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Complex formation and exchange decomposition in the ternary reciprocal system of lithium and potassium sulfates and nitrates. G. A. Bukhalova, M. L. Sholokhovich, and A. G. Bergman. *Doklady Akad. Nauk S.S.S.R.* 71, 287–90(1950).—The ternary system was investigated by the visual polythermal method. The 4 binary systems were investigated previously by other authors. The ternary diagram has 5 regions where the solid phases and the percentage of the total area are, resp.: K_2SO_4, 43.2; Li_2SO_4, 42.7; $Li_2SO_4.K_2SO_4$, 12; KNO_3, 0.8; $LiNO_3$, 1.3. There are 3 invariant points: a transition point at 440°, contg. 53.5 (equiv.) % SO_4, 58% Li; a transition point at 133°, contg. 1.0% SO_4, 41.5% Li; and a eutectic at 403°, contg. 1.0% SO_4, 43.5% Li. There is a thermodynamic discussion of the heat of reaction involved in the formation of the complex $Li_2SO_4.K_2SO_4$.

Arild J. Miller

SHOLOKHOVICH, M. L.

Chemical Abst.
Vol. 48 No. 4
Feb. 25, 1954
General and Physical Chemistry

Fusibility of the systems Na_2CO_3-K_2CO_3-$BaTiO_3$ and $BaCO_3$-$BaCl_2$-$BaTiO_3$. I. N. Belyaev and M. L. Sholokhovich (V. M. Molotov State Univ., Rostov). *Doklady Akad. Nauk S.S.S.R.* 77, 51-2(1951); cf. *C.A.* 47, 9128e.—The systems were investigated at temps. up to 1200°. The system Na_2CO_3-K_2CO_3-$BaTiO_3$ is a stable section through the more complex system Na, Ba, K||CO_3, TiO_3. There are 2 regions of crystn.: a small region, 1.27% of the total area, where solid solns. of Na_2CO_3 and K_2CO_3 crystallize out; and the remainder where $BaTiO_3$ is the stable phase. The boundary between the 2 regions extends from 826° and approx. 1% $BaTiO_3$-99% Na_2CO_3, down to an invariant min. of 700° at 60% Na_2CO_3-40% K_2CO_3; and up to 873° at approx. 2% $BaTiO_3$-98% K_2CO_3. In the system $BaCl_2$-$BaCO_3$-$BaTiO_3$ there are 5 regions of crystn. where the stable forms are, resp., α-$BaCl_2$ (1.481% of the total area), β-$BaCl_2$ (1.01% of area), α- and β-$BaCO_3$, and $BaTiO_3$ (areas for latter 3 phases not detd.). A ternary eutectic m. 811° contains 11.25% $BaCO_3$, 9.25% $BaTiO_3$, and 79.50% $BaCl_2$.

Arild J. Miller

MF 7-28-54

SHOLOKHOVICH, M. L.

USSR/Chemistry - Piezoelectric Substances Jun 52

"The Fusibility of the System K_2CO_3-Na_2CO_3-$BaTiO_3$," I. N. Belayev, M. L. Sholokhovich

"Zhur Prik Khim" Vol XXV, No 6, pp 657-662

The fusibility of the system Na_2CO_3-K_2CO_3-$BaTiO_3$ was investigated by the visual polythermic method through a temp range up to 1,200°. Fields of crystn of solid solns of sodium and potassium carbonates, occupying only 1.27% of the area of the system, and fields of crystn of barium titanate were detd. The system Na_2CO_3-K_2CO_3-$BaTiO_3$ is the stable cross section of the prism Na,K,Ba ll TiO_3,CO_3.

218T38

USSR/Chemistry, Piezoelectrics - Barium Titanate Aug 52

"The Fusibility of the System $BaCl_2$- $BaCO_3$-$BaTiO_3$," I. N. Belyayev, M. L. Sholokhovich

"Zhur Frik Khim" Vol 25, No 8, pp 818-825

PA 228T6

Established, through a visual-polythermal investigation of the fusibility of the triple system, $BaCl_2$-$BaCO_3$-$BaTiO_3$, that in the explored thermal interval the area of the liquidus corresponds to the crystn of 5 different phases: $\alpha BaCl_2$, occupying 0.1% of the area of the system; $\beta BaCl_2$, occupying 1.48% of the area of the system; of the areas of crystn α and β modifications of $BaCO_3$ and $BaTiO_3$. The fields of crystn of $\beta BaCl_2$, $\beta BaCO_3$ and $BaTiO_3$ converge in a triple eutectic point of the system, corresponding to 79.50% of $\beta BaCl_2$, 9.25% of $BaTiO_3$, and 11.25% of $\beta BaCO_3$.

228T6

SHOLOKHOVICH, M. L.

228T6

SHOLOKHOVICH, M.L.

Fusion in the $BaCl_2$-$BaCO_3$-$BaTiO_3$ system, I. N. Belyaev and M. L. Sholokhovich. *J. Appl. Chem. U.S.S.R.* 25, 90[illegible] *Khim.* 25, 818-25 (1952); cf. *C.A.* 48, 1789c.—Investigations of the system by the visual-polythermal fusion method show that in the temp. interval studied the liquidus surface corresponds to crystn. of 5 different phases: α-$BaCl_2$ occupying 0.1% of the area of the system, β-$BaCl_2$ corresponding to 1.48% of the area, and crystn. surfaces for the α and β modifications of $BaCO_3$, and for $BaTiO_3$. The crystn. fields of β-$BaCl_2$, β-$BaCO_3$, and $BaTiO_3$ meet at a ternary eutectic point for the system corresponding to 79.5% β-$BaCl_2$, 9.25% $BaTiO_3$, and 11.25% β-$BaCO_3$. Bernard Rubin

SHOLOKHOVICH, M.L.

/ Reciprocal system of sodium and barium chlorides and carbonates. I. N. Belyaev and M. L. Sholokhovich (Molotov State Univ., Rostov). *Zhur. Obshchei Khim., Akad. Nauk S.S.S.R.* 1, 134–43(1953); cf. *C.A.* 47, 9128e.—The system Na, Ba || CO_3, Cl was detd. for the first time. The binaries were redetd., and the surface of crystn. of the quaternary deduced from 12 internal planes and 2 diagonal and 1 adiagonal planes. In the binary Na_2CO_3–$BaCO_3$ there is a eutectic at 686° with 37% $BaCO_3$ (all compns. in mol. %) and 3 polymorphous transformations in the $BaCO_3$ branch at 811 and 982°. In the NaCl–$BaCl_2$ binary there is a eutectic at 648° with 51.5% $BaCl_2$. In the NaCl–$BaCO_3$ there are eutectics at 814 and 734° with 24 and 47% $BaCO_3$ and a compd. $2BaCl_2.BaCO_3$ with a m.p. at 827°. This compd. was obtained repeatedly in an atm. of CO_2, though in the earlier report (*loc. cit.*) it was not noted. The diagonal cross section NaCl–$BaCO_3$ (I) has a eutectic at 690° with 44% $BaCO_3$ and a polymorphic transformation at 811° γ-β $BaCO_3$ (68%). The diagonal cross section Na_2CO_3–$BaCl_2$ is unstable and passes through the crystn. fields of $BaCO_3$, NaCl, and $2BaCl_2.BaCO_3$ the branches intersecting at 566, 632, and 684° with 21.5, 71, and 81% $BaCl_2$. The diagonal I divides the reciprocal system into 2 independent ternaries: NaCl–$BaCO_3$–Na_2CO_3 (*a*) and NaCl–$BaCl_2$–$BaCO_3$ (*b*). In *a* the melt solidifies in a single eutectic at 502° with the 3 components. The ternary *b* is further subdivided by the adiagonal NaCl–$2BaCl_2.BaCO_3$ into the ternaries $BaCl_2$–NaCl–$3BaCl_2$.$BaCO_3$ with a eutectic at 618° (NaCl, $BaCl_2$, and $2BaCl_2$.$BaCO_3$), and $BaCO_3$–NaCl–$2BaCl_2.BaCO_3$ with a eutectic at 623° (all 3 components). The liquidus of the system consists of 5 crystn. fields: NaCl 24.10% (of total projected area), $BaCO_3$ 42.91% (γ 20.33, β 11.62, α 4.96). Na_2CO_3 8.43%, $BaCl_2$ 8.08%, and $2BaCl_2.BaCO_3$ 5.58%. This reciprocal system is an example of one passing from a diagonal to an adiagonal orientation. I. Bencowitz

BERGMAN, A.G.; SHOLOKHOVICH, M.L.

Reciprocal system of the adiagonal-zonal eutetic type, composed of metaphosphates and sulfates of lithium and potassium. Zhur.ob.khim. 23 no.7: 1075-1085 Jl '53. (MLRA 6:7)

1. Rostovskiy Gosudarstvennyy univesitet imeni Molotova.
(Systems (Chemistry)) (Phosphates) (Sulfates)

SHOLOKHOVICH, M. L.

Complex formation and exchange decomposition in the reciprocal system of the pyrophosphates and molybdates of sodium and potassium. I. N. Belyaev and M. L. Sholokhovich (V. M. Molotov State Univ., Rostov). *Zhur. Obshchei Khim.* 23, 1265–73(1953).—A chem. compd., m. 820°, having a 1:1 compn. is formed in the binary system $Na_4P_2O_7$–$(Na_2MoO_4)_3$. The crystn. surface of the reciprocal system K, Na ‖ MoO_4, P_2O_7 consists of the fields for the solid solns. $Na_4(K_4)P_2O_7$ and $Na_3(K_3)MoO_4$ which decomp. into their components within the system, and the field of the compd. $(Na_3MoO_4)_3.Na_4P_2O_7$. The system has 2 ternary eutectics and a ternary transition point.

J. Rovtar Leach

SHOLOKHOVICH, M.L.

USSR

Reciprocal systems of an adiagonal-belt type. A. G. Bergman, A. I. Kislova, and M. L. Sholokhovich. *Doklady Akad. Nauk S.S.S.R.* 89, 1011-14(1953); cf. Bergman and Bukhalova, *C.A.* 44, 10566f.—Adiagonal-belt eutectic-type systems are those in which lines connecting the representative points of the complexes on opposite sides of the square form a eutectic system, e.g. Li, K||SO_4, PO_4 and Li, K||SO_4, WO_4. Diagrams of these systems explain all reactions between components and complexes. Reaction of any pair of components results in complex formation, e.g. $3Li_2SO_4 + 2(KPO_3)_3 \rightarrow Li_2SO_4 \cdot K_2SO_4 + (LiPO_3)_2(KPO_3)_2$.

H. W. Rathmann

Sholokhovich, M. L.

USSR/ Chemistry

Card 1/1 Pub. 151 - 4/38

Authors : Belyaev, I. N.; Sholokhovich, M. L.; and Barkova, G. V.

Title : Reaction of lead titanate with salts in fusions

Periodical : Zhur. ob. khim. 24/2, 211-215, Feb. 1954

Abstract : The results obtained during the study of the reaction between $PbTiO_3$ and salts of various monovalent metals in fusions are presented. The study was conducted at temperatures up to 1100° by means of a visual-polythermal fusibility method. The effect of increased temperature on the volatility and decomposition of $PbTiO_3$ is explained. It was established that $PbTiO_3$ in fusions with sodium and potassium fluorides, silicates, carbonates, molybdates and tungstates forms certain eutectic systems which can be used for the formation of $PbTiO_3$ monocrystals in melted media. A great analogy between the chemical properties of $PbTiO_3$ and $BiTiO_3$ was established. Seven references: 6-USSR and 1-Japanese (1950-1953). Tables; graphs.

Institution : The V. M. Molotov State University, Rostov/Don

Submitted : September 26, 1953

Sholokhovich, M.L.

USSR/Chemistry - Fusibility

Card 1/1 Pub. 151 - 6/38

Authors : Sholokhovich, M. L., and Belyaev, I. N.

Title : Reaction of barium titanate with salts in fusions

Periodical : Zhur. ob. khim. 24/2, 218-224, Feb 1954

Abstract : The results obtained during the investigation of the reaction between $BaTiO_3$ and fluorides, silicates, carbonates, pyro- and metaphosphates, metaborates, chlorides, molybdates, tungstates and other salts of alkali and certain divalent metals in melted state, are tabulated. Of twenty-six systems representing diagonal sections of ternary systems nineteen were found to be stable sections suitable for the formation of $BaTiO_3$ monocrystals in melted media. The chemical bond, which reflects all properties of elements, was used as a basis for the classification of ternary systems and theory of solubility of salts in melted media. Thirteen USSR references (1873-1953). Tables.

Institution : The V. M. Molotov State University, Rostov/Don

Submitted : March 4, 1953

SHOLOKHOVICH, M. L.

USSR/Chemistry

Card 1/1

Authors : Bergman, A. G., and Sholokhovich, M. L.

Title : Anion type complex formation between pyrophosphates and oxygen salts of the type MeO_4'' (Me = S, Mo, Cr, W) of potassium and sodium.

Periodical : Zhur. Obshchei Khim. 24, Ed. 4. 593 - 597, April 1954

Abstract : Data obtained from the study of eight binary systems and the experimental material regarding melted salts indicate numerous cases where sodium salts show a greater tendency toward complex formation in comparison with corresponding potassium salts. All tested systems in which potassium salt was present showed no complex formation. These results indicate the great difference in the chemical composition of sodium and potassium salts. Eleven references; all USSR: 7 since 1951, 4 of earlier date. Tables, graphs.

Institution : The V. M. Molotov State University, Rostov/Don, USSR

Submitted : November 17, 1953

SHOLOKHOVICH, M.L.

USSR

Formation of complexes of the anionic type between pyrophosphates and oxygen salts of potassium and sodium of the type MO_4^{--} (M = sulfur, molybdenum, chromium, or tungsten). A. G. Bergman and M. L. Sholokhovich. *J. Gen. Chem. U.S.S.R.* 24, 695–8(1954)(Engl. translation). —See *C.A.* 49, 2931*b*. H. L. H.

