) and B (purity 99.5%), melted in purified helium in corundum or BeO crucibles and cooled at a rate of 20 deg/min. Fig. 1 shows that the Al - B system is complex and contains several peritectoid transformations. The variation of the lattice period of Al remains within the limit of error. Thus, x-ray data cannot be used to make conclusions as to the solubility of B in Al. The data found differed from those of W. Hofmann and W. Jäniche (Ref. 4: Zs. Metallkunde, 28, 1 (1936)). Al as well as AlB_2

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are present in specimens containing up to 1% of B. With a higher percentage of B, α-AlB_{12} (the tetragonal modification of "graphitoidal boron") is contained besides AlB_2. The peritectic line at 975°C corresponds to the decomposition of $AlB_2 \longrightarrow AlB_{12} \longrightarrow Al$. At low temperatures, the alloys are not in equilibrium, since α-AlB_{12} is found in quantities increasing with increasing B content. AlB_2 crystallizes in the form of thin hexagonal lamellas of bronze color. Its lattice constants are: $a = 3.01$ Å; $c = 3.26$ Å. The pycnometric density measured is 3.09 g/cm^3. Al and α-AlB_{12} were found in specimens quenched from 1000 - 1400°C. It was not possible to explain the nature of the transformations at 1450°C. The peritectic at 1550°C corresponds to the formation of β-AlB_{12}, the "diamond-like boron". This phase was obtained in pure state when specimens containing up to 82.5% of B were quenched from 1600°C. It crystallizes in the form of long tetragonal prisms or bipyramids and is

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yellow to brown. Their chemical analysis resulted in percentages of: 82.98 B and 16.85 Al (sometimes differing from stoichiometry: 86.0 and 14.1 resp.). The temperature range of β-AlB_{12} is 1550 - 1660°C. When cooled gradually it is converted to α-AlB_{12}. This conversion is not completed on slow, but insufficient cooling. In specimens quenched from 1700 - 1750°C AlB_{10} was found: black pyramidal crystals having a pycnometric density of 2.72 g/cm^3 and B and Al contents of 79.8 and 19.8% respectively. The temperature range is 1660 - 1850°C. AlB_{10} forms equally α-AlB_{12} on gradual cooling. Quenching from 1850 - 2070°C and slow cooling of the alloy 82.5% B + 17.5% Al results in α-AlB_{12} with the lattice periods a = 10.15 Å, c = 14.29 Å and a pycnometric density of 2.62 g/cm^3. α-AlB_{12} is found in alloys containing 82.5 - 93% of B and is a solid solution of Al in B. Seven alloys containing 4 - 30% of Al and 96 - 70% of B as well as amorphous boron were melted in an electric arc

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furnace in helium atmosphere to check the above-mentioned data. Their analysis differed from the charge composition owing to the evaporation of both components. Specimens containing up to 82% of B consisted of Al and α-AlB_{12}, those with 82 - 93% of B contained only α-AlB_{12}. The B melted was rhombohedral and had parameters of the hexagonal cell measured by reflection from the angles 78°7' and 78°58': a = 10.95 Å, c = 23.76 Å consistent with Ref. 13, see below). Between 93 and 100%, only rhombohedral boron was found which had c = 23.87 Å at 93%. Presumably, this is connected with the formation of the solid solution of Al in B. There are 1 figure and 13 references: 6 Soviet and 7 non-Soviet. The three references to English-language publications read as follows: Ref. 9: P. Cotter, Am. Mineralogist, 43, 781 (1958); Ref. 12: C. P. Talley, S. La Placa, Ben Post, Acta crystallogr., 13, 271(1960); Ref. 13: D. E. Sands, J. L. Hoard, J. Am. Chem. Soc., 79, 5582 (1957).

X

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

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32304
S/020/61/141/004/010/019
B103/B101

The constitution diagram of ...

PRESENTED: July 11, 1961, by N. V. Belov, Academician

SUBMITTED: July 11, 1961

Card 5/~~6~~5

34729
S/070/62/007/001/002/022
E032/E314

24.7700 (1153, 1454)

AUTHORS: Lyubimov, V.N., Venevtsev, Yu.N. and Zhdanov, G.S.

TITLE: Internal electric fields in $NaTaO_3$ and $CdTiO_3$ crystals

PERIODICAL: Kristallografiya, v. 7, no. 1, 1962, 12 - 19

TEXT: The aim of the present calculations was to obtain some information on the electrical properties of the above crystals. It is stated that they have not been extensively investigated and that the published information is to some extent conflicting. Thus, G.A. Smolenskiy (Ref. 1 - Dokl.AN SSSR, 85, 985, 1952; Ref.2 - Zh.tekhn. fiz., 20, 137, 1950 and Ref. 3 - Dokl. AN SSSR, 70, 405, 1950) reported that $CdTiO_3$ was a ferro-electric with a Curie point at 50 - 60 °K, while J.K. Hulm, B.T. Matthias and E.A. Long (Ref. 4 - Phys. Rev., 79, 885, 1950) did not find these properties. According to the experimental results of B.T. Matthias (Ref. 5 - Amer.Phys.Soc., 24, 28, 1949 and Ref. 6 - Phys. Rev., 75, 1771, 1949), $NaTaO_3$ should be regarded as a ferro-electric, while V.A. Isupov

