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BOROVIK-ROMANOV, A.S.

24(0); 5(4); 6(2) PHASE I BOOK EXPLOITATION SOV/2215

Vsesoyuznyy nauchno-issledovatel'skiy institut metrologii imeni D.I. Mendeleyeva

Referaty nauchno-issledovatel'skikh rabot; sbornik No. 2 (Scientific Research Abstracts; Collection of Articles, Nr 2) Moscow, Standartgiz, 1958. 139 p. 1,000 copies printed.

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Ed.: S. V. Reshetina; Tech. Ed.: M. A. Kondrat'yeva.

PURPOSE: These reports are intended for scientists, researchers, and engineers engaged in developing standards, measures, and gages for the various industries.

COVERAGE: The volume contains 128 reports on standards of measurement and control. The reports were prepared by scientists of institutes of the Komitet standartov, mer i izmeritel'nykh priborov pri Sovete Ministrov SSSR (Commission on Standards, Measures, and Measuring Instruments under the USSR Council of Ministers). The participating institutes are: VNIIM - Vsesoyuznyy nauchno-issledovatel'skiy metrologii imeni D.I. Mendeleyeva (All-Union Scientific Research Institute of Metrology imeni D.I. Mendeleyev) in Leningrad; Sverdlovsk branch of this institute; VNIIK - Vsesoyuznyy nauchno-issledovatel'skiy institut Komiteta standartov, mer i izmeritel'nykh priborov (All-Union Scientific Research Institute of the Commission on Standards, Measures, and Measuring Instruments), created from MGIMIP - Moskovskiy gosudarstvennyy institut mer i izmeritel'nykh priborov (Moscow State Institute of Measures and Measuring Instruments) October 1, 1955; VNIIFTRI - Vsesoyuznyy nauchno-issledovatel'skiy institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Scientific Research Institute of Physicotechnical and Radio-engineering Measurements) in Moscow; KhGIMIP - Khar'kovskiy gosudarstvennyy institut mer i izmeritel'nykh priborov (Khar'kov State Institute of Measures and Measuring Instruments); and NGIMIP - Novosibirskiy gosudarstvenyy institut mer i izmeritel'nykh priborov (Novosibirsk State Institute of Measures and Measuring Instruments). No personalities are mentioned. There are no references.

Fedan, M.S. (VNIIM). Determining the Coefficients of Standard High-speed (Pitot static) Tubes by the Absolute Method 65

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

SOV-120-58-1-34/43

AUTHORS: Astrov, D. N. and Borovik-Romanov, A. S.

TITLE: Mercury Manometer for Accurate Measurement of Pressure Changes (Rtutnyy manometr dlya tochnykh izmereniy davleniya)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1958, Nr 1, pp 132-134 (USSR)

ABSTRACT: The mercury manometer is the main instrument used in the measurement of the absolute magnitude of pressure in the range from a few mm to 2 m of mercury. The main difficulties connected with this manometer are those connected with the determination of temperature of the mercury and the observation of the meniscus. A precision mercury manometer is now described which was used in conjunction with a gas thermometer (Ref.1). A schematic drawing of the instrument is shown in Fig.1. The manometer tube cross section is accurately circular and its diameter is 19 mm. The left knee of the manometer is evacuated by a diffusion chamber while the right knee is connected to the vessel in which pressure is being measured. The length of the mercury column is determined by comparison with an invar rod, graduated in millimetres.

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SOV-120-58-1-34/43

Mercury Manometer for Accurate Measurements of Pressure Changes.

The invar rod was attached to the same frame as the manometer. The comparison was carried out, using a meter cathatometer. The manometer was thermostated and placed in a metallic envelope covered by a thermally insulating material. The envelope was divided into two parts by a partition so that circulation of air could be established in it by a suitable pump. A heater was placed on one side of the partition and a thermometer immediately above it. The output from this thermometer (resistance thermometer) was used for thermal regulation of the setup. To measure the temperature of the mercury two platinum resistance thermometers were used, one at the top and one at the bottom of the column. A special optical device was used to measure the position of the meniscus and is shown in Fig.1. The manometer may be used to measure pressures with an accuracy of ± 0.035 mm.