81

SHOLOKHOVICH, M.L.

USSR/Chemistry - Fusiblility

Card : 1/1

Authors : Sholokhovich, M. L., and Bergman, A. G.

Title : Complex formation and double decomposition in a system consisting of sodium and potassium pyrophosphates and tungstates

Periodical : Zhur. Ob. Khim., 24, Ed. 6, 936 - 946, June 1954

Abstract : Using the visual-polythermal fusibility method, the authors made a thorough investigation of the fusibility diagram for the system Na, K WO_4, P_2O_7. A fusion was established between the sodium tungstate and pyrophosphate in a ratio of 1:1 which melted with consequent decomposition at 767°. A fusion existed between the sodium and potassium tungstates in a ratio of 1:1, which melted with decomposition at 689°. The system had five ternary invariant points, one binary invariant point and one point of double descent. Three references. Tables, graphs.

Institution : State University, Rostov/Don

Submitted : January 29, 1954

SHOLOKHOVICH, M. L.

USSR/Chemistry Crystallization

Card : 1/1 Pub. 151 - 5/35

Authors : Sholokhovich, M. L., and Belyaev, I. N.

Title : Reaction between barium titanate and sodium and potassium fluorides and pyrophosphates

Periodical : Zhur. ob. khim. 24, Ed. 7, 1118 - 1123, July 1954

Abstract : The chemism (chemical affinity) of the reaction between $BaTiO_3$ and sodium and potassium fluorides and pyrophosphates (NaF, P_2O_7, KF, P_2O_7), is discussed. The crystallization surfaces of Na_4F - $Na_4P_2O_7$ - $(BaTiO_3)_2$ and K_4F_4 - $K_4P_2O_7$ - $(BaTiO_3)_2$ - systems was investigated by the visual polythermal fusibility method at 1100° and the results are presented in graphs. Three USSR references. Tables.

Institution : State University, Rostov/Don

Submitted : March 25, 1954

Sholokhovich, M.L.

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Singular irreversibly reciprocal system, with stratification, of chlorides and sulfates of lithium and thallium. A. G. Bergman and M. L. Sholokhovich (State Univ., Rostov-on-Don). *Zhur. Obshchei Khim.* 25, 461–8 (1955); *J. Gen. Chem. U.S.S.R.* 25, 423–7 (1955) (Engl. translation).—The crystn. surface of the system consists of 5 fields, LiCl, TiCl, Li_2SO_4, Tl_2SO_4, and Li_2SO_4·Tl_2SO_4, and contains 3 nonvariant points; eutectic E_1, m.p. 326°, 65% Tl_2Cl_2, 34% Li_2Cl_2, 1% Li_2SO_4, with LiCl, TiCl, and Li_2SO_4 as equil. phases; eutectic E_2, m.p. 330°, 66% Tl_2Cl_2, 3% Li_2SO_4, 31% Tl_2SO_4, with TiCl, Tl_2SO_4, Li_2SO_4·Tl_2SO_4 as equil. phases; transition point P, m.p. 338°, 68% Tl_2Cl_2, 2% Li_2SO_4, 30% Tl_2SO_4, with TiCl, Li_2SO_4, Li_2SO_4·Tl_2SO_4 as equil. phases. The diagonal section Li_2SO_4-Tl_2SO_4 is the stable section of the system. The double salt normally melting without decompn. melts with decompn. in the system. The stratification lens is located along the stable diagonal and occupies 51.7% of the area between 4 and 92.69% Li_2SO_4 on the diagonal and covers 2 crystn. fields, Li_2SO_4 and Li_2SO_4·Tl_2SO_4. The lens is asym. The ridge in crystn. area Li_2SO_4·Tl_2SO_4 becomes polysingular on lowering of temp.

V. N. Bednarski

Sholokhovich, M.L.

13584* Interaction of Lead Titanate With Sodium and Potassium Silicates. Vzaimodeistvie titanata svintsa s silikatami natriia i kaliia. (Russian.) M. L. Sholokhovich and G. V. Barkova. *Zhurnal Obshchei Khimii*, v. 25, no. 7, July 1955, p. 1255–1263.

Investigates the reactions in the ternary system Na_2SiO_3-$PbTiO_3$-K_2SiO (in fused state) for the purpose of determining the possibility of growing $PbTiO_3$ monocrystals. Tables, diagrams, graphs. 9 ref.

MT (1)

SHOLOKHOVICH, M. L.

Phase diagram of the system $Na^+-K^+-F^--TiO_3^{--}$.
M. L. Sholokhovich. *J. Gen. Chem. U.S.S.R.* 25, 1841–7 (1955) (Engl. translation).—See *C.A.* 50, 9840*f*.
B. M. R.

Sholokhovich, M. L.

J639

COMPLEX FORMATION AND INTERDECOMPOSITION IN INTERACTION SYSTEMS OF SODIUM AND POTASSIUM TITANATES AND FLUORIDES. M. L. Sholokhovich. (Rostov-on-Don State Univ.). Zhur. Obshchei Khim. 25, 1906-7(1955) Oct. (In Russian)

Metatitanates of sodium and potassium were obtained. Melting diagrams of the interaction systems Na_2TiO_3-K_2TiO_3 and Na_2TiO_3-NaF were investigated by visual-polythermal melting methods. Studies established that combinations of sodium titanates and potassium titanates in the ratio of 1:1 melt without decomposition at 906°C. Sodium titanate and sodium fluoride in the combination $3Na_2TiO_3$·2NaF melt without decomposition at 899°C. Boundaries of the crystallization zone inside the components and combinations of Na_2TiO_3·K_2TiO_3 and $3Na_2TiO_3$·2NaF were established, and four triple non-variant points, of which one had eutectic properties and three transitory ones, were found. (tr-auth)

Sholokhovich, M.L.

USSR/Chemistry - Alkali metals

Card 1/1 Pub. 22 - 24/45

Authors : Sholokhovich, M. L.; Lesnykh, D. S.; Bukhalova, G. A.; and Bergman, A. G.

Title : Stratification in fusions of mutual systems with participation of salts of first and second groups

Periodical : Dok. AN SSSR 103/2, 261-263, Jul 11, 1955

Abstract : Experiments conducted with Na, Cs, Li and other metal systems showed that one of the conditions leading to stratification during the fusion of these elements is the greater difference in the polarizability of the cations and anions of the components. The most vivid difference in the polarizability was established among ions with 8 or 2 external electron layers and ions with external electron structure consisting of 18 or 18 plus 2 electrons. The effect of fluorides on the prevention of stratification in liquid phases is explained. Nine USSR references (1929-1946). Graphs.

Institution : Rostov/Don State University im. V. M. Molotov

Presented by : Academician I. I. Chernyayev, May 13, 1955

SHOLOKHOVICH, M. L.

Interaction of the titanates and molybdates of potassium and lead in melts. I. N. BELYAEV, M. L. SHOLOKHOVICH, AND G. V. BARKOVA. *Zhur. Neorgan. Khim.*, 1 [6] 1320–34 (1956).—A visual polythermal method was used to investigate the reciprocal system $K,Pb–TiO_3.MoO_4$. The system is a quasi-stable profile of the four-component reciprocal system $PbO–K_2O–TiO_2–MoO_3$. In this system, in addition to the four salts forming strictly ternary reciprocal systems, two additional products of interaction are formed, TiO_2 and $PbO \cdot PbMoO_4$. The results of the work can be represented in the form of a regular tetrahedron in three-dimensional space. The ternary systems would be represented by phase diagrams on the faces of the tetrahedron, and the more complex systems, by diagrams on various sections through the figure. Stratification, which appears in the ternary compositions on the $K_2MoO_4–K_2TiO_3$ face of the tetrahedron, extends far into the square of the reciprocal system, covering a great part of the square of crystallization. (This square is a plane bisecting four of the six edges of the tetrahedron, on which the composition of a system $K_2MoO_4–K_2TiO_3–PbMoO_4–PbTiO_3$ can be diagramed). This circumstance supports an assertion previously reported that stratification in a ternary system may be simply an extension of stratification from more complex systems, particularly the square of crystallization corresponding to the three components of the given ternary system. The face of the tetrahedron $K_2TiO_3–PbTiO_3$ shows the compound $2K_2TiO_3 \cdot PbTiO_3$ with a melting temperature of 830°C. It is shown that K_2TiO_3 has a stabilizing influence on $PbTiO_3$, whereas, in contrast, $PbMoO_4$, $K_2MoO_4 \cdot PbMoO_4$, and K_2MoO_4 decrease the stability of $PbTiO_2$. In the presence of these salts, $PbTiO_3$ breaks down at much lower temperatures. 8 figures, 8 references.

D.T.W.

Category: USSR / Physical Chemistry
Thermodynamics. Thermochemistry. Equilibrium. Physico-chemical analysis. Phase transitions. B-8

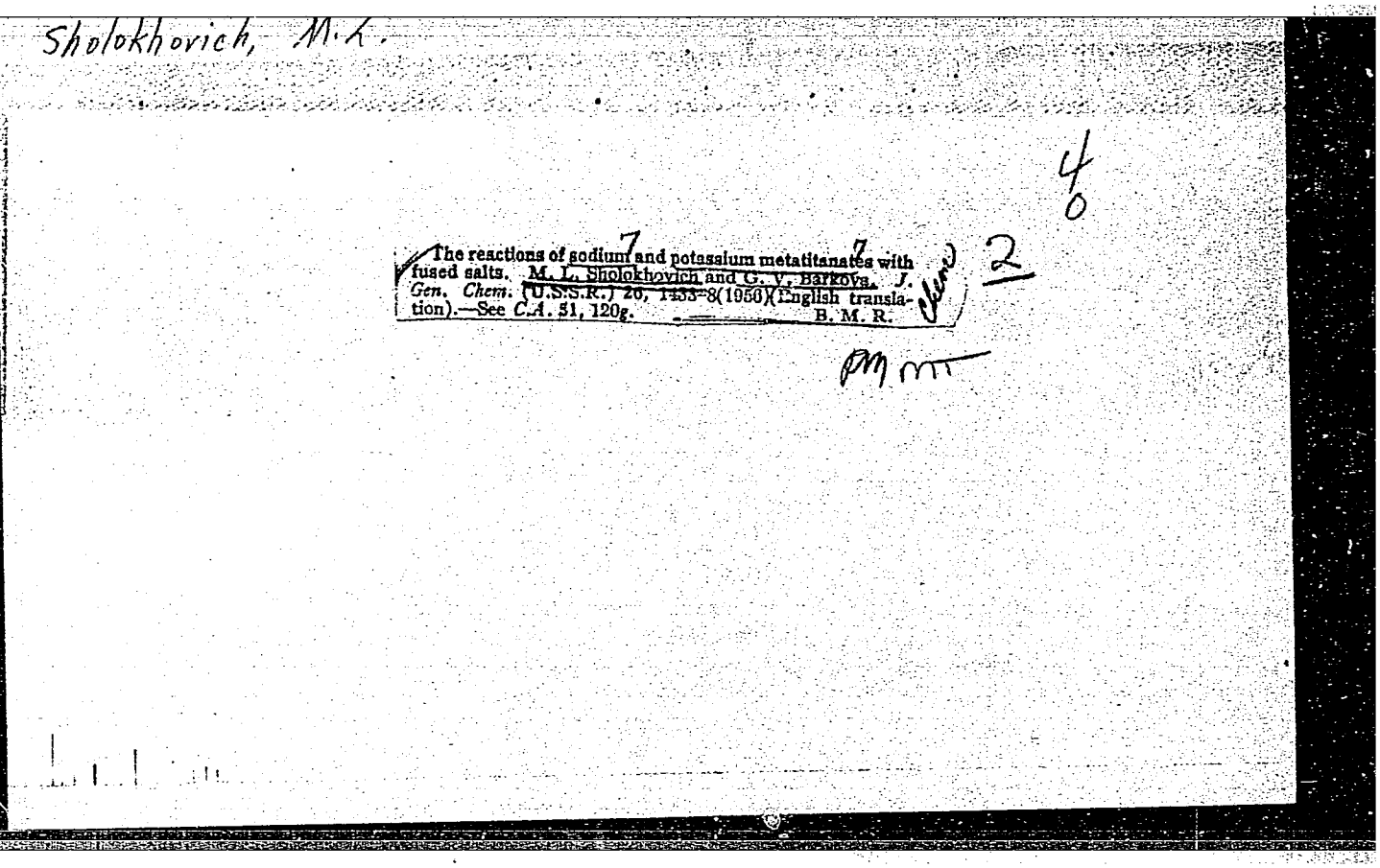
Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29941

Author : Sholokhovich M. L., Barkova G. V.
Inst : not given
Title : Interaction of Metatitanates of Sodium and Potassium with Salts in Fusions

Orig Pub: Zh. obshch. khimii, 1956, 26, No 5, 1266-1272

Abstract: In the systems, investigated by the visual-polythermal method, of Na_2TiO_3 - Na_2Cl_2, K_2TiO_3 - K_2Cl_2, Na_2TiO_3 - Na_2CrO_4, K_2TiO_3 - K_2CrO_4, K_2TiO_3 - K_2SO_4, Na_2TiO_3 - Na_2SO_4, Na_2TiO_3 - Na_2WO_4, K_2TiO_3 - K_2WO_4, Na_2TiO_3 - Na_2MoO_4, K_2TiO_3 - K_2MoO_4 stratification has been ascertained over a wide range of concentrations. In the Na-systems stratification regions are considerably wider than in the systems with K-salts. In the systems of meta-titanates and meta-vanadates of Na and K solid phase of TiO_2 separates. The authors consider these systems the in-

Card : 1/2



Sholokhovich, M. L.

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The reactions of sodium and potassium metatitanates with fused salts. M. L. Sholokhovich and G. V. Barkova. *J. Gen. Chem.* (U.S.S.R.) 20, 1433–8(1950)(English translation).—See *C.A.* 51, 120g. B. M. R.