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(Ref. 8 - Izv. AN SSSR, Ser. fiz., 22, 1504, 1958) describes it as "quasi-ferro-electric". In order to resolve these difficulties, the present authors calculate the internal electric fields of the above structures at room temperature. Use is made of a modified form of Eq. (10) in the paper by S.P. Solov'yev, Yu.V. Venevtsev and G.S. Zhdanov (Ref. 10 - Kristallografiya, 5, 1960, 718) in order to abbreviate the calculations. The structural coefficients of $CdTiO_3$ were calculated by P.P. Ewald's method (Ref. 11 - Ann. Phys., 64, 253, 1921) using the Strela computer. Each structural coefficient was determined to four decimal places. The procedure used by the authors enabled them to reduce the number of points for which the coefficients had to be evaluated from 34 to 15. There are 9 structural coefficients for each of these 15 points. Of the resulting total number of 135, there are 74 which are equal to zero. The authors have used this theory to calculate the dipole moment of the superstructure cell and found its antiparallel components. The dipole moment and the contribution of ions to the spontaneous polarization

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are given (in units of 10^{-18} ESU) in Table 5. The internal fields (in units of 10^{-8} V/cm), the spontaneous polarization and the structural distortion of various crystals of type ABO_3 are given in Table 6. It is stated that further careful studies of the structural, dielectric and other characteristics of these substances are necessary. Acknowledgments are expressed to S.P. Solov'yev for advice and T.A. Osipova for evaluating the structural sums. There are 6 tables and 17 references: 10 Soviet-bloc and 7 non-Soviet-bloc. The four latest English-language references are: Ref. 4 (quoted in text); Ref. 7 - H.F. Kay, J.L. Miles - Acta crystallogr., 10, 213, 1957; Ref. 12 - H.F. Kay, P.C. Baily - Acta crystallogr., 10, 219, 1957 and Ref. 15 - J.R. Tessman, A.H. Kahn, W. Shockley - Phys. Rev., 92, 890, 1953.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova (Physicochemical Institute im. L.Ya. Karpov)

SUBMITTED: February 15, 1961

Card 3/5

S/070/62/007/001/007/022
E132/E460

AUTHORS: Fedulov, S.A., Venevtsev, Yu.N., Zhdanov, G.S., Smazhevskaya, Ye.G., Rez, I.S.

TITLE: X-ray and electrical studies of the system $PbTiO_3$-$BiFeO_3$

PERIODICAL: Kristallografiya, v.7, no.1, 1962, 77-83

TEXT: X-ray powder photographs were taken at various temperatures up to about 800°C of specimens from the $BiFeO_3$-$PbTiO_3$ system and measurements were made of dielectric constant and electrical conductivity. Fig.1 shows the change in cell dimensions with composition, wt.%; Fig.7 shows the phase diagram. The rhombohedral phase near the composition $BiFeO_3$ has an exceptionally high Curie point, about 850°C, which is near its incongruent m.p. At lower concentrations of $BiFeO_3$ (65%) before the transition from tetragonal to rhombohedral, the tetragonal phase reaches a c/a ratio of 1.17, which is exceptionally high. As a base for ferroelectric structure, $BiFeO_3$ has wide possibilities and may lead to technical materials with both ferroelectric and ferromagnetic properties. There are 7 figures.

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-g.7.

36139

S/070/62/007/002/005/022
E132/E160

24,7100

AUTHORS: Lyubimov, V.N., Venevtsev, Yu.N., and Zhdanov, G.S.

TITLE: On a method of calculating the gradients of the internal electric fields in complex dipole structures

PERIODICAL: Kristallografiya, v.7, no.2, 1962, 229-233

TEXT: The problem of calculating the gradients q of the internal electric field in a crystal lattice of any symmetry made up of charges and dipoles is examined. As $q = \text{grad}\ \underline{E} = -\text{grad}\ V$ and $\partial E_x/\partial y = \partial E_y/\partial x$, q is a symmetrical tensor with 6 components. In the general case $6m$ quantities must be calculated to give the field if there are m atoms per unit cell. Inclusion of the symmetry of the unit cell may reduce this to $6n$ where n is the number of complexes, and simplify the formulae. The symmetry of the ions themselves introduces further simplifications.

X

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova (Physico-chemical Institute imeni L.Ya. Karpov)

Card 1/1

SUBMITTED: April 26, 1961

S/070/62/007/004/003/016
E132/E435

AUTHORS: Zhdanov, G.S., Soklakov, A.I.