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SOV-120-58-1-34/43

Mercury Manometer for Accurate Measurements of Pressure Changes.

P. G. Strelkov is thanked for his advice and constant interest. There are 4 figures and 4 references, 1 of which is English and 3 Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Scientific Research Institute for Physico-Technical and Radiotechnical Measurements)

SUBMITTED: June 18, 1957.

1. Manometers--Design 2. Manometers--Temperature factors
3. Thermometers--Applications 4. Pressure--Measurement

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

AUTHOR: Denishchuk, B.V., Dovbinshteyn, M.I.
Stolper, M.B., Engineers, Borovik-Romanov, A.S., Candidate of Technical Sciences

SOV/67-11-5-16/18

TITLE: Answers to the Readers (Otvety chitatelyam)

PERIODICAL: Kislorod, 1958, Vol 11, Nr 5, pp 69-70 (USSR)

ABSTRACT: Under this title questions of readers are answered in brief.
1) Question on the use of certain thermometers and manometers in Soviet oxygen works. Thermometer types for the measurement of introduced air are given and thermometer types for measuring temperature during the process. The types of manometers common in Russia are also mentioned.
2) Why are the nitrogen tubes destroyed at very low temperatures? Due to the dependence of the heat exchanger on the supply from the upper columns, due to the unequal distribution of air between the throttle valve and detander.
3) Which magnetic properties has oxygen? Oxygen is paramagnetic and its magnetism is expressed by the formula

$$\mu = 1 + 4\pi.$$

The dielectric state of some gases is given.
4) On the interruption of the oxygen plant Kg-30 which is necessary every four hours. It is recommended to check the

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2nd card

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SOV/56-35-4-45/52

24(3)

AUTHORS: Borovik-Romanov, A. S., Kreynes, N. M.

TITLE: The Transition From the Antiferromagnetic to the Ferromagnetic State in $CoSO_4$ (Perekhod iz antiferromagnitnogo v ferromagnitnoye sostoyaniye v $CoSO_4$)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 4, pp 1053-1055 (USSR)

ABSTRACT: In the range of 15°K, $CoSO_4$ goes over into the antiferromagnetic state. By a method previously described the authors produced $CoSO_4$ single crystals without water weighing ~1.5 mg, and investigated their magnetic properties within the temperature range of from 1.3 to 70°K. These crystals were bipyramidal in shape. Measurements were carried out along the axis connecting the vertices of the pyramids and along the edges of the ground surface. At all temperatures and at field strengths of up to ~4000 Oe magnetic susceptibility does not depend on field strength. The results obtained by susceptibility measurements carried out along all 3 axes of the crystal are shown

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The Transition From the Antiferromagnetic to the Ferromagnetic State in $CoSO_4$

by a diagram. The curves thus obtained confirm that $CoSO_4$ goes over into the ferromagnetic state at $T_N = 12^oK$. A very sharp susceptibility peak along the a-axis is possibly connected with the character of the splitting-up of levels of the ion Co^{++} in the crystal field. At $T \rightarrow 0^oK$ susceptibility does not tend exactly towards zero on any of the axes. The most interesting results are those obtained for great field strengths. Whereas the susceptibility of the axes b and c is independent of field strength up to field strengths of 18,000 Oe, the magnetic properties along the axis a show considerable anomaly. With the application of a field H along the axis a, the molar magnetic moment of $CoSO_4$ increases linearly up to a field strength of H = 12,000 Oe. With a further increase of H by 1,000 Oe, the moment increases sharply from some 100 to 6,000 CGSM, which is followed by a further slight increase. This anomaly is apparently due to the upsetting of the magnetization vectors of the sublattices and to the transition of the substance under investigation from the antiferromagnetic to the ferromagnetic state. The following facts are of particular