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SHOLOKHOVICH M. L.

USSR /Physical Chemistry. Crystals. B-5

Abs Jour : Ref Zhur - Khimiya, No 8, 1957, 25081

Author : A.L. Khodakov, M.L. Sholokhovoch, Yr.G. Fesenko, O.P. Komarov
Title : Monocrystals of Strontium Titanite.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 11, 2505 - 2507

Abstract : The monocrystals of $SrTiO_3$ (I) were prepared by crystallization 1) in a solution of I in the melt of potassium fluoride and, 2) in a solution of I in the melt of a mixture of 60 mol. % of Na_2CO_3 + 40 mol. % of K_2CO_3. Crystals prepared by the 1st method are quite transparent, of light yellow color and are confined within faces {100}, the edges being 1 mm long; the structure is that of perovskite with ideal cu-cells; the refraction index is 2.35, the x-ray density is 5.12, the picknometer density is about 5.0. Crystals prepared by the 2nd method are less transparent of a smoky color, the prevailing faces are {100} and {111}, and they contain up to 0.7% of Fe; their x-ray density is 5.14. The dielectric properties of both these kinds are somewhat different.

Card : 1/1

SHOLOKHOVICH, M.L.

PA - 1221

CARD 1/1 PA - 1221

SUBJECT USSR / PHYSICS
AUTHOR CHODAKOV, A.L., ŠOLOCHOVIČ, M.L., FESENKO, E.G., KRAMAROV, O.P.
TITLE The Production and the Dielectric and Optical Properties of the Monocrystals of Solid Solutions of Barium Titanate and Strontium Titanate.
PERIODICAL Dokl. Akad. Nauk, 108, 825-828 (1956)
. Publ. 6 / 1956 reviewed 8 / 1956

The monocrystals were bred in platinum bowls from solutions of the mixtures of barium- and strontium titanate in potassium fluoride by evaporation of the latter at the crystallization temperature of the solid solutions and by subsequent slow cooling down to the temperature of complete solidifications. As a basis for this method there served the crystallization surface of the system K_2F_2 - $SrTiO_3$ - $BaTiO_3$, which was examined up to 1100° by the visual-polythermal method. The continuous series of the solid solutions produced in the system $BaTiO_3$ - $SrTiO_3$ at 1350° is conserved up to room temperature and is retained without change also when dissolved in potassium fluoride. Therefore the surface of crystallization of the system K_2F_2 - $BaTiO_3$ consists only of two phases, i.e. of potassium fluoride, which occupies a very small part of the crystallization surface of the system, and of the solid solutions $(Ba-Sr)TiO_3$, which take up the remaining part of the system. The crystals are light yellow to cinnamon colored and up to 1,5 mm in size.

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Sholokhovich M.L.

546.523 : 537.226.2

4857. PREPARATION AND PROPERTIES OF SINGLE CRYSTALS OF SOLID SOLUTIONS OF BARIUM AND LEAD TITANATES AND OF SINGLE CRYSTALS OF LEAD TITANATE. M.L.Sholokhovich, E.G.Fesenko, O.P.Kramarov and A.L.Khodakov. Dokl. Akad. Nauk SSSR, Vol. 111, No. 5, 1025-8 (1956). In Russian.

Melting isotherms in the $KF-BaTiO_3-PbTiO_3$ system were determined up to ~950°C and conditions for growing titanate crystals studied. The largest obtained were brown-coloured irregular cubes of up to 1 mm edge. Some of the smaller crystals produced were bright yellow and well formed. Loss of PbO and $PbTiO_3$ by volatilization was troublesome and a viscous flux $Pb(BO_2)_2$ was tried so as to reduce it. Melting curves for this with $PbTiO_3$ and $PbTiO_3$.PbO both showed minima near 90 mol.% $Pb(BO_2)_2$ and 640°C. Well formed bright yellow $PbTiO_3$ crystals, 1-2 mm cubes, density 7.3 g/cm³, refractive index 2.71, were grown. The Curie point of a crystal grown from a KF-fluxed 50% $BaTiO_3$, 50% $PbTiO_3$ melt was 190°C, which by comparison with polycrystalline specimens suggested a $PbTiO_3$ content of 18.5%. This difference in composition of initial melt and crystal was ascribed to loss by volatilization. At 25°C dielectric constant was 380. Structure at 20°C was perovskite type with a = 3.905 c = 4.037 A.

C.H.L.Goodman

S/564/57/000/000/022/029
D258/D307

AUTHORS: Khodakov, A. L., Sholokhovich, M. L., Fesenko, Ye. G., and Kramarov, O. P.

TITLE: Preparation and dielectric and optical properties of single crystals of the solid solutions (Ba-Sr) TiO_3

SOURCE: Rost kristallov; doklady na Pervom soveshchanii po rostu kristallov, 1956 g. Moscow, Izd-vo AN SSSR, 1957, 294-304

TEXT: Monocrystals of $BaTiO_3$, $SrTiO_3$ and (Ba-Sr)TiO_3 (from 95 to 50% $BaTiO_3$) were grown from K_2F_2 melts, in view of the theoretical and practical interest of these seignetto-electric materials. This method is based on the study of the K_2F_2 - $BaTiO_3$ - $SrTiO_3$ system, studied by the authors up to

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Preparation and...

1100°C, which showed that this system contains a continuous series of solid solutions $(Ba-Sr)TiO_3$. Measurements of dielectric permeability and the loss angle at temperatures from -180° to +150°C showed that the dielectric properties of $(Ba-Sr)TiO_3$ crystals change considerably with temperature, similarly to $BaTiO_3$; furthermore, prior to thermal treatment, the monocrystals exhibited only weak seignettoelectric properties but became typical seignettoelectrics after heating at 1350°C. X-ray and optical examination showed the solid solution crystals to be almost ideally cubic, anisotropic, and those not subjected to heat treatment contained domains at temperatures considerably above which the dielectric permeability reached a maximum. The domain structure disappeared at higher temperatures. There are 9 figures and 4 tables.

ASSOCIATION: NIFMI pri Rostovskom n/D Gosudarstvennom universitete (NIFMI, Rostov-on-Don State University)

Sholokhovich, M.L.

48-3-1/26

SUBJECT: USSR/Luminescence

AUTHORS: Novosil'tsev, N.S., Khodakov, A.L., Sholokhovich, M.L., Fesenko, Ye.G. and Kramarov, O.P.

TITLE: The Cultivation and Investigation of Ferroelectric Monocrystals (Vyrashchivaniye i issledovaniye monokristallov segneto-elektrikov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya fizicheskaya, 1957, Vol 21, #3, pp 295-304 (USSR)

ABSTRACT: The Scientific Research Physico-Mathematical Institute at the ROSTOV/DON State University has studied the interaction of barium titanate, strontium titanate, lead titanate and lead zirconate with a series of substances in the molten state. A number of suitable salty solvents for the above mentioned substances and crystallization conditions have been established.

Several methods for cultivating crystals of barium and strontium titanates and zirconates were applied:

a. Monocrystals of $BaTiO_3$ and $SrTiO_3$ were obtained out of a molten mixture of sodium and potassium carbonates and polycrystallic barium and strontium titanates. These monocrystals

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48-3-1/26

TITLE: The Cultivation and Investigation of Ferroelectric Monocrystals (Vyrashchivaniye i issledovaniye monokristallov segnetoelektrikov)

Thus $BaTiO_3$ crystallization out of molten salts yielded various modifications of crystals with anomalous ferroelectric properties. By varying temperature conditions, it was possible to grow crystals with different values of the c/a ratio, including non-ferroelectric crystals.

It was later discovered that these crystals can be carried through the whole series of states by means of thermal treatment.

Monocrystals of $SrTiO_3$ were obtained by two methods:

1. Out of a molten mixture of polycrystallic $SrTiO_3$ with potassium fluoride, and
2. Out of a molten mixture of polycrystallic $SrTiO_3$ with 50 % of sodium carbonate + 50 % of potassium carbonate.

The monocrystals obtained by these two methods differed in their dielectric properties.

Monocrystals of solid solutions of the $(Ba,Sr)TiO_3$ type were obtained out of corresponding mixtures of barium and strontium titanates and molten potassium fluoride. Dielectric

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Sholokhovich, M.L.

48-3-2/26

SUBJECT: USSR/Luminescence

AUTHORS: Fesenko Ye.G., Kramarov O.P., Khodakov A.L. and Sholokhovich M.L.

TITLE: Some Peculiarities of Monocrystals of $PbTiO_3$ and Monocrystals of Solid Solutions $(Ba,Pb)TiO_3$ (Nekotoryye osobennosti monokristallov $PbTiO_3$ i monokristallov tverdykh rastvorov $(Ba,Pb)TiO_3$).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya fizicheskaya, 1957, Vol 21, #3, pp 305-310 (USSR)

ABSTRACT: The authors obtained various monocrystals of solid solutions of the $(Ba,Pb)TiO_3$ type containing different ratios of components. Monocrystals of $PbTiO_3$ were obtained out of a molten mixture of sodium silicates and lead metaborate.
All crystals belonged to the perovskite structural type with tetragonal cells. Spontaneous deformation increased with the increase of the lead content. The temperature course of the parameters of $PbTiO_3$ and $(Ba,Pb)TiO_3$ is evidence of the presence of the phase transition of the first kind.
The presence of domain structure was established for crystals

Cart 1/2

SHOLOKHOVICH, M.L.

USSR/Electricity - Semiconductors G-3

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12144

Author : Khodakov, A.L., Sholokhovich, M.L., Fesenko Ye.G., Kramarov, O.P.

Inst :

Title : Production of Single Crystals of Solid Solutions of Barium and Strontium Titanate, and Their Dielectric and Optical Properties.

Orig Pub : Dokl. AN SSSR, 1956, 108, No 5, 825-823

Abstract : Report on the production and investigation of single crystals of solid solutions of barium and strontium titanates. The single crystals were grown from solutions of mixtures of barium and strontium titanate in potassium fluoride by evaporating the latter at the crystallization temperature of the solid solution with subsequent slow cooling to the temperature of total solidification.

A study was made of the structure of the single

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USSR/Electricity - Semiconductors G-3

Abs Jour : Ref Zhur - Fizika, No 5, 1957, 12144

crystals, and of their optical and electrical properties. After heat treating at a temperature of 1350° for two hours, the single crystals with various contents of barium titanate and strontium titanate displayed the following ferroelectric properties: the characteristic dependence (with maximum) of the dielectric constant (ε) on the temperature, and the nonlinear dependence of the polarization on the electric field intensity. Using a polarization microscope, the regions of spontaneous polarization were observed. The maxima of ε were observed at the same temperatures, as in polycrystalline specimens of the corresponding solid solutions. At low frequencies (50 -- 10^6 cycles), a frequency dependence of ε was observed, but it vanished after heat treatment.

On the basis of the electric, optical, and X-ray data, it is concluded that the investigated specimens represent single crystals of a continuous series of solid solutions.

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Production of Mono-Crystals of Lead Metatitanate From $PbO-B_2O_3-TiO_2$-Melt 78-3-5-27/39

melts [50% PbO + 50% B_2O_3] - [20% $PbTiO_3$] - [50% PbO + + 50% B_2O_3] - 40% [75% PbO + 25% TiO_2]

The easy solubility of $PbTiO_3$ in the melt of $PbO \cdot B_2O_3$, the ready crystallizability at relatively low temperature, and the transparency of the crystals, as well as the relatively low electric conductivity of $PbTiO_3$, allow one to recommend this manner of production from the $PbO-B_2O_3-TiO_2$ system.

There are 5 figures, 2 tables, and 10 references, 8 of which are Soviet.

SUBMITTED: May 3, 1957

AVAILABLE: Library of Congress

1. Single crystals--Preparation 2. Single crystals--X-ray analysis 3. Lead metatitanate crystals--Production

Card 2/2

24(3),24(2)
AUTHORS: Khodakov, A. L., Sholokhovich, M. L. SOV/48-22-12-8/33

TITLE: Preparation and Dielectric Properties of Single Crystals From Some Solid Solutions of Titanate and Stannate of Barium (Polucheniye i dielektricheskiye svoystva monokristallov nekotorykh tverdykh rastvorov titanata i stannata bariya)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 12, pp 1445-1448 (USSR)

ABSTRACT: In preparatory works (Refs 7-9) the authors obtained single crystals of solid $(Ba-Sr)TiO_3$- and $(Ba-Pb)TiO_3$- solutions. The first attempts, however, to obtain single crystals of $BaTiO_3$-$BaSnO_3$ proved to be considerably more difficult.