TITLE: X-ray investigation of the radial distribution in amorphous solid solutions $S-As_2S_3$

PERIODICAL: Kristallografiya, v.7, no.4, 1962, 555-559

TEXT: Evaporated layers were obtained by heating elementary As and S to 900°C for several hours. Specimens were prepared with 0.5, 1, 4, 5, 10 and 15 at.% As. They were examined by diffractometer УРС-50И (URS-50I) using a monochromator of pentaerithritol and Cu radiation. The maximum count rate from the specimen was about 14000 counts/min. The decay of the amorphous phase and the appearance of the crystalline one was followed by heating the specimen to 110°C. The scattering curves were inverted to give the radial density curves by the computer "Strela". Discussion of these curves leads to a model of the process. Spiral chains are envisaged as proposed by Prins for amorphous S. As stabilizes these chains by forming cross links between them but at the same time favours the formation of crystalline regions. If there is less than one atom

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E132/E435

X-ray investigation ...

of As per turn of the spiral then the structure remains plastic; this is up to 10 - 12% As, the As atoms appear not to interact with each other. Above 12%, the material becomes more rigid and, on annealing, tends towards the structure of amorphous As_2S_3. The results obtained agree with measurements of the viscosity of melts of S + As. There are 4 figures and 1 table.

ASSOCIATIONS: Moskovskiy gosudarstvennyy universitet
im. M.V.Lomonosova (Moscow State University imeni
M.V.Lomonosov)
Nauchnyy institut udobreniy i insektofungisidov
im. Ya.V.Samoylova (Scientific Institute for
Fertilisers and Insecto-Fungicides imeni
Ya.V.Samoylov)

SUBMITTED: September 14, 1961

Card 2/2

S/126/62/013/001/004/018
E021/E580

AUTHORS: Zhuravlev, N.N., Zhdanov, G.S. and Smirnova, Ye.M.

TITLE: Study of ternary solid solutions on the basis of superconducting compounds

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.1, 1962, 62-70

TEXT: The aim of the present work was to find alloys with wide regions of solid solubility, based on superconducting compounds with a nickel-arsenide structure, in order to study the change in superconductivity on partial substitution of one element of the binary compound by a third. The following systems were investigated: PtBi-PtSb, PtBi-PtPb, NiBi-NiSb, NiBi-RhBi, PtBi-PdBi, PdSb-PdBi, NiBi-PtBi, NiBi-MnBi, PtBi-MnBi, PtBi-PtSn, PtSb-PdSb, PtSb-CoSb. Alloys were prepared from 99.98% Bi, 99.98% Sb, 99.9% Pb, 99.95% Sn, electrolytic Ni and Mn, Pt and sponge Pd. Melting was carried out in a quartz flask in vacuo. Heat treatments were also carried out in quartz flasks. Superconducting properties were studied on samples of diameter 1.5-2.5 mm and 20-30 mm length. All the alloys were investigated by X-ray,

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microscopic, thermal and microhardness methods. Results showed that in many cases there were wide ranges of solid solubility. However, in spite of the fact that X-ray and microscopic studies showed homogeneity, an investigation of superconductivity showed that full equilibrium was not attained even after 300-500 hours homogenization. Thus, superconductivity measurements are a more sensitive method for detecting microinhomogeneity of alloys. The change in microhardness is linear with change in composition for the systems PtBi-PtSb, NiBi-RhBi and PdSb-PdBi. X-ray analysis of the solid solutions showed a linear change in lattice parameter with composition, in agreement with the results of an investigation of similar sections of semiconducting compounds. There are 5 figures and 1 table.

ASSOCIATION: Moskovskiy gosuniversitet im. M.V. Lomonosova
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: May 26, 1961

Card 2/2

DUDAREV, V.Ya.; ZHDANOV, G.S.; ALEKSEYEV, B.A.; KASYMBEKOVA, K.K.

Products of graphite sputtering when bombarded with Sn^-, V^+, Mo^+ ions. Atom. energ. 13 no.2:184-186 Ag '62. (MIRA 15:8)
(Sputtering (Physics)) (Graphite) (Ion beams)

S/089/62/013/004/009/011
B102/B108

AUTHORS: Dudarev, V. Ya., Zhdanov, G. S., Alekseyev, B. A.

TITLE: X-ray diffraction study of precipitates produced by bombarding some metals with ions of other metals

PERIODICAL: Atomnaya energiya, v. 13, no. 4, 1962, 382 - 383

TEXT: The ions of a metal are sputtered by bombardment with ions of some 10 kev, each of which strikes out about 10 ions of the target. In an effort to find the most convenient way of separating accumulated isotopes from the resulting precipitates, copper was bombarded with Sn^+, Zr^+, and Mg^+ ions of ~30 kev in a vacuum of $\sim 10^{-6}$ mm Hg, and Al was bombarded with Zr^+. The precipitates were analyzed. (1) Cu + Sn: X-ray diffraction studies of the bronze precipitates showed that they resembled a Cu-Sn alloy whose composition varies in the layer thickness, even though their crystal was that of copper. In the lower layers the tin content was 2.5 at% and on the surface it was about 1.8 at%. (2) Cu + Zr: This double-layer precipitate, too, was an alloy with an average zirconium content of 5.29%. The precipitate displayed lines which could not be attributed with certainty either to

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X-ray diffraction study ...