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The Transition From the Antiferromagnetic to the Ferromagnetic State in $CoSO_4$

interest: 1) The ferromagnetic moment does not attain a state of saturation even at field strengths of ~18,000 Oe. 2) The ferromagnetic moment amounts to only 30% of the nominal moment, which was calculated on the assumption of a total freezing-up of the orbital moments. Reference is made to works by other authors. A detailed discussion of the anomaly observed follows after the detailed investigation of this phenomenon within the entire temperature range. The authors thank P. L. Kapitsa, Academician, for his constant interest in this work, and they also express their gratitude to Professor P. G. Strelkov for some valuable advice. There are 2 figures and 6 references, 4 of which are Soviet.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute for Physical Problems of the Academy of Sciences USSR)
Vsesoyuznyy institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Institute for Physico-Technical and Radio-technical Measurements)

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BOROVIK-ROMANOV, A. S. Doc Phys-Math Sci -- (diss) "Magnetic properties of antiferromagnetic dielectrics." Mos, 1959. 13 pp (Acad Sci USSR. Inst of Phys Problems), 150 copies (Bibliography at end of text (22 titles)

(KL, 49-59, 137)

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24(0) SOV/30-59-2-42/60

AUTHOR: Khalatnikov, I. M., Doctor of Physical and Mathematical Sciences

TITLE: Investigations of Low-temperature Physics (Issledovaniya po fizike nizkikh temperatur)

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 2, pp 98-100 (USSR)

ABSTRACT: The 5th All-Union Conference on this problem took place in Tbilisi from October 27 to November 1, 1958. It was attended by physicists from Moscow, Khar'kov, Leningrad, Tbilisi, Sverdlovsk, and Kiyev. 4 fields of low-temperature physics were discussed: superliquidity of liquid helium II, supraconductivity, antiferromagnetism, magneto-resistive effect. The following reports and communications were heard: A. A. Abrikosov, L. P. Gor'kov reported on the investigation of the properties of supraconductive alloys. A. A. Abrikosov, L. P. Gor'kov, I. M. Khalatnikov spoke of properties of supraconductors in the high-frequency magnetic field. D. V. Sherkov and Chen' Chun'-yan' and Chzhou Si-shin', two young Chinese scientists working at Moscow University, described investigations for determination of the influence exercised by the Coulomb (Kulon) interaction of charges on supraconductivity. V. V. Tolmachev explained the nature of the so-called collective excitations of the Bose type in supraconductors. D. N. Zubarev, Yu. A. Tserkovnikov spoke of the thermodynamics of supraconductors and D. Z. Geylikman, V. Z. Kresin of the thermal conduction of supraconductors. Yu. V. Sharvin, V. F. Gantmakher reported on experimental work with supraconductors. N. V. Zavaritskiy spoke of the measurement of the anisotropy of thermal conductivity in the supraconductive state. In a series of reports problems of the superliquidity of helium were discussed, which was discovered in 1938 by P. L. Kapitsa and the theory of which was set up in 1941 by L. D. Landau. E. L. Andronikashvili and his collaborators investigated the properties of rotating helium. V. P. Peshkov spoke of the effect of the formation of the boundary between superliquid and non superliquid helium. Guan Vey-yan', collaborator of the Institut fizicheskikh problem (Institute of Physical Problems) investigated the properties of the so-called jump in temperature of Kapitsa. I. M. Lifshits, V. G. Peschanskiy investigated galvanomagnetic phenomena in strong magnetic fields for metals with open Fermi surfaces. N. Ye. Alekseyevskiy, Yu. P. Gaydukov experimentally investigated the resistance anisotropy of gold monocrystals in the magnetic field. I. S. Kan, B. G. Lazarev combine the presence of a temperature minimum with the structural state of the metal. M. Ya. Azbel' reported on the quantum theory of metallic conductivity in the alternating electromagnetic and constant magnetic field. A. S. Borovik-Romanov reported on the weak ferromagnetism in antiferromagnetic crystals of $MnCO_3$. E. M. Kreynes, Ye. A. Turov investigated the magnetic anisotropy of the antiferromagnetic monocrystals $CuSO_4$ and $CoSO_4$. R. A. Alikhanov reported on neutronographic investigations of antiferromagnetics. Ye. I. Kondorskiy and collaborators reported on the susceptibility of nickel and nickel-copper alloys at low temperatures. M. I. Kaganov, V. M. Tsukernik reported on kinetic phenomena in ferromagnetics at low temperatures. A. I. Akhiyezer, V. G. Bar'yakhtar, and S. P. Peletminskiy spoke of computations of the relaxation of the magnetic moment in ferromagnetic dielectrics at low temperatures. T. I. Sanadze spoke of observation results of paramagnetic resonance of terbium in the $TbNO_3 \cdot 6H_2O$ nitrate. G. R. Khutsishvili gave a theoretical analysis of the orientation of the nuclear spin in the Overhauser (Overkhauser) effect in nonmetals. B. N. Samoylov, S. M. Reynov and collaborators reported on obtaining orientated nuclei. R. V. Sulatova, V. N. Kogan and B. G. Lazarev showed that hydrogen isotopes in solid state have different structures. I. A. Gindin, B. G. Lazarev, Kh. D. Starodubov and V. I. Khotkevich detected polymorphism in a number of metals at low temperatures. E. L. Andronikashvili, V. P. Peshkov and M. F. Malkov reported on the stage of development of foreign scientific research work in the field of low-temperature physics. At the end of the Conference P. L. Kapitsa spoke of his successful development of investigations in the field of low-temperature physics. The participants of the Conference visited the Institut fiziki Akademii nauk Gruzinskoy SSR (Physics Institute of the Academy of Sciences of the Gruzinskaya SSR) and the Physics Faculty of Tbilisi University as well as the building of the new research atomic reactor near Tbilisi.