A solution of potassium fluoride was used as a solvent to obtain single crystals of isomorphous $BaTiO_3$-$BaSnO_3$ mixtures. This was done by basing on the surface investigation of the crystallization cross section of K_2F_2-$BaTiO_3$-$BaSnO_3$, because a continuous formation of a number of solid $BaTiO_3$-$BaSnO_3$-solutions was ascertained in this process. Figure 1 shows a few crystallization curves. The existence of a phase of isomorphous $BaTiO_3$-$BaSnO_3$-

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mixtures in a frozen melt was also confirmed by Ye. G. Fesenko with the aid of X-ray structural analysis. Two series of experiments were carried out: in the first one, mixtures of $BaTiO_3$ and SnO_3 of different concentrations and previously annealed at 1200°, were employed as initial material. In the second series of experiments, previously prepared polycrystalline solid $BaTiO_3$-$BaSnO_3$-solutions of corresponding concentration were employed. Data on crystals prepared are given in table 1. Crystal composition data concerning a second series of experiments show how difficult the exchange of TiO_2 by SnO_2 and the formation of solid $BaTiO_3$-$BaSnO_3$-solutions is. A thorough investigation of the reaction of $BaTiO_3$ + SnO_2 is carried out. At any rate, results obtained so far show that in the preparation of single crystals of a continuous series of solid $BaTiO_3$-$BaSnO_3$-solutions, the $BaSnO_3$-content of which exceeds 10-11%, an amount of $BaCO_3$ being stoichiometric as to SnO_2 should be added to the

Preparation and Dielectric Properties of Single Crystals From Some Solid Solutions of Titanate and Stannate of Barium

SOV/48-22-12-8/33

$BaTiO_3$+SnO_2-mixtures. The dielectric properties of the crystals obtained were measured at the Q-meter (kumetr) at f = 10^6 cycles, at the IYeN-2 bridge at 10^3 cycles and at the unbalanced bridge at 50 cycles. The reversible dielectric constant was measured at f = 10^6 cycles and a 25 V cm^{-1} voltage of the alternating field. Oscillograms were recorded in the usual manner. Dielectric parameters of the second experimental series, containing up to 11% $BaSnO_3$, were not investigated. Their small extents cause additional difficulties. The authors thank N. S. Norosil'tsev for the interest displayed. There are 4 figures, 2 tables, and 10 references, 9 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-matematicheskiy institut pri Rostovskom-na-Donu gos. universitete (Scientific Research Institute of Physics and Mathematics at Rostov-na-Donu State University)

Card 3/3

24(2)
AUTHORS: Sholokhovich, M. L., Vanicheva, V.I. SOV/48-22-12-9/33

TITLE: Investigation of the PbO - BaO - B_2O_3 - TiO_2 System (Issledovaniye sistemy PbO - BaO - B_2O_3 - TiO_2)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 12, pp 1449-1452 (USSR)

ABSTRACT: In the present paper the interaction of lead- and barium borates with lead- and barium titanates is investigated. The authors wanted to explain the effect of these borates on the stability of solid barium titanate and lead titanate solutions and to ascertain the possibility of obtaining them in the form of single crystals from the respective melt. The PbO - TiO_2 - B_2O_3 - BaO system in a melt is a complicated 4-component system and can be represented graphically as a tetrahedron. Data are given concerning the surface of the crystallization cross section [50% PbO + 50% B_2O_3] - $PbTiO_3$ - $Ba(BO_2)_2$ - $BaTiO_3$ of this tetrahedron. The investigation was carried out in a platinum crucible, by employing the optical "polythermal" method.

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Investigation of the PbO - BaO - B_2O_3 - TiO_2 System SOV/48-22-12-9/33

The cross section sides and 24 internal sections were investigated. The arrangement of the sections is shown in figure 1 and the data on the sections and side faces in figures 2-4. Figure 5 shows the dielectric constant course of temperature and also the composition of the melt employed for the preparation of (Ba-Pb)TiO_3 . Table 2 contains data on crystals. The formation of crystals was confirmed for each single case by Ye. G. Fesenko by means of X-ray structural analysis. The crystals obtained have a perfect shape. The crystals from all the experiments were investigated after annealing for 2 hours at 1200°. Measurements were made at the Q-meter (kummetr) at a frequency of 10^6 cycles. The authors thank N. S. Novosil'tsev for the interest displayed. There are 5 figures, 2 tables, and 6 references, 4 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-matematicheskiy institut pri Rostovskom-na-Donu gos. universitete (Scientific Physico-Mathematical Research Institute at Rostov-na-Donu State University)

Card 2/2

SOV/70-4-1-18/26

AUTHORS: Novosil'tsev, N.S. (Deceased), Khodakov, A.K., Sholokhovich, M.L., Fesenko, Ye.G. and Kramarov, O.P.

TITLE: Experimental Work on Growing Single Crystals of Ferroelectrics (Opyt raboty po vyrashchivaniyu monokristallov segnetoelektrikov)

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 1, pp 101 - 108 (USSR)

ABSTRACT: General review of work on (Ba, Pb)(Ti, Zr)O_3 ferroelectrics. There is a considerable difference between the observed and calculated densities of perovskite ceramics indicating disordered regions between domains. Colour and electrical conductivity are also variable. Attempts were made to grow $SrTiO_3$ by the Verneuil process but complications due to the formation of the hexagonal phase occurred and lowered permittivity. Growth from the melt has also been tried using an arc furnace but difficulties with oxygen deficiency and the metastable hexagonal phase again arose. Remejka (Ref 46) reported that the presence of iron oxide hindered the formation of oxygen defects but only 1.5% ferrate in $BaTiO_3$ gave

Card1/3

Experimental Work on Growing Single Crystals of Ferroelectrics

a hexagonal structure. In 1956, zone refining was tried very successfully, crystals greater than 1 cm being obtained but attention has turned to the use of crystals with artificially introduced disordering. It was found in 1951-2 that appropriate thermal treatment could restore $BaTiO_3$ with poor permittivity curves to the proper state and the composition to the equilibrium value. In 1953, it was found that foreign atoms could alter the temperature variation of physical properties and solid solutions of $BaTiO_3$-$BaSnO_3$-$BaZrO_3$ were studied. Because of applications to memory devices, the interest in single crystals and their electrical properties increased. Melts of KF were used for obtaining crystals of $(Ba,Pb)TiO_3$ and $(Sr,Ba)TiO_3$. Dielectric properties have been measured at from 50 to 10^6 c/s, including recording of the hysteresis loop under various conditions. Linear expansion

coefficients have been measured as has the dependence of Curie point on composition. A volume jump at the Curie point can be shown dilatometrically. X-ray measurements for $(Ba_{0.5}, Pb_{0.5})TiO_3$ single crystals gave $a = 3.965$, $c = 4.037$ Å and $c/n = 1.018$ at 20 °C. Twinning has been studied optically and supercooling at the transition through the Curie point has been shown. Cinematographic records of jump-like transitions (at about 500 °C) taking 0.1 to 0.4 sec at a rate of heating of 2-4 °/min have been made. The changes in domain structure in electric fields have been followed. There are 3 figures and 48 references, 44 of which are Soviet, 2 English, 1 Dutch and 1 international.

ASSOCIATION: Rostovskiy-na-Donu gos. universitet (Rostov-na-Donu State University)

SUBMITTED: December 7, 1958

85007

9.2180

S/048/60/024/010/016/033
B013/B063

AUTHORS: Khodakov, A. L., and Sholokhovich, M. L.

TITLE: Monocrystals of Solid $BaTiO_3$-$BaSnO_3$ Solutions

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 10, pp. 1238 - 1241

TEXT: Experiments conducted for obtaining monocrystals of solid $BaTiO_3$-$BaSnO_3$ solutions from different molten media are described. It was found to be possible to obtain the said monocrystals with a high $BaSnO_3$ content from KF-$BaTiO_3$-$BaSnO_3$ melts. These monocrystals are easier to produce when nonannealed $BaCO_3$ and SnO_2 are used. The authors succeeded in obtaining monocrystals of solid $BaTiO_3$-$BaSnO_3$ solutions with a $BaSnO_3$ content of up to 13%. Experiments were made with the addition of Fe_2O_3 in order to obtain lamellar crystals. It was found that

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Monocrystals of Solid $BaTiO_3$-$BaSnO_3$ Solutions

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B013/B063

the formation of lamellar crystals is dependent on the cooling conditions and concentration of the melts, but is not dependent on the presence of Fe_2O_3 impurities in the solution. Every set exhibits different values of the dielectric parameters, which can be explained by different crystal growth conditions. The characteristics shown in Figs. 1-3 are, however, typical. As may be seen from Fig.1, the dependence of the dielectric constant of $BaTiO_3$-$BaSnO_3$ on the field strength of the alternating field is much more marked than is the case with $BaTiO_3$ crystals. Also the dependence of the reverse dielectric constant on the magnitude of the constant displacement field is more marked in them than it is in $BaTiO_3$ crystals. For the practical use of piezoelectric materials, an important factor is the change of their capacity with a change of the alternating voltage and simultaneous effect of the displacing constant field. These dependences are given in Fig.2. The hysteresis loops exhibit an ordinary form. At the Curie point they pass over to a straight line. Fig.3 shows the values of the reverse dielectric constant at different points of the hysteresis loops for crystals

L 10042-63 EWT(1)/EPF(n)-2/EWP(q)/EWT(m)/BDS/T-2/EEC(b)-2/ES(s)-2--ASD/AFFTC/ESD-3/SSD--Pu-4/Pt-4--IJP(C)/GG/WH
ACCESSION NR: AR3000363 S/0058/63/000/004/E054/E054

80
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SOURCE: RZh. Fizika, Abs. 4E368

AUTHOR: Sholokhovich, M. L.; Khodakov, A. L.; Lezgintseva, T. N.; Varicheva, V. I.

TITLE: New ferroelectrics with large nonlinearity

CITED SOURCE: Sb. Segnetoelektriki. Rostov-na-Donu, Rostovsk. un-t, 1961, 12-20

TOPIC TAGS: Ferroelectrics, haffnium-doped, dielectric properties, production techniques

TRANSLATION: The dielectric characteristics and the electric conductivity Sigma of solid solutions of Ba (Ti, Hf) O sub 3, containing up to 25 molar percent of Ba Hf O sub 3 have been investigated. The ceramic specimens were prepared in accordance with the usual technology, using triple annealing at 100, 1450, and 1500 degrees C, with the duration of the annealing at 1000 C amounting to 20

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hours, but even under these conditions the specimens which contained more than 5% of Ba Hf O sub 3 were quite porous. Measurements made on single crystals obtained in the form of plates 80 - 500 microns thick from a melt of Ba Ti O sub 3, Ba C O sub 3, and Hf O sub 2 in KF have shown that the Curie temperature decreces lineally with increasing content of Ba Hf O sub 3. The maximum value of Epsilon is observed for a composition containing 6 molar percent of Ba Hf O sub 3. At room temperature, tg Delta of single crystals of the investigative materials ranges from 003 to 0.07. The ratio of Epsilon at the Curie point to Epsilon at room temperature reaches 20-30. No such increase in Epsilon is observed in the ceramic specimens. Small amounts of Ba Hf O sub 3 influence noticeably the nomenial properties of the solid solutions. At a frequency of 50 cps, Epsilon increases with increasing field by more than 200 times, and it may reach 100,000 at a field E equals 0.6 kv/cm, with the increase of Epsilon being accompanied by an increase of tg Delta, which goes through a maximum at approximately 1 kv/cm with increasing E, after which it decreases and reached 0.2. In the region of weak fields, the coefficient of reversible nomeniality of the single crystals of Ba (Ti Hf) O sub 3 is much higher than in solid solutions Ba (Ti Sn) O sub 3. The hysteresis loops of these single crystals are rectangular and reach saturation even at fields of 5 kv/cm. An anomaly is observed in the temperature variation of Sigma for most crystals near the Curie

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85008

9,2180

S/048/60/024/010/017/033
B013/B063

AUTHORS: Sholokhovich, M. L. and Fesenko, Ye. G.

TITLE: Preparation and Structure of Crystals of Some Lead-containing Ferroelectric Substances and Their Solid Solutions

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 10, pp. 1242 - 1246

TEXT: The authors describe their attempt to obtain monocrystals of solid solutions of $PbTiO_3$-$PbZrO_3$, of $PbNb_2O_6$ crystals, and of solid solutions of $PbTiO_3$-$PbNb_2O_6$ from their solutions in PbO-B_2O_3 melts. The authors applied the method described in Refs. 1-4. Fig.1 shows the crystallization surface of the section $[50PbO + 50\ B_2O_3]$-$PbTiO_3$-$PbZrO_3$ which was studied up to 1000°C. From some melts of the section examined the authors obtained monocrystals of solid solutions of $Pb(Ti,Zr)O_3$ with a $PbZrO_3$ content of up to 13.9%. The shape of the gold-yellow,

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transparent crystals differed according to the conditions of crystallization, and exhibited, above all, hexahedral plates and cubes. X-ray structural analyses showed that they belong to the perovskite type with a tetragonal cell. Type of structure, symmetry, and parameters were determined by means of powder patterns. The dependence of the parameters on the concentration is illustrated in Fig.2. These data agree with those obtained for the corresponding polycrystalline solid solutions (Ref.5). The refractive index determined by immersion amounts to 2.72 for all crystals examined. The Curie points were found with the help of a polarization microscope. It was found that monocrystals of lead metaniobate may be obtained from its solutions in $PbO-B_2O_3$ melts. Fig.3 shows the surface of the primary crystallization of the system $PbO-B_2O_3-Nb_2O_5$, which was studied up to 1100°C. When the melts finally solidify, only lead metaniobate and lead borate glasses crystallize. The crystals obtained showed piezoelectric properties only after a heat treatment of three and a half hours at 1300°C. Their dielectric properties were studied by A. L. Khodakov (Fig.4). Fig.5 shows the fusibility

Preparation and Structure of Crystals of Some Lead-containing Ferroelectric Substances and Their Solid Solutions

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diagram of the system $[50\%\ PbO + 50\%\ B_2O_3]$-$PbNb_2O_6$-$PbTiO_3$, which was studied up to 1000°C. The X-ray structural analysis of the crystals that were subjected to a heat treatment at 1300°C has shown that within a wide concentration range (from $PbNb_2O_6$ to 90% $PbTiO_3$ and above) there is a continuous series of solid solutions which do not belong to the perovskite type. Heat treatment changes the structure of the crystals. It is assumed that there is a transition from rhombohedral $PbNb_2O_6$ to the modification described in Refs. 8 and 9, namely, rhombic $PbNb_2O_6$. The measurement of crystals that did not undergo a heat treatment showed a monotonic change of the parameters of rhombohedral $PbNb_2O_6$ with an increase of concentration of $PbTiO_3$. The authors thank A. L. Khodakov for his interest in the work. The present paper was read at the Third Conference on Piezoelectricity, which took place in Moscow from January 25 to 30, 1960. There are 5 figures and 9 references: 4 Soviet.

85008

Preparation and Structure of Crystals of Some Lead-containing Ferroelectric Substances and Their Solid Solutions

S/048/60/024/010/017/033
B013/B063

ASSOCIATION: Fiziko-matematicheskiy nauchno-issledovatel'skiy institut pri Rostovskom-na-Donu gos.universitete (Scientific Research Institute of Physics and Mathematics of Rostov-na-Donu State University).