S/089/62/013/004/009/011
B102/B108

Cu_2Zr or Cu_3Zr. It is assumed that these lines come from other compounds. (3) Cu + Mg: Again an alloy. (4) Al + Zr: Chemical analysis showed that these precipitates too were alloys containing 18.09% by weight of Zr. All the alloys mentioned are heterogeneous, i. e., containing intermetallic compounds as well as the solid solution. The higher concentration of the bombarded metal near the backing is due to the temperature dependence of the sputtering coefficient.

SUBMITTED: December 14, 1961

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37699

S/126/62/013/004/007/022
E193/E383

18.1240

AUTHORS: Zhuravlev, N.N., Zhdanov, G.S. and Smirnova, Ye.M.

TITLE: Investigation of platinum-bismuth alloys in the 10 to 50 at.% platinum-concentration range

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no. 4, 1962, 536 - 545 + 1 plate

TEXT: The object of the present investigation was to obtain more precise data on the cause of instability of PtBi and $PtBi_2$ alloys at low and ultralow temperatures. To this end the constitution of Pt-Bi alloys containing 10 - 50 at.% Pt was studied by hardness measurements and by thermal, metallographic and X-ray diffraction analysis. The results of thermal analysis are reproduced in Fig. 1, showing the constitution diagram of the Pt-Bi system, the circles and crosses representing, respectively, data obtained in the course of the present and earlier investigations (Ref. 4 - N.N. Zhuravlev and L. Kertes - ZhETF, 1957, 32, 1313). Other results can be summarized as follows.

1) As a result of a peritectic reaction at 685 °C a γ-phase

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E193/E383

Investigation of ....

is formed in alloys containing between 35 and 50 at.% Pt; this phase undergoes a eutectoid transformation at about 570 °C, decomposing to yield PtBi and $PtBi_2$.

2) PtBi has the nickel arsenide structure with lattice parameters a = 4.315 and c = 5.490 kX.

3) The superconductive properties of cast Pt-Bi alloys of a composition near to PtBi are associated with the presence of the γ-phase.

4) There are three allotropic modifications of $PtBi_2$: α-$PtBi_2$ with a cubic structure (a = 6.683 kX); β-$PtBi_2$ crystallizing in trigonal singony (a = 6.59, c = 6.17 kX); γ = $PtBi_2$ with a complex structure. The differences observed in the behaviour of $PtBi_2$ at ultralow temperatures must be attributed to the existence of these three modifications, those stable at high temperatures being responsible for superconductive

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Investigation of S/126/62/013/004/007/022
E193/E383

properties of alloys of a composition near to that of $PtBi_2$, which are characterized by a high critical temperature of $T_k \approx 2.4$ °K.

There are 7 figures and 4 tables.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova (Moscow State University im. M.V. Lomonosov)

SUBMITTED: June 30, 1961

Card 3/3

42198

S/051/62/013/004/019/023
E032/E514

24,3300

AUTHORS: Vertsner, V.N., Vorona, Yu.M. and Zhdanov, G.S.

TITLE: Observation of the crystal lattice with the ЭМ-5 (EM-5) electron microscope

PERIODICAL: Optika i spektroskopiya, v.13, no.4, 1962, 605-607

TEXT: It is noted that observations of crystal faces are usually carried out with complicated instruments with a resolution of 10 Å or better. Although the microscope EM-5 has a nominal resolution of 20 Å, its electron-optical parameters are such that it is possible, in fact, to obtain a resolution of the order of 10 Å. In view of this, the authors decided to use it to repeat the observations of Menter (Proc. Roy. Soc., A236, 119, 1956) and Bassett, Menter and Pashly (Proc. Roy. Soc., A246, 345, 1958; J. Phot. Sci., 7, 60, 1959). The condensing and intermediate lenses incorporated a fixed magnetic stigmator from the EM-7 microscope. The magnification was X5300 or X6700 at an accelerating voltage of 60 kV. A figure is reproduced showing the microphotograph of a copper phthalocyanin crystal in which the (001) planes, which are at a distance of 12.6 Å, are clearly resolved.

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Observation of the crystal lattice ... S/051/62/013/004/019/023
E032/E514

The (201) planes, 9.8 Å apart, are also clearly resolved in another photograph. The fact that the EM-5 is capable of a 10-12Å resolution is therefore confirmed. There are 3 figures and 1 table.

SUBMITTED: May 16, 1962

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35597
S/048/62/026/003/006/015
B107/B102

24.7100 (1153,1160)

AUTHORS: Ivanova, V. V., Kapyshev, A. G., Venevtsev, Yu. N., and Zhdanov, G. S.