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Borovik-Romanov, A.S.

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6 (5), 9 (9) SOV/115-59-11-14/36

AUTHORS: Astrov, D.N., Borovik-Romanov, A.S., Orlov, M.P., Strelkov, P.G.

TITLE: The Design of a Practical Temperature Scale in the Range of 10 - 90°K

PERIODICAL: Izmeritel'naya tekhnika, 1959, Nr 11, pp 35-38

ABSTRACT: In a publication made by the authors in 1954 [Ref 1], a practical temperature scale in the range of 10 - 90°K was explained. In 1958, at a session of the Advisory Committee on Thermometry of the International Bureau of Measures and Weights, an international comparison of existing temperature scales between 10 and 90°K was suggested by VNIIFTRI - Vsesoyuznyy nauchno-issledovatel'skiy institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Scientific Research Institute of Physical and Radio Engineering Measurements). This article is based on the previous publication [Ref 1] of the aforementioned authors and deals with equipment and measuring methods. The au-

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The Design of a Practical Temperature Scale in the Range of 10 - 90°K

thors explain first the individual characteristics of thermometers, mentioning briefly platinum and gas thermometers. They describe briefly a membrane-gage measuring instrument and pressure measurements in the reservoir of a gas thermometer. They explain the assembly of the equipment and the cryostat used. Finally, the measuring method is outlined briefly. There are 4 diagrams, 1 table and 14 references, 8 of which are Soviet, 3 German, 2 French and 1 Dutch.

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SOV/56-36-3-18/71

24(3)

AUTHOR: Borovik-Romanov, A. S.

TITLE: Investigation of Weak Ferromagnetism in a $MnCO_3$ Single Crystal (Izucheniye slabogo ferromagnetizma na monokristalle $MnCO_3$)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 3, pp 766-781 (USSR)