Card 4/4

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S/196/62/000/008/005/017
E114/E135

AUTHORS: Sholokhovich, M.L., and Khodakov, A.L.

TITLE: Production and properties of single crystals of the solid solutions $BaTiO_3$ and $BaSnO_3$ and of single crystals of $PbTiO_3$

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no.8, 1962, 6, abstract 8 B29. (Rost. kristallov (Growth of Crystals), v.3, M., AN SSSR, 1961, 463-467. Discussion, 501-502).

TEXT: By investigating a part of the crystallisation surface of the system K_2F_2-$BaTiO_3$-$BaSnO_3$ and of the evolved solid phases, a possibility was established of obtaining $BaTiO_3$-$BaSnO_3$ single crystals from KF melts. The dielectric characteristics of the crystals were measured and it was established that their ferro-electric properties were more pronounced than those of corresponding ceramic compounds. They have a greater degree of non-linearity; ε grows faster with θ. Thin single crystals in the shape of square plates of

Card 1/2

9,4300 (3005, 1150, 1136, 1154, 1145)

S/139/61/000/002/010/018
E021/E435

AUTHORS: Khodakov, A.L. and Sholokhovich, M.L.

TITLE: Preparation and Dielectric Properties of Single Crystals of Solid Solutions of Lead Metaniobate $Pb(TiO_3-ZrO_3)$ and Crystals of Solid Solutions of Lead Metaniobate and Lead Titanate

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1961, No.2, pp.85-91

TEXT: Melts of the $PbO-B_2O_3$ system were used as solvents for preparation of the crystals. Molar quantities of PbO and B_2O_3 were taken, and mixtures of PbO, TiO_2 and ZrO_2 of given concentrations added. Single crystals of solid solutions of $PbTiO_3$ and $PbZrO_3$ were grown in this way containing 1.4, 1.7, 3.2, 5.4, 7.0 and 13.9% $PbZrO_3$. The composition was determined by X-ray spectrographic analysis. The crystals were gold-yellow in colour and were 6-sided platelets, cubes or intermediate forms. The size was up to 4 mm. The colour darkened with increase of $PbZrO_3$. A 24% mixture of 50% PbO and 50% Nb_2O_5 was added to the $PbO-B_2O_3$ melt, heated to 1100°C, held for 7 hours and cooled to 500°C at 20°C/hour. The furnace was then switched off.

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E021/E435

Preparation and Dielectric ...

Crystals of $PbNb_2O_6$ were obtained which were light yellow in colour. They were transparent 6-sided or right-angled platelets. Various forms were obtained and a photograph shows some of these forms. Single crystals of solid solutions of $PbTiO_3$ and $PbNb_2O_6$ containing 25, 50, 75 and 90% $PbTiO_3$ were prepared by heating $PbTiO_3$ and $PbNb_2O_6$ in PbO and B_2O_3 to 1000°C, holding for 3 to 7 hours and cooling to 600°C at 20°C/hour. The crystals had a transparent orange colour and were 3-sided plates of 3 mm. The solidification surface for the $PbTiO_3$-$PbNb_2O_5$-(50% PbO + 50% B_2O_3) system is given in Fig.2. Measurements of the dielectric constant and the loss factor were made on the solid solutions. Fig.4 shows the relation between ε and tg δ and temperature (at 10^6 c.p.s.) for the solid solution containing 3.2% $PbZrO_3$. The small addition of $PbZrO_3$ has no effect on the dielectric properties and the crystals possess large tg δ values. The curie point for different contents of $PbZrO_3$ was as follows:

% $PbZrO_3$	Θ °C
0	490
0.9	489
1.5	487
2.0	485
3.2	483

Fig.5 shows the relationship between electrical conductivity and temperature for the solid solution containing 3.2% $PbZrO_3$. The conductivity sharply increases with temperature, the crystal behaving as a semiconductor. The following conclusions are arrived at. 1. In using melts of the B_2O_3-PbO system as solvents, single crystals of the solid solutions $Pb(TiO_3$-$ZrO_3)$ containing up to 1.39% $PbZrO_3$ were obtained for the first time. 2. Single crystals of $PbNb_2O_6$ were obtained with side lengths of up to 5 mm. 3. For the first time single crystals of the solid solutions $PbTiO_3$-$PbNb_2O_6$ containing 25, 50, 75 and

Preparation and Dielectric ...

90% $PbTiO_3$ were obtained. 4. The dielectric properties were studied of single crystals of $Pb(Ti-Zr)O_3$ and it was established that slight additions of $PbZrO_3$ do not have any influence on the dielectric properties, as can be seen from Fig.4, and the crystals have high tg δ values. 5. The electric conductivity of $Pb(Ti-Zr)O_3$ crystals increases strongly with increasing temperature they have a semiconductor behaviour. 6. The dielectric properties of $PbNb_2O_6$ single crystals were studied and it was found that appropriate heat treatment transformed these into the ferroelectric modification. There are 6 figures, 2 tables and 10 references: 4 Soviet and 6 non-Soviet.

ASSOCIATION: Rostovskiy-na-Donu gosuniversitet
(Rostov-on-Don State University)

SUBMITTED: May 3, 1960

Card 4/6

Preparation and Dielectric ...

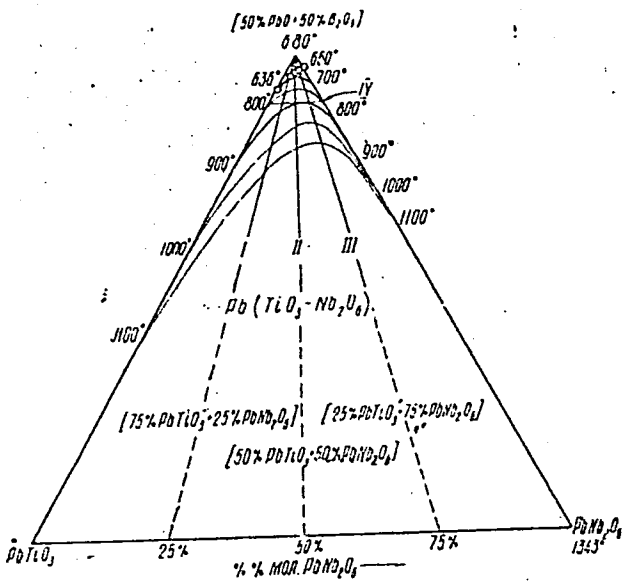

Fig.2.

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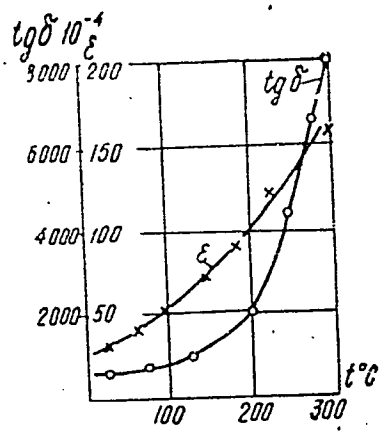

Fig.4.

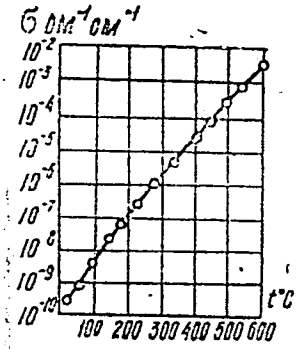

Fig.5.

24.7800(1043,1145,1153)
15.2450

30551
S/564/61/003/000/027/029
D207/D304

AUTHORS: Sholokhovich, M. L., and Khodakov, A. L.

TITLE: Preparation and properties of $BaTiO_3$ - $BaSnO_3$ solid-solution monocrystals and of $PbTiO_3$ monocrystals

SOURCE: Akademiya nauk SSSR. Institut kristallografii. Rost kristallov, v. 3, 1961, 463-467

TEXT: The authors describe the preparation of thin monocrystalline plates of $BaTiO_3$ - $BaSnO_3$ solid solutions and of $PbTiO_3$ by cooling suitable melts. Ferroelectric properties (nonlinearity, rapid rise of permittivity at the Curie point, strong temperature dependence of permittivity) were much more marked in monocrystals than in ceramic $BaTiO_3$ - $BaSnO_3$ solid solutions. Two other series of experiments were carried out using charges consisting, apart from K_2F_2, of $BaTiO_3$ + SnO_2

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30551

S/564/61/003/000/027/029
D207/D304

Preparation and properties...

mixture (fired first at 1200°C) or of $BaCO_3 + TiO_2 + SnO_2$ mixture (fired first at 1200°C). These two series of experiments were not successful in producing monocrystalline plates. $PbTiO_3$ plates were grown from a mixture containing: 2 parts PbO + 2 parts TiO_2 + 1 part $PbTiO_3$.

The best thermal cycle for preparing plate-shaped monocrystals was: heating for 5 hours until 960°C was reached; keeping at 950°C for 20 hours; cooling to 600°C at 15 - 20 deg/hour. Monocrystals were separated out by washing in nitric acid. They were six-sided or square plates (3 - 4 mm sides and 100 μ thickness) and many of them were of the mono-domain type. They were light yellow, transparent and had a refractive index of 2.71 . Their crystal structure was tetragonal perovskite. The room temperature permittivity (ε = 80) of plates was lower than that of $PbTiO_3$ ceramics or cubic monocrystals; this was probably due to predominance of c-domains since permittivity is low along the c-axis. At room temperature the tg δ of plates was 0.055 (compared with tg δ = = 0.300 for cubic monocrystals) and the losses rose more slowly with

Card 2/3

Preparation and properties...

temperature than in monocrystalline cubes. There are 4 figures and 9 Soviet-bloc references.

X

Card 3/3

21340

54110 1136 1145 1160

S/078/61/006/004/014/018
B107/B218

AUTHORS: Sholokhovich, M. L., Varicheva, V. I.

TITLE: The reaction in the system PbO - Nb_2O_5 - B_2O_3 and in the cut (50% PbO + 50% B_2O_3) - $PbNb_2O_6$ - $PbTiO_3$

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 4, 1961, 944-947

TEXT: The melting processes in the system PbO - Nb_2O_5 - B_2O_3 were studied up to about 20 mole% of Nb_2O_5 (Fig. 2); besides, the authors investigated the cut (50% PbO + 50% B_2O_3) - $PbNb_2O_6$ - $PbTiO_3$ in the corner (50% PbO + 50% B_2O_3) (Fig. 3). The phases of this system can be important because of their piezoelectric properties. The initial substances were: PbO for analysis, chemically pure B_2O_3, TiO_2 for analysis, Nb_2O_5 with a degree of impurity of about 2 %, including 1.1 % of Ta_2O_5. X-ray analysis was conducted by Ye. G. Fesenko, and tests for piezoelectric properties

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The reaction in the system...

were carried out by A. L. Khodakov. From the system PbO - Nb_2O_5 - B_2O_3, 13 cuts were studied. In the region of high content of B_2O_3, the system separates into component parts. The melts solidify in the form of glass. The major part of the system is occupied by the crystallization surface of lead metaniobate. Two more phases of the side system PbO - Nb_2O_5 (A and B) do not remain stable in the ternary system, but decompose already at low temperatures (R_1 588°C, R_2 730°C). During solidification of the melt, $PbNb_2O_6$ single crystals form in glass which may be removed by nitric acid. In this way, single crystals with an edge of 0.5 cm were obtained. These crystals adopt piezoelectric properties when heated at 1300°C for 3.5 hr. Studies of the cut (50% PbO + 50% B_2O_3) - $PbNb_2O_6$ - $PbTiO_3$ disclosed an uninterrupted series of mixed crystals between $PbTiO_3$ and $PbNb_2O_6$. These rhombic, imperfect crystals of the perovskite type are not piezoelectric. Only after heating at 1300°C for 6 to 9 hr the mixed crystals 75% $PbNb_2O_6$ + 25% $PbTiO_3$ and 50% $PbNb_2O_6$ + 50% $PbTiO_3$ became piezoelectric. There are 3 figures and 16 references: 4 Soviet-bloc. The two references to

21340

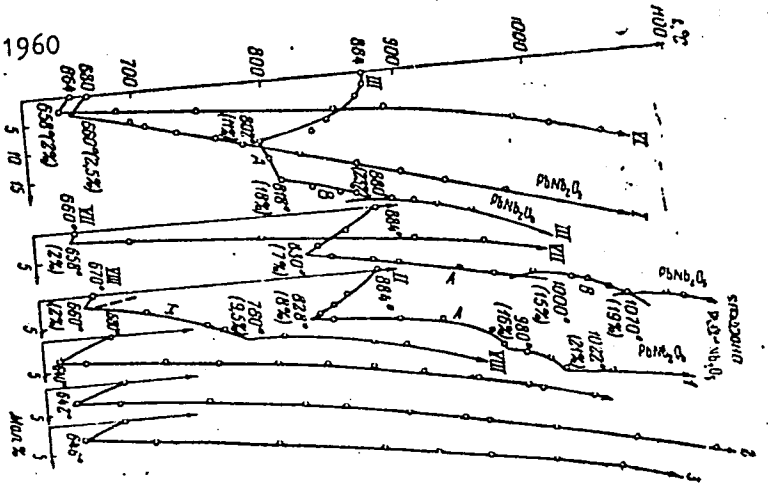
S/078/61/006/004/014/018
B107/B218

The reaction in the system...

English-language publications read as follows: R. S. Roth. J. Res. Nat. Bur. Stand. 62, 2925 (1959); E. C. Subbarao. J. Amer. Ceram. Soc., 42, 448 (1959).