TITLE: X-ray determination of symmetry of the elementary cells of the ferroelectrics $(K_{0.5}Bi_{0.5})TiO_3$ and $(Na_{0.5}Bi_{0.5})TiO_3$ and of the high-temperature phase transitions in $(K_{0.5}Bi_{0.5})TiO_3$

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 3, 1962, 354-356

TEXT: The ferroelectrics with perovskite structure, $(K_{0.5}Bi_{0.5})TiO_3$ and $(Na_{0.5}Bi_{0.5})TiO_3$ with the Curie point at 380 and 320°C, respectively, had been described in earlier papers (Ref. 1: G. A. Smolenskiy, A. I. Agranovskaya, Fiz. tverdogo tela, 1, no. 10, 1562 (1959); Ref. 2: G. A. Smolenskiy, V. A. Isupov, A. I. Agranovskaya, N. N. Kraynik, Fiz. tverdogo tela, 2, no. 11, 2982 (1960)). The radiographic examination with an РКУ-114 (RKU-114) camera shows that the samples are single-phased at room

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S/048/62/026/003/006/015
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X-ray determination of symmetry ...

temperature, and that K and Bi, and/or Na and Bi are statistically distributed in the sites of the elementary cell with the coordination number 12. Splitting of some lines was observed, but could not be measured accurately. CrK radiation and an РКД-143 (RKD-143) camera (produced at the FKhI imeni L. Ya. Karpov) were therefore used. The following lattice constants were determined from the splitting of the line with $\sum h_i^2 = 8$: $(K_{0.5}Bi_{0.5})TiO_3$ is tetragonal with $a = 3.913 \pm 0.003$ Å, $c = 3.993 \pm 0.003$ Å, $V = 61.1 \pm 0.15$ Å^3; $(Na_{0.5}Bi_{0.5})TiO_3$ is rhombohedral with $a = 3.891 \pm 0.002$ Å, $\alpha = 89^\circ 36' \pm 3'$, $V = 58.7 \pm 0.1$ Å^3. Furthermore, the change in the lattice constants with temperature up to 500°C was determined for $(K_{0.5}Bi_{0.5})TiO_3$. At 270°C the tetragonal passes over into a pseudocubic phase. The slightly diffuse lines make more accurate determination impossible. On the basis of previous conclusions (Ref. 4: Yu. N. Venevtsev, G. S. Zhdanov, Izv. AN SSSR. Ser. fiz., 21, 2275 (1957)) the distortion can be assumed to be tetragonal. The cubic phase occurring from 410°C onward makes the radiographs clearer. The authors thank V. A. Isupov who supplied the samples. There is 1 figure.

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X-ray determination of symmetry ... S/048/62/026/003/006/015
B107/B102

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

X

Card 3/3

35598

S/048/62/026/003/007/015
B117/B102

24.7800 (1035, 1043, 1153)

AUTHORS: Fedulov, S. A., Venevtsev, Yu. N., Zhdanov, G. S., and Dzhmukhadze, D. F.

TITLE: X-ray and electrical analysis of the system $PbTiO_3$-$LaFeO_3$

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 3, 1962, 357 - 361

TEXT: This paper was presented at the VII Nauchno-tekhnicheskoye soveshchaniye po primeneniyu rentgenovykh luchey k issledovaniyu materialov (7th Scientific-technical Conference on the Use of X-rays for the Examination of Materials) held in Leningrad from June 22 to 29, 1961. The system $PbTiO_3$ - $LaFeO_3$ was studied by means of X-ray and electrical analysis. The specimens were prepared by double annealing (preliminary annealing at 800 - 1100°C, final annealing at 1100 - 1400°C, for one hour each) in lead oxide vapor. X-ray analysis was made with CuK_α and FeK_α radiation in РКУ-114 (RKU-114) and РКД-143 (RKD-143) cameras (designed at the Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical

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S/048/62/026/003/007/015
B117/B102

X-ray and electrical analysis...

Institute imeni L. Ya. Karpov). The dielectric constant was measured at 450 kcps by a КВ-1 (KV-1) Q-meter, electrical conductivity was measured by a МОМ-4 (MOM-4) bridge. The results obtained by X-ray analysis agree with those in other publications. The system $PbTiO_3$ - $LaFeO_3$ forms a continuous series of solid solutions which at room temperature occur in three modifications: tetragonal, pseudomonoclinic I, and pseudomonoclinic II. Specimens with an $LaFeO_3$ content higher than 50% showed a hyperfine structure of the lines whose intensities increased with the $LaFeO_3$ concentration. The elementary cell volume of solid solutions $(Pb,La)(Ti,Fe)O_3$, decreased with increasing $LaFeO_3$ concentration. This became especially distinct in the region of tetragonal modification and can be explained by the specific electrostrictive properties of $PbTiO_3$. According to the activation energy determined for $PbTiO_3$ and $LaFeO_3$ from their conductivities (with relatively high values), these compounds were classified as semiconductors. The temperature dependences of conductivity of solid solutions as functions $\log \sigma = f(1/T)$ had a complicated course when the $LaFeO_3$

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X-ray and electrical analysis...

content was increased. This indicates a change in the conductivity mechanism of solid solutions according to their composition. At certain temperatures, corresponding to the phase transition points, salient points were observed on these straight lines. A phase diagram (Fig. 5) was set up on the basis of the data obtained. Comparison of the data obtained for $PbTiO_3$ - $LaFeO_3$ with those for $PbTiO_3$ - $BiFeO_3$ showed that in contrast to $PbTiO_3$ - $BiFeO_3$ in which the Curie temperature rises when $BiFeO_3$ is added, the Curie temperature decreases in $PbTiO_3$ - $LaFeO_3$ when the $LaFeO_3$ concentration is increased. Probably the main reason thereof is the different polarizability of the La and Bi ions compared with the polarizability of the Pb ion. The different ionic radii of Bi (1.20 Å) and La (1.04 Å) probably do not influence the behavior of the Curie temperature. Presumably they are the main reason of the different sequence of the phases. The relatively high temperature of the magnetic transformation of $LaFeO_3$ ($\sim 570^{\circ}C$) in part of the solid solutions in its neighborhood also suggest magnetic properties. The authors thank Ye. G. Smazhevskaya for her help. There are 5 figures and 13 references: 8 Soviet and 5 non-Soviet.