ABSTRACT: The present paper contributes towards solving the problem of weak ferromagnetism in antiferromagnetics by investigating the ferromagnetic properties of a very pure $MnCO_3$ rhombohedron. The paper consists of a theoretical and an experimental part. On the basis of the theory developed by I. Ye. Dzyaloshinskiy (Ref 7), the theoretical part first deals with crystal structure, and further with the temperature dependence of magnetic properties near transition point and with an investigation of anomalies. The experimental investigation of the anisotropy of the magnetic properties was carried out on an $MnCO_3$ zinc crystal (rhodochrosite), which originated from the Pyrenees and was placed at the author's disposal by the Mineralogical Museum of the Academy of Sciences, in the temperature range of 1.3 to 300°K. It was found that, in accordance with the

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Investigation of Weak Ferromagnetism in a $MnCO_3$ Single Crystal

theory, a ferromagnetic moment σ could be observed only in the basis plane. The crystal is paramagnetic along the triple axis. The temperature dependence of σ, $\chi_\perp$ and $\chi_\parallel$ was investigated in detail throughout the complete region of existence of antiferromagnetic ordering. In agreement with the theory of phase transitions of the second kind near the transition point it holds that $\sigma/\chi_\perp \sim \sqrt{T_N - T}$.

At low temperatures σ is proportional to T^2 in the range of from 1.5 to 23°K (0.7 T_N). The dispersion law and temperature dependence of the thermodynamical quantities for antiferromagnetics with a magnetic structure of the $MnCO_3$ type have been obtained by the spin wave theory method. In this case the spontaneous magnetization vector is directed perpendicular to the crystal axis. A result of this is the absence in the energy spectrum of a gap related to the anisotropy field. The qualitative formulae obtained by the author agree with experimental results. The author finally thanks Academician P. L. Kapitsa for his interest in this work, and he further thanks I. Ye. Dzyaloshinskiy for discussions and V. I.

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Investigation of Weak Ferromagnetism in a $MnCO_3$ Single Crystal SOV/56-36-3-18/71

Kolokol'nikov for his assistance in carrying out the experiments. There are 9 figures and 35 references, 13 of which are Soviet.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute for Physical Problems of the Academy of Sciences, USSR)

SUBMITTED: October 3, 1958

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24 (3)

AUTHOR: Borovik-Romanov, A. S. SOV/56-36-6-63/66

TITLE: Piezomagnetism in Antiferromagnetic Cobalt- and Manganese Fluorides (P'yezomagnetizm v antiferromagnitnykh ftoridakh kobal'ta i margantsa)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1954 - 1955 (USSR)

ABSTRACT: The magnetic symmetry of some antiferromagnetic crystals renders the occurrence of a piezomagnetic effect possible, i.e. if pressure is applied, a spontaneous magnetic moment occurs. Dzyaloshinskiy (Ref 3) showed that, especially in the group of the fluorides of transition metals, in which the antiferromagnetic vector is in the direction of the fourth order axis of the tetragonal cell, a ferromagnetic moment $m_y = \lambda\sigma_{xz}$ must be observable if a shear stress σ_{xz} is applied. This effect has, however, as yet not been experimentally detected. In order to do so, the author of the present "Letter to the Editor" investigated CoF_2- and MnF_2-monocrystals by means of a device constructed specially for this purpose. These monocrystals had

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been ground in a special manner (see figure) into the shape of parallelepipeds. By the application of the pressure p a shear stress $\sigma_{xz} = p/2$ occurred in these samples. The sample was in an inhomogeneous magnetic field ($H \parallel y$), and at certain H-values a measurable moment m_y occurred. The measurements were carried out at 20.4°K, where the antiferromagnetic order in the sample had nearly attained saturation. The error of the relative measurements amounted to $\sim \pm 3\%$, that of absolute measurements of the moment 10%. The results obtained by measuring a CoF_2-sample are shown by a figure (dependence of the molar magnetic moment on H in the range of from -1.0 to +1.0 kOe. The results obtained are briefly discussed (without pressure - no moment; at $p \sim 500$ kg/cm^2, $m_o \sim 10$ G/Mol independently of the field. In weak fields up to 500 Oe the direction of the piezomagnetic moment was unchanged. In stronger fields the direction was equal to that of the spontaneous moment; reversal of magnetization, duration 15-20 min). In MnF_2 the observed piezomagnetic effect