SUBMITTED: March 14, 1960

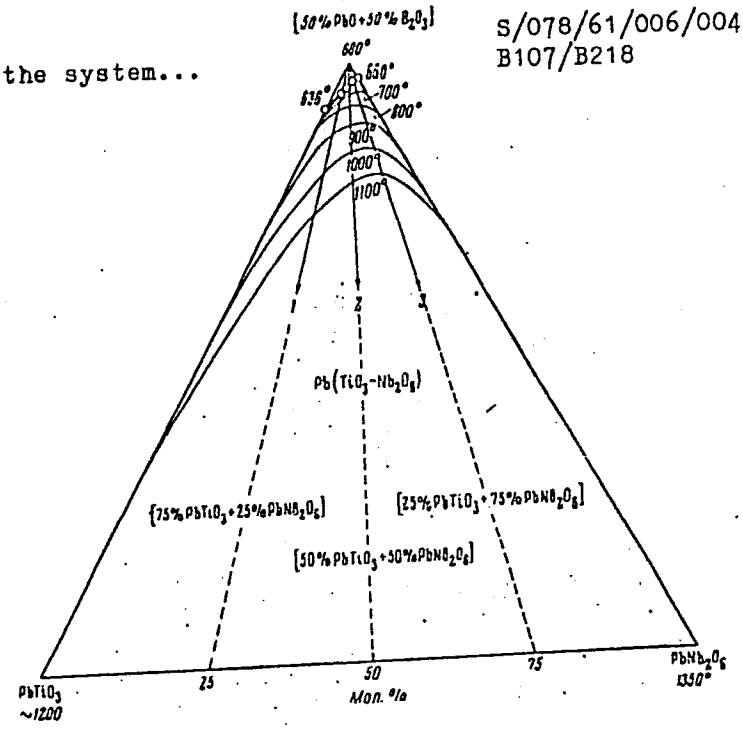
Рис. 1.



Card 3/5

S/078/61/006/004/014/018
B107/B218

The reaction in the system...



Card 5/5

Рис. 3.

0700
S/020/61/141/002/011/027
B104/B138

24.7800

AUTHORS: Khodakov, A. L., and Sholokhovich, M. L.

TITLE: Ferroelectric monocrystals with large nonlinearities

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 2, 1961, 338-341

TEXT: A potassium fluoride solvent was used to grow ferroelectric monocrystals from compositions which were solid solutions of $BaTiO_3$ and $BaHfO_3$. Concentration of the components and temperature conditions were determined from data on the system K_2F_2-$BaTiO_3$-$BaHfO_3$. The monocrystals were grown in a closed platinum dish, placed in an electric furnace. The thickness of the resulting plates ranged from 60 to 700 μ. The composition of the crystals grown differed considerably from that of the original mixture. At radio frequencies the absolute dielectric constant reached 15,000 at Curie point and the $\varepsilon(t)$ curve has a sharp peak. At room temperature ε = 500. The tangent of the dielectric loss angle is quite low at radio frequencies ($\tan\delta = 2\cdot10^{-2}$-$3\cdot10^{-2}$). When the crystals are heated, the maximum dielectric constant increases and is at the same time

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reached at lower field strengths (Fig. 4). The nonlinearity of the $BaTiO_3$-$BaHfO_3$ crystals grown by the authors is much greater than that of other compositions: $K = \varepsilon_{max}/\varepsilon_0$ is 5-6 for $BaTiO_3$, 20 for BK-2 (VK-2) cermet and >100 for the crystals described here. ε_0 is the absolute dielectric constant for E = 0. There is practically no difference between the Curie point of the monocrystals described here and that of $BaTiO_3$ monocrystals, except that the former has better parameters. This is achieved by injecting slight additions of $BaHfO_3$. The crystals polarize easily and their piezo modulus d_{33} is greater than that of ceramic barium titanate. B. M. Vul' is thanked by the authors for his interest. There are 3 figures, 1 table, and 5 Soviet references.

ASSOCIATION: Rostovskiy-na-Donu gosudarstvennyy universitet (Rostov-na-Donu State University)

PRESENTED: June 30, 1961, by A. V. Shubnikov, Academician

SUBMITTED: June 30, 1961

S/070/62/007/002/019/022
E132/E160

24,7800

AUTHORS: Khodakov, A.L., and Sholokhovich, M.L.

TITLE: Single crystals of ferroelectrics with large piezoelectric moduli

PERIODICAL: Kristallografiya, v.7, no.2, 1962, 320

TEXT: Single crystals of $BaTiO_3$ containing 1% $BaHfO_3$ have been grown as triangular plates up to 2 cm in edge and up to 0.7 mm thick. After electrical treatment the modulus d_{33}, measured by statistical method, reaches 50-110 (x 10^{-6} CGSU) which is ten times the value for $BaTiO_3$. Crystals of $BaTiO_3$ containing 2% $BaHfO_3$ were also studied. In this case d_{33} reaches 8 x 10^{-6} CGSU.

ASSOCIATION: Rostovskiy-na-Donu gosudarstvennyy universitet (Rostov-on-Don State University)

SUBMITTED: July 1, 1961

Card 1/1

S/196/63/000/001/004/035
E193/E383

AUTHORS: Kramarov, O.P., Khodakov, A.L., Sholokhovich, M.L. and Fesenko, Ye.G.

TITLE: Single crystals of solid solutions of strontium and lead titanates

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no. 1, 1963, 15, abstract 1 B51. (In collection: Segnetoelektriki (Ferroelectrics), Rostov-na-Donu, Rostovsk. un-t, 1961, 5-11)

TEXT: Single crystals of (Pb, Sr)TiO_3 solid solutions, crystallized out of $PbTiO_3$-$SrTiO_3$-KF melts cooled slowly (5-10 °C/h) in a platinum crucible, were studied. Specimens containing 10, 25, 40 and 50 mole.% $PbTiO_3$ were obtained in the 1273-1103 °K range (i.e. at 1000-830 °C), those containing 60 and 75% $PbTiO_3$ being crystallized out of melts cooled from 1373 °K (1100 °C). It was established that with increasing quantity of Sr ions, isomorphically displaced in $SrTiO_3$ by Pb ions, the lattice parameter increased owing to the difference in the ionic radii. X-ray spectrum analysis showed that the composition of specimens prepared in this manner was practically identical with the

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Single crystals ....

composition of the charge. The temperature dependence of ε and $\tan\delta$ in the 73-673 °K range (i.e. at -200 to +400 °C) was studied at 10^6 c.p.s. (see the figure; the numbers by each curve indicate percentage concentration of $PbTiO_3$ in the $PbTiO_3$-$SrTiO_3$ solid solution and at a frequency f = 50 c.p.s. The values of Θ of single crystals were found to be near the known values for polycrystalline specimens. The magnitude of tan δ increased slightly with increasing Pb content and, at its minimum, was equal to (40-70) x 10^{-4}. The values of Θ of specimens with high specific conductivity were determined with the aid of a specially designed dilatometer, capable of measuring expansion on specimens 1-2 mm long. With the aid of this method it was possible to establish that the temperature of phase-transformation of $PbTiO_3$ was 785 °K (512 °C). The hysteresis loops studied at room temperature at f = 50 c.p.s. in fields of up to 12 kV/cm had no saturation. It was established that the refractive index of $PbTiO_3$-$SrTiO_3$ solid solutions varied non-monotonically from 2.35 for the latter to 2.70 for the former compound. There are 4 figures and 10references.

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44652
S/196/63/000/001/005/035
E193/E383

AUTHORS: Sholokhovich, M.L., Khodakov, A.L., Lezgintseva, T.N. and Varicheva, V.I.

TITLE: New, highly nonlinear ferroelectrics

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no. 1, 1963, 15-17, abstract 1 B54. (In collection: Segnetoelektriki (Ferroelectrics), Rostov-na-Donu, Rostovsk. un-t, 1961, 12-20)

TEXT: The ferroelectric properties of sintered compacts and single crystals of $Ba(Ti-Hf)O_3$ solid solutions, containing up to 25 mole.% Hf, were studied. The powder compacts were sintered three times at 1273, 1683 and 1873 °K (1000, 1450 and 1500 °C), the sintering time at 1273 °K (1000 °C) being 20 hrs. The specimens were ground and recompacted after the first sintering operation. Sintered compacts containing more than 6% Hf were porous. Single crystals of $Ba(Ti-Hf)O_3$ (molten K_2F_2 was used as a solvent) constituted coarse, triangular platelets joined along one of the sides, the length of the sides and thickness of some platelets reaching, respectively, 2.5 cm and 80-500 μ. Single crystals were light

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yellow in colour and transparent. As a rule, a small number of single crystals in the form of cubes were found in the top layer of the melt after cooling. X-ray diffraction analysis showed that the composition of single crystals differed from the composition of the starting mixtures before crystallization. A study of the temperature-dependence of ε in the 273-423 ^{o}K range (15 - 150 ^{o}C) at 5 x 10^{5} c.p.s. showed that on increasing the concentration of Hf in the solid solution the maximum of this relationship was shifted towards lower temperatures (a linear dependence on concentration of Hf was observed) and the highest value of ε was obtained in the solid solution containing 6 mole.% Hf; this is shown in Fig. 1, where the numbers indicate the percentage concentration of Hf and the broken curve relates to a single crystal of the solid solution. The value of tan δ of single crystals of the solid solution at room temperature was of the order of (300-700) x 10^{-4}. The field-dependence of ε and tan δ of a single crystal of the solid solution at 50 c.p.s. was also studied (see Fig. 2). The increase in ε of sintered solid-solution specimens, caused by increasing the intensity of the field B, was considerably less than that in the case of single crystals.

New, highly nonlinear ferroelectrics

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The field intensity E_m, corresponding to the maximum value of ε, increased with increasing frequency f. Oscillograms of hysteresis loops of single crystals of solid solutions were characterized by pronounced rectangularity and reached saturation in fields as weak as 5 kV/cm. The total polarization ability of the crystals reached 30 - 35 kg/cm^2. Slight asymmetry of the hysteresis loops was attributed to the effect of electrons. A wide loop indicated considerable hysteresis losses, the nature of which was not associated with relatively low conductivity. A characteristic anomaly was observed in the temperature-dependence of the electrical conductivity σ in the vicinity of Θ (see Fig. 3). It was established that the nonlinear properties of single crystals were particularly strongly revealed under the simultaneous action of constant and alternating fields. The relationship between ε and the intensity of a DC field E at $f = 10^6$ c.p.s. is shown in Fig. 4, where the numbers given by each curve indicate the intensity of the alternating field. The most useful fact from the practical point of view is that maximum nonlinearity is observed in weak fields. There are 8 figures and 8 references.
[Abstracter's note: Complete translation.]

Card 3/3

S/196/63/000/001/007/035
E193/E383

AUTHORS: Sholokhovich, M.L., Kramarov, O.P. and Varicheva, V.I.

TITLE: Single crystals of lead metazirconate

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no. 1, 1963, 17-18, abstract 1 B56. (In collection: Segnetoelektriki (Ferroelectrics), Rostov-na-Donu, Rostovsk. un-t, 1961, 31-36)

TEXT: A method is described for growing single crystals of $PbZrO_3$, up to 30 μ in size, from melts containing PbO and ZrO_2 mixtures dissolved in KF, KCl, PbF_2, $Pb_3(PO_4)_2$, NaCl, Na_2WO_4 or Na_2MoO_4. Another method, entailing the volatilization of NaCl from a $PbO-ZrO_2-PbCl_2$ melt, made it possible to produce $PbZrO_3$ single crystals, 1-2 mm in size, for which the temperature-dependence of ε was determined (see the figure). The effect of temperature on the hysteresis loops was also studied. There are 1 figure and 13 references.

Editor's note. In the original the frequency is erroneously given in "mc/s" instead of "Mc/s".

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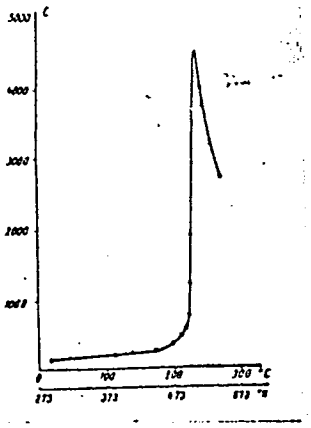
S/196/63/000/001/007/035
E193/E383

Single crystals of ....

[Abstracter's note: Complete translation.]

Figure:



Card 2/2

L 15629-65 EWT(l)/EPA(s)-2/EWT(m)/EEC(t)/EWP(t)/EEC(b)-2/EWP(b) Pt-10/Pl-4
ASD-3/AFFTC/ESD-3/SSD/IJP(c) JD/GG
ACCESSION NR: AR3010278 S/0081/63/000/012/0071/0071

SOURCE: RZh. Khimiya, Abs. 12B466 B

AUTHOR: Kramarov, O. P.; Khodakov, A. L.; Sholokhovich, M. L.; Fesenko, Ye. G.