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X-ray and electrical analysis...

S/048/62/026/003/007/015
B117/B102

The four references to English-language publications read as follows: N. D. Megaw, Proc. Phys. Soc., 58, 133 (1946); R. Roy, J. Res. Nat. Bur. Standards, 58, 2, 75 (1957); M. H. Francombe, B. Lewis, J. Electronics, 2, 387 (1957); G. Shirane, S. Hoshino, K. Suzuku, Phys. Rev., 80, 6, 1115 (1950).

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

Fig. 5. Phase diagram of the system $PbTiO_3$ - $LaFeO_3$.

Legend: (1) cubic (paraelectric); (2) tetragonal (piezoelectric); (3) pseudomonoclinic I; (4) pseudomonoclinic II.

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S/053/62/076/002/002/004
B117/B104

AUTHORS: Zhdanov, G. S., and Ozerov, R. P.

TITLE: Neutron diffraction study of magnetic materials

PERIODICAL: Uspekhi fizicheskikh nauk, v. 76, no. 2, 1962, 239 - 282

TEXT: This is a survey on progresses achieved in the field of neutron diffraction study of magnetic materials. It was written on the basis of a lecture on "magnetic structures", read on the occasion of the plenary meeting of the VII Soveshchaniye po primeneniyu rentgenovskikh luchey k issledovaniyu materialov (7th Conference on the Use of X-rays in the Examination of Materials), held in Leningrad on June 19, 1961. The survey summarizes studies of magnetic structures, dealing with the following problems: magnetic neutron scattering; determination of magnetic moments of atoms; magnetic structure of transition metals and of some compounds; magnetic critical and small-angle scattering of neutrons; neutron scattering from spin waves; magnetic scattering of conduction electrons. The authors point out that studies of magnetic structures are of importance for getting a better insight into the elementary structure of

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Neutron diffraction study... S/053/62/076/002/002/004
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matter, for further development of the solid-state theory and for important practical fields of application. Ye. S. Fedorov, V. N. Bykov, Ye. I. Kondorskiy, V. L. Sedov, R. A. Alikhanov, G. Avakyants, S. V. Maleyev, D. A. Yevtushenko, R. Z. Levitin, Yu. A. Izyumov, M. A. Ginzburg, Sh. Sh. Abel'skiy, Ye. A. Turov, A. A. Berdyshev, I. N. Vlasov, V. L. Bonch-Bruyevich, B. V. Karpenko, A. V. Shubnikov are mentioned. There are 38 figures, 8 tables, and 116 references: 23 Soviet and 93 non-Soviet. The four most recent references to English-language publications read as follows: J. P. Burger, M. A. Taylor, Phys. Rev. Lett. 6, 185 (1961); M. K. Wilkinson, E. O. Wollan, H. R. Child, J. W. Cable, Phys. Rev. 121, 74 (1961); T. Riste, A. Wanic, J. Phys. Chem. Solids 17, 318 (1961); N. G. Backlund, J. Phys. Chem. Solids 20, 1 (1961).

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36915
S/020/62/143/005/013/018
B101/B110

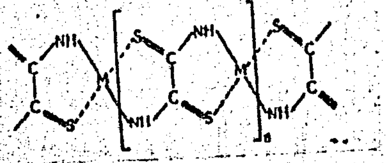
15.8340

AUTHORS: Vozzhennikov, V. M., Zvonkova, Z. V., Rukhadze, Ye. G., Zhdanov, G. S., and Glushkova, V. P.

TITLE: Electrical conductivity and activation energy of some dithio oxamide-, N-substituted dithiocarbamate-, and thiocyanate (Cu, Co, Ni) polymers

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 143, no. 5, 1962, 1131-1134

TEXT: The electrical conductivity, σ, and the activation energy, E, of the following polychelates were studied:



(I),

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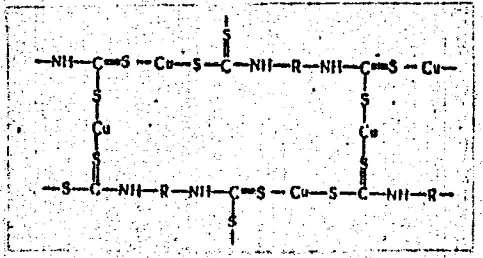
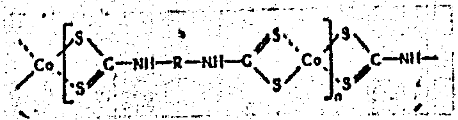
M = Cu, Ni, or Co;



(II),

R = p-C_6H_4-; p,p-$(C_6H_4)_2$-; $(CH_2)_6$; and



(III),

R = p-C_6H_4-; p,p-$(C_6H_4)_2$-; $(CH_2)_6$; $(CH_2)_2$. The following was found:

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Electrical conductivity and ...