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Piezomagnetism in Antiferromagnetic Cobalt- and Manganese Fluorides SOV/56-36-6-63/66

is 100 times smaller than in CoF_2. The author thanks Academician P. L. Kapitsa for his interest in this investigation, N. N. Mikhaylov and O. S. Zaytsev for preparing the samples, and I. Ye. Dzyaloshinskiy for discussions. There are 1 figure and 6 references, 4 of which are Soviet.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute for Physical Problems of the Academy of Sciences, USSR)

SUBMITTED: April 1, 1959

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21(0) SOV/53-67-4-7/7

AUTHOR: Chentsov, R.

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields.

III. Galvanomagnetic Phenomena. (10 lectures). I. M. Lifshits and V. D. Peschanskiy (KhFTI, Khar'kov Physico-technical Institute, Khar'kov University) showed that the most important part in connection with the galvanomagnetic properties of metals is played by the concrete form of the Fermi surface of conductivity electrons. N. Ye. Alekseyevskiy (IFP) spoke about experiments he carried out together with Yu. P. Gaydukov. He investigated the variation of the resistance in the transversal magnetic field at helium temperatures of Au, Cu, Pb, Te, Ga, Ni and (together with T. I. Kostina) of Bi. Ye. S. Borovik and V. G. Volotskaya (KhFTI) investigated the galvanomagnetic properties at low temperatures of chromium and zirconium and found that the resistance of chromium grows with field strength without attaing a saturation value. L. S. Kan and B. G. Lazarev (KhFTI) investigated the resistance minimum in gold at low temperatures and found that if the sample is heated, the minimum disappears. Yu. P. Gaydukov (IFP) said in this connection in the course of the discussion that the minimum effect does not occur in gold in the case of very pure samples; the disappearance of the minimum is explained by the plastic deformation of the sample at helium temperatures. M. Ye. Azbel' (KhFTI) gave a report of his work in connection with the quantum theory of the high-frequency resistance of metal in a constant magnetic field at low temperatures. M. I. Kaganov and V. M. Tsukernik (KhFTI) spoke about a theoretical investigation of the influence exercised by thermoelectric forces upon the skin effect in various conductors. B. I. Verkin and B. N. Aleksandrov (KhFTI) spoke about measurements of the electric resistance of thin wires made from highly-pure tin, indium and cadmium, and computed the free length of path at 4.2°K in these metals as amounting to 1/3 to 2/3 mm. H. B. Brandt (MGU) and B. I. Verkin and I. M. Dmitrenko (KhFTI) investigated the influence exercised by the hydrostatic pressure (of 1000 atmospheres absolute pressure) upon the behavior of metals at low temperatures and investigated the quantum oscillations of the magnetic susceptibility of bismuth at 1.6 - 4.2°K. G. Ye. Zil'berman and A. M. Kosevich (KhFTI) gave a theoretical explanation of the fact that already relatively small deformations exercise considerable influence upon oscillation effects in metals. IV. Magnetism. A. S. Borovik-Romanov (IFP) delivered a report on investigations he carried out of the anisotropy of the weak ferromagnetism in monocrystal samples of the antiferromagnetic $MnCO_3$ (the effect of anisotropy was predicted by the thermodynamical theory developed by Dzyaloshinskiy). In the course of the discussion R. A. Alikhanov (IFP) spoke about neutronographical investigations he carried out of the magnetic structure of $MnCO_3$ and $FeCO_3$ at low temperatures. P. L. Kapitsa stressed the importance of the method based upon Dzyaloshinskiy's theory. N. M. Kreynes (VNIIFTRI), whose lecture was read by A. S. Borovik-Romanov, reported on measurements carried out by him (in the IFP) of the magnetic anisotropy of the antiferromagnetic $CuSO_4$- and $CoSO_4$-monocrystals.

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Ye. A. Turov (IFM AN SSSR, Sverdlovsk) spoke about his theore-

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SOV/115-60-1-15/28

AUTHOR: Borovik-Romanov, A.S., Orlova, M.P. and Strelkov, P.G.