TITLE: Monocrystals of solid solutions of strontium and lead titanates 18 18 27 27

CITED SOURCE: Sb. Segnetoelektriki. Rostov-na-Donu, Rostovsk. un-t, 1961, 5-11 21

TOPIC TAGS: solid solution, strontium, lead, strontium titanate, lead titanate, monocrystalline structure

TRANSLATION: The fusion diagram for the system K_2F_2--$PbTiO_3$--$SrTiO_3$ has been studied and the formation of a continuous series of solid solutions (Pb--Sr)TiO_3 has been established. For determining the position of the Curie point in compounds with high electrical conductivity, a specially constructed dilatometer was used which permitted measurement of elongation in samples of 1-2 mm. A phase

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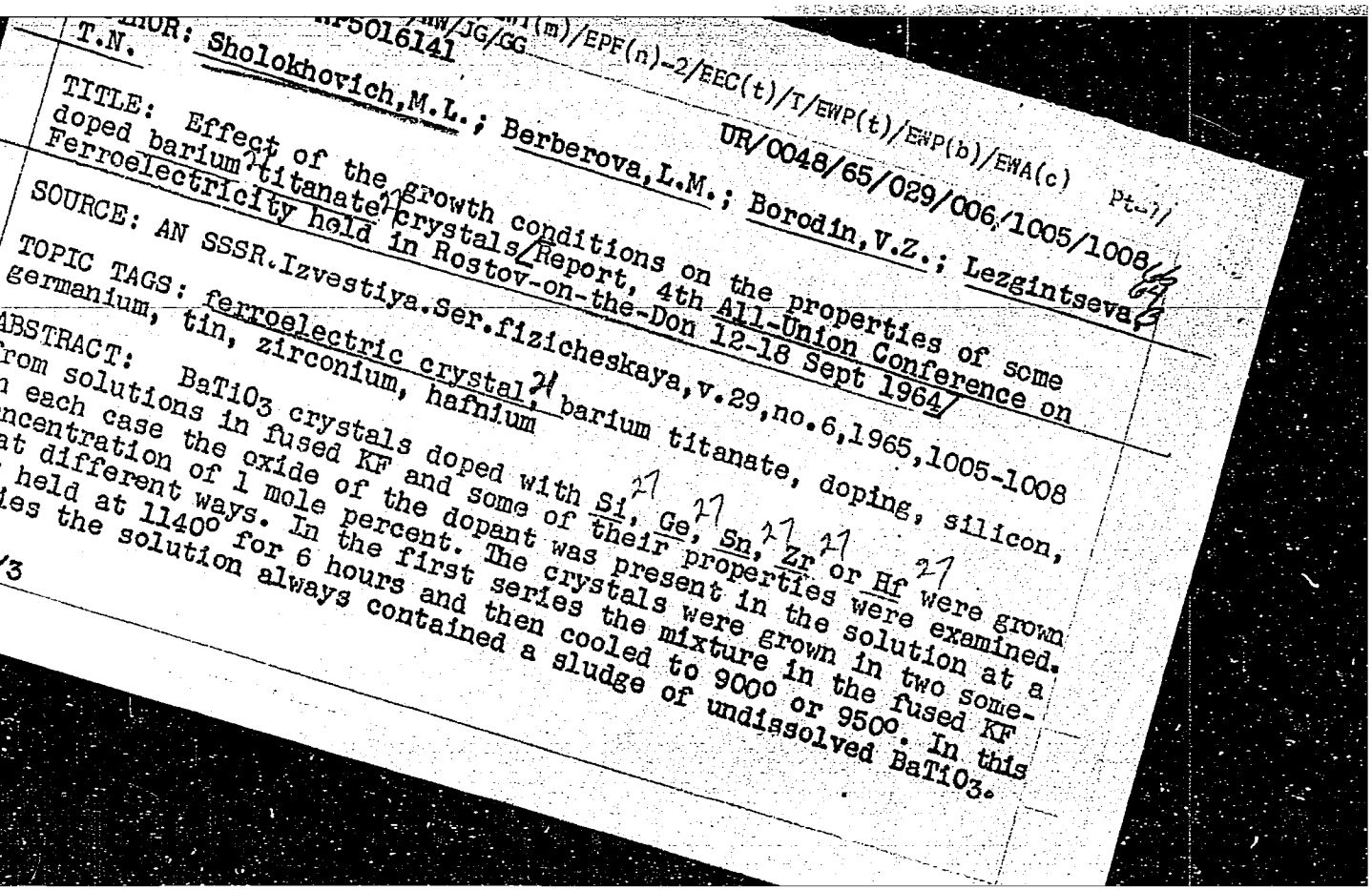
ACCESSION NR: AR3010278

transition temperature of 512° for monocrystals of $PbTiO_3$ was determined by the same method. The Curie point for monocrystals of solid solutions is close to the data known for polycrystalline samples. The refractive index for monocrystals $(Pb--Sr)TiO_3$ changes in a nonmonotonic fashion within the limits of 2.35 (for $SrTiO_3$) to 2.70 (for $PbTiO_3$).

SUB CODE: MM, SS ENCL: 00

Card 2/2



AUTHOR: Sholokhovich,M.L.; Berberova,L.M.; Borodin,V.Z.; Lezgintseva, T.N. 44,55

TITLE: Effect of the growth conditions on the properties of some doped barium titanate crystals [Report, 4th All-Union Conference on Ferroelectricity held in Rostov-on-the-Don 12-18 Sept 1964]

SOURCE: AN SSSR.Izvestiya.Ser.fizicheskaya,v.29,no.6,1965,1005-1008

TOPIC TAGS: ferroelectric crystal, barium titanate, doping, silicon, germanium, tin, zirconium, hafnium

ABSTRACT: $BaTiO_3$ crystals doped with Si, Ge, Sn, Zr or Hf were grown from solutions in fused KF and some of their properties were examined. In each case the oxide of the dopant was present in the solution at a concentration of 1 mole percent. The crystals were grown in two somewhat different ways. In the first series the mixture in the fused KF was held at 1140° for 6 hours and then cooled to 900° or 950°. In this series the solution always contained a sludge of undissolved $BaTiO_3$.

L 57559-65
ACCESSION NR: AP5016141

The crystals obtained by this procesure were in the form of laminated twins. In the second series the mixture was held at 1180° until solution was complete and then cooled slowly to 840°. $BaTiO_3$ crystals obtained in this way are ordinarily cubes, but in this case the presence of the dopant affected the crystal form. The concentration of dopant in the final crystal was small and was not affected by prolonged heating. The concentrations of Si, Sn, Zr, Hf and Ge were 0.5, 0.5, 0.1, 0.05 and 0.01 percent by weight, respectively. The domain structure was affected by some of the dopants; this is discussed briefly. Doping the crystals with Sn, Zr and Hf did not change the temperature dependence of the dielectric constant. In the Si and Ge doped crystals the dielectric constant showed a small washed out maximum at a temperature somewhat below the Curie point. This is ascribed to the change in the number of a-domains with temperature. Prolonged application of a 2 kV/cm alternating field caused a gradual change in the shape of the hysteresis loop, particularly in the case of the Si doped crystals. Except for the Hf doped crystals, the saturation polarizations were between 1.0×10^{-5} and 1.8×10^{-5} C/cm^2. The saturation polarization of the Hf doped crystals was 2.5×10^{-5} C/cm^2. The

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L 57559-65
ACCESSION NR: AP5016141

starting fields (the field at which a rapid rise of polarization begins) were increased from about 500 V/cm for pure $BaTiO_3$ to between 750 and 950 V/cm for the doped crystals. Orig.art.has: 4 figures.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-matematicheskiy institut Rostovskogo-na-Donu gosudarstvennogo universiteta (Physico-mathematical Scientific Research Institute, Rostov-on-the-Don State University)

SUBMITTED: 00 ENCL: 00 SUB CODE: SS, IC

NR REF SOV: 003 OTHER: 006

Card 3/3

L 7841-66 EWT(l)/EWP(e)/EPA(s)-2/EWT(m)/EWP(i)/EPA(w)-2/EWP(t)/EWP(b)
ACC NR: AP5028121 IJP(c) JD/GG/WH SOURCE CODE: UR/0048/65/029/011/2064/2067

AUTHOR: Kramarov,O.P.; Sholokhovich,M.L.; Granovskiy,V.G.; Berberova,L.M;Nikulina,V.P.

ORG: Rostov-on-the Don State University (Rostovskiy-na-Donu gosudarstvennyy universitet)

TITLE: Increase of the Curie point of ferroelectric materials by introduction of nonferroelectric dopants [Report, Fourth All-Union Conference on Ferro-electricity held at Rostov-on-the Don 12-16 September 1964]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 11, 1965, 2064-2067

TOPIC TAGS: ferroelectric material, solid solution, dopant, barium titanate, zirconium, copper, silicon, dielectric constant, dielectric relaxation, Curie point.

ABSTRACT: The temperature dependence of the dielectric constant of $BaTiO_3$ and ferroelectric (Ba, Sr)TiO_3 and Ba(Ti, Zr)O_3 solid solutions containing up to 10 mole % of $CaTiO_3$, $BaSiO_3$, or $CuTiO_3$ ($CuCO_3 + TiO_2$) was measured at 10^3 and 10^6 cycle/sec in order to determine whether relaxation processes are involved in the apparent increase of the Curie temperature to which these nonferroelectric dopants are known to give rise. In all cases the dielectric constant was independent of frequency and the temperature at which it reached its maximum increased with increasing dopant content. The measurements on the $BaTiO_3$--$BaSiO_3$ system were repeated with particular attention to the purity of the materials, cp $BaTiO_3$ synthesized by the oxalate method, cp $BaCO_3$,

Card 1/2

L 7841-66

ACC NR: AP5028121

and semiconductor-grade SiO_3 being employed. The Curie point of the cp $BaTiO_3$ was higher than that of the less pure material, but it was raised still higher by addition of the pure $BaSiO_3$. It is concluded that relaxation processes are not involved, but that a true increase of the Curie point takes place. The ferroelectric nature of the dielectric constant maximum in the doped materials was confirmed by observation of the hysteresis loops. The addition of the nonferroelectric dopant lead in all cases to a broadening of the dielectric constant peak (diffusion of the phase transition) and in most cases to a reduction of the maximum value of the dielectric constant. The results are discussed briefly in terms of the theory of A.L.Khodakov and V.G.Granovskiy (Izv. vysh. uchebn. zaved, Fizika, No. 2, 118 (1962)). "Fictitious Curie points" are assigned to the dopants, from which their influence on the Curie point of the doped ferroelectric can be calculated. It is suggested that it may be possible to obtain ferroelectric solid solutions of nonferroelectric components homologous with $BaTiO_3$. It is not possible, however, to characterize the effect of a dopant by any single property of the added ion as, e.g., its polarizability. Further investigation is desirable. Orig. art. has: 1 formula and 5 tables.

SUB CODE: SS, EM SUBM DATE: 00/ ORIG.REF: 007 OTH.REF: 002

nw

Card 2/2

L 7834-66 EWP(e)/EPA(s)-2/EWT(m)/EWP(i)/EPA(w)-2/EWP(t)/EWP(b)/EWA(h)

ACC NR: AP5028122 IJP(c) JD/WH SOURCE CODE: UR/0048/65/029/011/2068/2071

AUTHOR: Sholokhovich,M.L.; Novikova,L.V.; Varicheva,V.I.; Kramarov,O.P.; Kupriyanov,M.F.

ORG: Rostov-on-the Don State University (Rostovskiy-na-Donu gosudarstvennyy universitet)

TITLE: Preparation of solid solutions of barium and lead titanates from water-soluble compounds and characteristics of such solutions /Report, Fourth All-Union Conference on Ferroelectricity held at Rostov-on-the Don 12-16 September 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 11, 1965, 2068-2071

TOPIC TAGS: ferroelectric material, solid solution, barium titanate, lead, titanate, dielectric constant, Curie point

ABSTRACT: Chemically pure (Ba, Pb)TiO_3 solid solutions were prepared from water-soluble reagents by coprecipitation from titanium tetrachloride, barium chloride, and lead nitrate solution, and by the exchange reaction between potassium titanyl oxalate and lead and barium nitrates. The chemical procedures are discussed in some detail and the properties of the solid solutions are described briefly. Lead titanyl oxalate synthesized at room temperature from titanium tetrachloride and lead nitrate by the method of B.V.Strizhkov, A.V.Lapitskiy, and L.G.Vlasov (Zh. prikl. khim., 34, 673 (1960)) was always contaminated with lead chloride, as were also the coprecipated mix-

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L 7834-66

ACC NR: AP5028122

tures of lead and barium titanyl oxalates. It was not possible so to adjust the pH as to eliminate this contamination. Lead chloride also precipitated when the synthesis was performed at 80°C by the method of W.S.Clabaugh, E.M.Swiggard, and R.Gilchrist (J. Res. Natl. Bur. Standards, 56, No. 5, 289 (1956)) and could only be removed (together with some of the titanyl oxalates) by prolonged washing with hot water. X-ray studies of the coprecipitated materials clearly showed the formation of tetragonal solid solutions after heating to 800°. The degree of tetragonality decreased regularly from lead to barium. The resulting chemically pure solid solutions sintered poorly and it was not possible to obtain dense ferroelectric ceramics by sintering in air at 1100 to 1300°. The Curie point of a ceramic of the composition $(Ba_{0.95}, Pb_{0.05})TiO_3$, derived from the temperature dependence of the dielectric constant at 1 megacycle/sec, was 153°. This is considerably higher than the approximately 140° Curie point usually obtained for ceramics of this composition prepared from technical grade materials. The increase of the Curie temperature is ascribed to the purity of the material. The dielectric constant itself was lower than is usually obtained for ceramics of this composition, owing to the large porosity due to poor sintering. Orig. art. has: 1 figure and 3 tables.

SUB CODE: GC, SS, EM SUBM. DATE: 00/ ORIG.REF: 009 OTH.REF: 002

SHOLOM, A.G., inzhener-podpolkovnuk

Directional factor in the development abroad of aviation equipment for detecting submarines. Mor.sbor. 44 no.3:74-80 Mr '61. (MIRA 14:4)

(Aeronautics, Military) (Submarine warfare)

ACCESSION NR: AT4041985 S/2582/64/000/011/0123/0129

AUTHOR: Kotyuzhanskiy, G.A., Sholom, M.M., Epshteyn, V.L.

TITLE: An algorithm for selecting symbols of high probability in a system having limited storage capacity

SOURCE: Problemy* kibernetiki, no. 11, 1964, 123-129

TOPIC TAGS: computer programming, medical diagnosis, machine translation, symbol selection, storage capacity, memory sparing

ABSTRACT: An algorithm is derived which could be useful in solving a wide range of problems such as: 1. automatic translation using an author's dictionary, each word being subjected to the selection algorithm which selects the most frequently used words and reinforces them in the operational memory; and 2. medical diagnosis, in which all possible combinations of symptoms and diseases are sorted to eliminate unlikely combinations, the most probable diagnosis being obtained from the relative probabilities of the various disease-complexes with respect to the symptom-complexes, also depending on the season, occurrence of an epidemic, whether the patient was already undergoing treatment, etc. Generalization requires a source generating symbols in a certain alphabet, not more than 'm' symbols being stored for technical reasons, and an algorithm allowing storage of the

Card 1/2

DASHKEVICH, B.N.; TSMUR, Yu.Yu.; SHOLOM, V.P.