Polymer	M, R	T, °K	$\sigma_{290°K}$ $ohm^{-1} \cdot cm^{-1}$	σ_o $ohm^{-1} \cdot cm^{-1}$	E, ev
I	Cu	290-350	$4 \cdot 10^{-8}$	$1 \cdot 10^{4}$	0.6
"	Ni	290-500	$2 \cdot 10^{-11}$	$7 \cdot 10^{-1}$	0.6
"	Co	400-500	$7 \cdot 10^{-16}$ *	$1 \cdot 10^{-3}$	0.7
II	$p-C_6H_4-$	290-425	$7 \cdot 10^{-11}$	1	0.42; 0.62 **
"	$p,p-(C_6H_4)_2-$	290-450	$5 \cdot 10^{-13}$	$1 \cdot 10^{-3}$	0.36; 0.60
"	$(CH_2)_6$	310-380	$1 \cdot 10^{-13}$	$2 \cdot 10^{-1}$	0.72
III	$p-C_6H_4-$	370-460	$9 \cdot 10^{-12}$ ***	$1 \cdot 10^{-3}$	0.58
"	$p,p-(C_6H_4)_2-$	380-460	$3.5 \cdot 10^{-12}$	$3 \cdot 10^{-3}$	0.62
"	$(CH_2)_6$	400-460	$1.7 \cdot 10^{-12}$	$5 \cdot 10^{-3}$	0.76
"	$(CH_2)_2$	400-460	$8 \cdot 10^{-13}$	$1 \cdot 10^{-3}$	0.74

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Electrical conductivity and ....

* extrapolated; ** first figure at $T < 360^\circ K$, second figure at $T > 360^\circ K$; *** $\sigma_{400^\circ K}$. In the compounds II and III the higher σ and the lower E of the phenylene derivatives are explained by the effect of the π bonds which is reduced in the diphenylene group owing to the angle between the ring planes. Logσ is a linear function of 1/T, the straight line has, however, a salient point at 360°K for compounds II. The susceptibility of compounds III is 3.5 μB. Compounds with the bridge groups S=C=N- have semiconductor properties. Also CuSCN showed a salient point in the curve logσ versus 1/T: at the beginning, $E_1 = 0.4$ ev, after a 2-hr heating at 400°C, $E_2 = 0.1$ ev. There are 4 figures and 1 table. The most important English-language reference is: R. M. Hurd, G. De La Mater et al., J. Am. Chem. Soc., 17, 4454 (1960).

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

Card 4/5

40385

S/020/62/145/006/007/015
B182/B102

24.2200

AUTHORS: Kiselev, S. V., Ozerov, R. P., and Zhdanov, G. S.

TITLE: Determination of the magnetic order in the ferroelectric $BiFeO_3$ by neutron diffraction patterns

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 145, no. 6, 1962, 1255-1258

TEXT: Perovskite of type $BiFeO_3$ has ferroelectric properties. On the other hand, compounds of the perovskite type ABO_3 (with B = Fe, Mn) show ferromagnetic and antiferromagnetic properties. The existence of a magnetic order in $BiFeO_3$ is now verified by comparing two neutron diffraction patterns, one of which taken at 600°C shows coherent diffraction peaks as would be expected from a cubic lattice whilst the other taken at room temperature shows the same peaks in addition to reflections in positions where one would not expect them on the basis of the chemical structure of the unit cell. The magnetic nature of these peaks is identified by the temperature dependence of their intensities; a Neel

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B182/B102

Determination of the magnetic order...

temperature of 380°C results. The peaks in the 600°C pattern have been identified on the assumption of a cubic unit cell with a = 3.963 Å. By choosing a period a_{magn} = 2a = 7.926 Å, it is possible, however, to identify the magnetic peaks in the other pattern as well as the coherent ones. From this it is found that the magnetic structure of $BiFeO_3$ is of the type G (Phys. Rev. 100,545, 1955); i.e. each magnetic moment is surrounded by six antiparallel moments. The quantum number as calculated from the magnetic structure and the intensity of the first magnetic peak is S = 1.98, whereas the expected value for Fe^{3+} would be S = 5/2. This can be attributed primarily to the fact, that at room temperature the magnetic order is incomplete. The results indicate the existence of a new class of chemical compounds with definite magnetic and electric properties. In $BiFeO_3$ the periodicity of the magnetic field is twice the periodicity of the electric field. From the interaction of these fields a weak ferromagnetism of the lattice is to be expected, and this phenomenon may possibly be typical for all cases in which the period of the magnetic field differs from that of the electric field. There are 2 figures.

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ZHDANOV, G.S., prof.