Synthesis of tertiary acetylenic alcohols exhibiting halochromism.
Ukr. khim. zhur. 27 no.4:479-480 '61. (MIRA 14:7)

1. Uzhgorodskiy gosudarstvennyy universitet, kafedra organicheskoy khimii.

(Alcohols)

MIRZOYEV, D.A.; SHOLOMINSKAYA, L.F.

Bitumen potential of Mesozoic sediments in the Yuzhno-Sukhokumsk region in Daghestan. Izv.vys.ucheb. zav.[illegible] i gaz 5 no.5: 4-8 '62. (MIRA 16:5)

1. Dagestanskiy gosudarstvennyy universitet imeni V.I.Lenina i Institut geologii Dagestanskogo filiala AN SSSR.
(Daghestan--Bitumen--Geology)

L 61901-65 EWT(d)/EWT(l)/EWP(v)/EEC(b)-2/EWP(k)/EWP(h)/EWP(l)/EWA(h) Pm-4/
Po-4/Pq-4/Pf-4/Pg-4/Peb/Pk-4/Pl-4 IJP(c) GS/BC
AM5009844 BOOK EXPLOITATION UR/

68
B+1

Sapozhnikov, Rostislav, Alekseyevich; Bessonov, Aleksandr Andreyevich; Sholomitskiy, Adrian Grigor'yevich

Reliability of automatic control systems (Nadezhnost' avtomaticheskikh upravlyayushchikh sistem), Moscow, Izd-vo "Vysshaya shkola", 64. 0263 p. illus., biblio., index. 15,000 copies printed.

TOPIC TAGS: automatic control system, reliability theory, reliability engineering

PURPOSE AND COVERAGE: The book discusses the theory of reliability and its application to automatic control systems. The material may be of assistance in the design, manufacture, and operation of various systems of automatic control. The book is intended for readers familiar with principles of the theory of probability interested in problems of reliability in automation.

TABLE OF CONTENTS (abridged):

Foreword -- 3
Ch. I. The problem of reliability -- 5

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Card 2/2

SHOLOMITSKIY, G.B.

Neutral hydrogen in T association Taurur T2. Astron.zhur. 39 no.4:765-766 Jl-Ag '62. (MIRA 15:7)

1. Gosudarstvennyy astronomicheskiy institut imeni P.K.Shternberga.
(Stars--Constitution) (Hydrogen)

SHOLOMITSKIY, G.B. (Moskva)

Nature of radiogalaxies. Priroda 51 no.6:108-109 Je '62. (MIRA 15:6)

(Radio astronomy)

S/033/63/040/002/003/021
E001/E120

AUTHOR: Sholomitskiy, G.B.

TITLE: On the mass of filamentary nebulae (loop) in Cygnus

PERIODICAL: Astronomicheskiy zhurnal, v.40, no.2, 1963, 223-228

TEXT: The 21-cm radio emission of the filamentary nebulae (Loop) in Cygnus was observed during July-August 1961 at the Krymskaya radioastronomicheskaya stantsii (Crimean Radioastronomical station of FIAN. These nebulae form a slowly expanding envelope which includes NGC 6960 and NGC 6992-5 as its most pronounced parts. The radio emission is concentrated in three regions denoted by A, B and C. The expected spectrum of the Loop nebula is considered as a combination of a thermal spectrum and a non-thermal spectrum with index = -0.5. The expected minimum mass of HI in the Loop is ~80 M⊙, assuming the density of hydrogen atoms estimated to be n_H = 0.1 cm^{-3}. The radius of the nebula = 20 parsec. Direct observations of the radio emission disclosed maxima at galactic latitudes b = -1° and b = -10°, the first of which is near the source A, and the second near the source C (NGC 6992-5). Comparison of the optical image with radio isophotes at a frequency of 960 Mc

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S/033/63/040/002/003/021
E001/E120

...II indicates a collision ...eous cloud. An approximate ...alue of 200 - 300 M⊙ . ...is of a magnetic field system ... from a Supernova explosion. ...oop is estimated to be ~280M⊙ ...meter = 40 parsec. Hence the ... limits 80 M⊙ < M < 480 M⊙ ... which is less, ... estimation ...

The A-cloud is ... and relativistic pa... The mass of ionized hyd... assuming $\bar{n}_H \leq 0.41$ cm^{-3} and ... full mass of the Loop is within th... and its probable value is assumed to be ~400 M⊙ which is less, by a factor of 10, than the value estimated by Menon. Extrapolating backwards, on the basis of this mass and the present expansion speed = 100 km/sec, a value for the initial mass of the envelope = 5 M⊙ and its initial speed = 7500 km/sec is obtained which renders it similar to the Cassiopeia nebula, as already found by I.S. Shklovskiy. A comparison of kinetic energies of these two objects, ~2 x 10^{51} erg for Cassiopeia and ~4 x 10^{49} erg for the

Card 2/3

L 64703-65 FBD/EWT(1)/EWG(v)/EEC-4 GW/WS-4

ACCESSION NR: AR5012301 UR/0058/65/000/003/H062/H062

26
B

SOURCE: Ref. zh. Fizika, Abs. 3Zh392

AUTHOR: Sholomitskiy, G. B.; Kuril'chik, V. N.; Matveyenko, L. I.; Khromov, G. S.
55 55 55 55

TITLE: Three sources of radio emission with peculiar spectra
55, 12

CITED SOURCE: Astron. tsirkulyar. no. 283, 18 fev., 1964, 2-3

TOPIC TAGS: radio emission, cosmic radio source, radiation spectrum

TRANSLATION: Observations on the 32 m wavelength confirmed the existence of three discrete sources LHE 459, 523 and 210 not contained in surveys made on lower frequencies. Radiation from the sources was measured at frequencies of 85.5, 159 and 178 Mc. The unusual form of their spectra is noted. It is pointed out that the spectral data must be refined and the angular dimensions of the objects must be determined.

SUB CODE: AA, EC ENCL: 00

Card 1/1

L 17937-65 EWT(1)/FBD/EWG(v)/EEC-4/EEC(t) Pe-5/Pi-4/Pae-2 GW/WS
ACCESSION NR: AP4047152 S/0033/64/041/005/0823/0828

AUTHOR: Sholomitskiy, G. B.; Kuril'chik, V. N.; Matveyenko, L. I.; Khromov, G. S.

TITLE: Observations of some weak radio emission sources at a wavelength of 32 cm

SOURCE: Astronomicheskiy zhurnal, v. 41, no. 5, 1964, 823-828

TOPIC TAGS: radio emission, weak radio emission, radio emission source, extragalactic radio source

ABSTRACT: In the fall of 1963 an investigation of 13 weak radio emission sources was carried out by means of high-sensitivity radio equipment installed on an antenna which had previously been used for radar observations of planets. A radiometer using a semiconductor diode modulator was used. The radiometer had a bandwidth of 10 mc. With the antenna directed toward the zenith, the total noise temperature of the receiving system was 250K. As reference sources, radio sources 3C- 33 and 3C- 273 were used, for which flux magnitudes were assumed to be 18.8×10^{-26} and 43.5×10^{-26} w/m^2 cps, respectively.

Card 1/2

L 02336-67 EWT(1) GW

ACC NR: AR6028399 SOURCE CODE: UR/0269/66/000/005/0041/0041

AUTHOR: Kardashev, N. S.; Sholomitskiy, G. B.

TITLE: Limit of distances in extragalactic studies

SOURCE: Ref. zh. Astronomiya, Abs. 5.51.330

REF SOURCE: Astron. tsirkulyar, no. 336, iyulya 31, 1965, 3-6

TOPIC TAGS: extragalactic object, extragalactic distance, extragalactic red shift, red shift limit, emission spectrum, optic density, extragalactic dust

ABSTRACT: For the investigation of extragalactic objects in the condensation stage, the objects for consideration should be those with the corresponding red shift $\Delta\lambda/\lambda = z \geq 100$. Investigation of these objects, requires the condition $\alpha \leq 0$, if the source of a continuous emission spectrum is represented by the formula $F_\nu \sim \nu^{-\alpha}$. The derived expression for the optical density of emission scattering for free electrons, with respect to z in isotropic homogeneous models of the Universe, shows that the limit of the observable value z is about 7. The authors are of the opinion that a more precise determination of the value of the

Card 1/2

UDC: 523.855

Card 2/2

L 42283-66 EWT(d)/FBD/ESS-2/EWT(1) GW/WS-2
ACC NR: AP5022788 SOURCE CODE: UR/0141/65/008/004/0651/0654

AUTHOR: Matveyenko, L. I.; Kardashev, N. S.; Sholomitskiy, G. B.

ORG: Physics Institute im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR)

TITLE: Radiointerferometer with a large base

SOURCE: IVUZ. Radiofizika, v. 8, no. 4, 1965, 651-654

TOPIC TAGS: radio antenna, antenna radiation pattern, interferometer, radio receiver

ABSTRACT: A radiointerferometer system is proposed which permits realizing very large bases (1000 km), doing away with radio relaying, automating the recording of the signal and processing of the recordings, and accomplishing a full scan within the pattern of a single antenna. A system of two antennas operating by the principles described in this article permits obtaining, with large bases, not only amplitude but also space-phase characteristics of interference and consequently to study in detail the distribution of the brightness of discrete sources of very small angular dimensions. The authors mathematically examine two independent receiving systems separated by a large distance. Each system consists of an antenna, HF amplifier, mixer, heterodyne, IF amplifier, and an HF recording device. Orig. art. has: 4 formulas.

SUB CODE: 17/ SUBM DATE: 27Jan64/ ORIG REF: 001/ OTH REF: 007
UDC: 621.396.67:523.164

Card 1/1

SHOLOMITSKIY, G.B.

Fluctuations in the CTA102 flux at the wavelength of 32.5 cm.
Astron. zhur, 42 no.3:673-674 My-Je '65. (MIRA 18:5)

1. Gosudarstvennyy astronomicheskiy institut im. P.K.Shternberga.

SHOLOMITSKIY, G.B.; KOKIN, Yu.F.

Radio emission from clusters of galaxies. Astron. zhur. 42 no.3:674-675 My-Je '65. (MIRA 18:5)

1. Gosudarstvennyy astronomicheskiy institut im. P.K.Shternberga.

and with the position of the C-cloud of HI indicates a collision between the expanding envelope and a gaseous cloud. An approximate estimation of the C-cloud mass gives a value of 200 - 300 $M_\odot$.

The A-cloud is considered as the remains of a magnetic field system and relativistic particles originating from a Supernova explosion. The mass of ionized hydrogen in the Loop is estimated to be $\sim 280 M_\odot$ assuming $\bar{n}_H \leq 0.41$ cm^{-3} and the diameter = 40 parsec. Hence the full mass of the Loop is within the limits $80 M_\odot < M < 480 M_\odot$ and its probable value is assumed to be $\sim 400 M_\odot$ which is less, by a factor of 10, than the value estimated by Menon.

Extrapolating backwards, on the basis of this mass and the present expansion speed = 100 km/sec, a value for the initial mass of the envelope = 5 $M_\odot$ and its initial speed = 7500 km/sec is obtained which renders it similar to the Cassiopeia nebula, as already found by I.S. Shklovskiy. A comparison of kinetic energies of these two objects, $\sim 2 \times 10^{51}$ erg for Cassiopeia and $\sim 4 \times 10^{49}$ erg for the

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E001/E120

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The A-cloud is considered as the remains of a magnetic field system and relativistic particles originating from a Supernova explosion. The mass of ionized hydrogen in the Loop is estimated to be $\sim 280 M_\odot$ assuming $\bar{n}_H \leq 0.41$ cm^{-3} and the diameter = 40 parsec. Hence the full mass of the Loop is within the limits $80 M_\odot < M < 480 M_\odot$ and its probable value is assumed to be $\sim 400 M_\odot$ which is less, by a factor of 10, than the value estimated by Menon. Extrapolating backwards, on the basis of this mass and the present expansion speed = 100 km/sec, a value for the initial mass of the envelope = 5 $M_\odot$ and its initial speed = 7500 km/sec is obtained which renders it similar to the Cassiopeia nebula, as already found by I.S. Shklovskiy. A comparison of kinetic energies of these two objects, $\sim 2 \times 10^{51}$ erg for Cassiopeia and $\sim 4 \times 10^{49}$ erg for the

Loop, leads to the conclusion, assuming the same initial kinetic energy and age of the Loop ~50 000 years, that $n_H = 4$ cm^{-3}, i.e. higher than the estimate given above. This suggests that the gas in the Loop is ionized and heated to a high temperature, and hence is not visible.
There are 2 figures.

ASSOCIATION: Gos. astronomicheskiy in-t im. P.K. Shternberga
(State Astronomical Institute imeni P.K. Shternberg)

SUBMITTED: February 9, 1962

L 64703-65 FBD/EWT(1)/EWG(v)/EEC-4 GW/WS-4

ACCESSION NR: AR5012301 UR/0058/65/000/003/H062/H062

26
B

SOURCE: Ref. zh. Fizika, Abs. 3Zh392

AUTHOR: Sholomitskiy, G. B.; Kuril'chik, V. N.; Matveyenko, L. I.; Khromov, G. S.
55 55 55 55

TITLE: Three sources of radio emission with peculiar spectra
55, 18

CITED SOURCE: Astron. tsirkulyar. no. 283, 18 fev., 1964, 2-3

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SUB CODE: AA, EC ENCL: 00

Card 1/1

L 17937-65 EWT(1)/FBD/EWG(v)/EEC-4/EEC(t) Pe-5/Pi-4/Pae-2 GW/WS
ACCESSION NR: AP4047152 S/0033/64/041/005/0823/0828

AUTHOR: Sholomitskiy, G. B.; Kuril'chik, V. N.; Matveyenko, L. I.; Khromov, G. S. 8

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