Significance of X-ray, electron and neutron diffraction studies for solving the problems set by the 22d Congress of the CPSU. Izv. AN SSSR. Ser. fiz. 26 no.3:I-II Mr '62. (MIRA 15:2)

1. Predsedatel' Komissii po rentgenografii AN SSSR. (Diffraction)

①

L 22121-66 EWT(1)/EWT(m)/EWP(w)/EPF(n)-2/T/EWP(t) IJP(c) JD/JG/GG

ACC NR: AP6004921 SOURCE CODE: UR/0056/66/050/001/0069/0075

AUTHOR: Roginskaya, Yu. Ye.; Tomashpol'skiy, Yu. Ya.; Venevtsev, Yu. N.; Petrov, V. M.; Zhdanov, G. S. 27 28

ORG: Physicochemical Institute im. L. Ya. Karpov (Fiziko-khimicheskiy institut) 13

TITLE: On the character of dielectric and magnetic properties of $BiFeO_3$

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. v. 50, no. 1, 1966, 69-75

TOPIC TAGS: bismuth compound, ferroelectric material, dielectric property, solid solution, Curie point, Neel temperature, magnetic property 21 21 21

ABSTRACT: This is a continuation of earlier work by the authors on $BiFeO_3$ (ZhETF v. 46, 1921, 1964). In view of the contradictory reports on the properties of $BiFeO_3$, especially with respect to its ferroelectric properties, the authors analyze the published data and in addition carried out a more detailed investigation of the dielectric properties and the structure of $BiFeO_3$ in a broad range of temperatures, as well as of solid solutions of this substance with $PbFe_{1/2}Nb_{1/2}O_3$. Particular attention is paid to the 400--500C region, and to the solid solution. The polycrystalline samples for the investigation were prepared by the usual ceramic techniques. The dielectric constant and the loss angle were measured at

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ACC NR: AP6004921

300 Mcs by the coaxial-line method. Other specific properties of $BiFeO_3$ in addition to the large internal fields and large spontaneous polarization, were a high Curie temperature (850C), and the absence of nonlinear properties at room temperature. An analysis of all the published data and the present results shows that in spite of the fact that the spontaneous electric polarization of $BiFeO_3$ is very high, so that no dielectric hysteresis loops could be obtained, this substance is ferroelectric. Various reasons for this conclusion are discussed. An analysis of the magnetic properties below the Neel temperature (370C) also shows that $BiFeO_3$ has compensated ferromagnetism in addition to ferroelectricity. Orig. art. has: 5 figures.

SUB CODE: 20,07/ SUBM DATE: 17Aug65/ ORIG REF: 022/ OTH REF: 002

Card 2/2 BK

L 29297-66 EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6012456 SOURCE CODE: UR/0181/66/008/004/1021/1027

AUTHORS: Zhdanov, G. S.; Vertsner, V. N.

39
B

ORG: none

TITLE: Direct observation of condensation and crystallization of mercury

21

SOURCE: Fizika tverdogo tela, v. 8, no. 4, 1966, 1021-1027

TOPIC TAGS: mercury, vapor condensation, crystallization, electron microscope, metal film, particle collision/El'miskop 1 electron microscope

ABSTRACT: Inasmuch as most electron-microscope investigations of the kinetics of the growth of thin films [illegible] metals in the microscope directly [illegible] produced particles, and not the [illegible] rence, the authors investigated [illegible] of mercury on cooled carbon films. The [illegible] scope, with resolution 1 -- 1.5 nm (10 -- 15 Å) was [illegible] vapor pressure near the object was estimated [illegible] 2 x 10^{-8} mm Hg, depending on the evacuation conditions. The carbon

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2/2 19A

L 23082-66 EWT(m)/EWP(t) IJP(c) JD/JH

ACC NR: AP5028999 SOURCE CODE: UR/0128/65/000/009/0030/0031

AUTHOR: Spektorova, S. I. (Engineer); Zhdanov, G. S. (Engineer)

ORG: none

TITLE: Electric resistance of aluminum-silicon alloys

SOURCE: Liteynoye proizvodstvo, no. 9, 1965, 30-31

TOPIC TAGS: electric resistance, aluminum base alloy, silicon containing alloy, electric motor / AL2 Al-Si alloy, AL9 Al-Si alloy

ABSTRACT: The article presents the results of an investigation of the magnitude and scatter of electric resistivity ρ as a function of, primarily, the chemical composition and structure of Al-Si alloys, since ρ is an important factor in determining the suitability of these alloys as rotor linings. ρ was measured in by means of an UZO3 double-measuring-bridge device for specimens of four alloys (Fig. 1) (1 and 2 are non-inoculated alloys, 3 and 4 are alloys inoculated with Na before and after annealing, respectively). It was found that, beginning with roughly 3% Si, the mean ρ of Al-Si alloys decreases after inoculation. Aluminum AV000 contained less than 0.05% Si and Fe and the maximal scatter of its ρ was ±2% of the mean (Fig. 2) whereas for the alloys AL2 and AL9, owing to their high Si content and 0.15%-0.20% Fe content, the scatter of ρ was greater because of their heteroge-

Card 1/4 UDC: 669.715:537.311.3