TITLE: Establishing a Practical Temperature Scale for the 10-90° K Range. Deviations of the International Temperature Scale From the VNILFTRI Group Standard Scale and the Thermodynamic Scale Near the Oxygen Point.

PERIODICAL: Izmeritel'naya tekhnika, 1960, Nr 1, pp 34-35 (USSR)

ABSTRACT: The VNIIFTRI temperature scale for the 10-95° K range coincides with the International Scale ("MShT") at the boiling-point of oxygen (-182,97°C) except for a discrepancy of 0.01° in the 90-95° K range, which means that the interpolation formula is only suitable for temperatures near 90° K. Former comparisons made by Heuse and Otto /Ref. 3/, Keesom and Dammers /Ref. 4/, and Bricwedde and Hoge /Ref. 5/

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SOV/115-60-1-16/28

Establishing a Practical Temperature Scale for the 10-90° K Range. Deviations of the International Temperature Scale From the VNIIFTRI Group Standard Scale and the Thermodynamic Scale Near the Oxygen Point

appear to be insufficiently accurate. The authors suggest a better practical scale for the 90-273° K range. Use of the interpolation power formulas is not advised and recommendations are made to establish a scale according to the principle suggested by Strelkov and Sharevskaya /Ref. 6/. The VNIIFTRI group standard thermometers were compared at the boiling-point of "natural composition" hydrogen, which was determined as

$$T = 20.39 \pm 0.003$$

This value can differ from the thermodynamic temperature of boiling hydrogen by the value

$$20.39 \left[\frac{TO_2}{90.19} - 1\right] \pm 0.006^\circ \text{ K}$$

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SOV/115-60-1-16/28

Establishing a Practical Temperature Scale for the 10-90° K Range. Deviations of the International Temperature Scale From the VNIIFTRI Group Standard Scale and the Thermodynamic Scale Near the Oxygen Point

The article includes a temperature table of the boiling-point of "natural composition hydrogen", measured by different authors, after the phenomenon of ortho-para conversion became known. There are 3 graphs, 1 table and 12 references, of which 5 are Soviet, 4 German, 1 Dutch and 2 unidentified.

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SHAREVSKAYA, D.I.; STREIKOV, P.G.; BOROVIK-ROMANOV, A.S.; ASTROV, D.N.; MOROZOVA, G.Kh.

Difference in the temperature coefficients of the resistance of some kinds of platinum in the range of 10.8 and 273.16°K. Izm.tekh. no.7:34-37 Jl '60. (MIRA 13:7)
(Thermometry) (Platinum--Thermal properties)

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S/056/60/038/004/010/048
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AUTHOR: Borovik-Romanov, A. S.

TITLE: Piezomagnetism in Antiferromagnetic Cobalt and Manganese Fluorides

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1088-1098

TEXT: Experiments for determining the piezomagnetism of the compounds CoF_2 and MnF_2 are discussed in this work. For this purpose, a torsion balance was developed which is shown in detail in Figs. 2 and 3, and is discussed exhaustively. The single crystals of MnF_2 and CoF_2 used for the experiments were grown by N. N. Mikhaylov and O. S. Zaytsev from a melt placed in HF vapor. Because of the special construction of the torsion balance, it was possible to put the samples under pressure. Figs. 5-8 diagrammatically show the experimentally determined dependence of the molar magnetic moment of CoF_2 on the magnetic field without pressure and under a pressure of 340 kg/cm^2 taken at the hydrogen temperature. The

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Piezomagnetism in Antiferromagnetic Cobalt and Manganese Fluorides

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same Figs. also show the dependence of the transverse piezomagnetic moment per unit volume of CoF_2 on the magnitude of the shearing stress applied; and the analogous dependence of the longitudinal piezomagnetic moment per unit volume, and the piezomagnetic effect in MnF_2. An analysis of the results obtained here is made with reference to the papers of I. Ye. Dzyaloshinskiy (Refs. 5, 11, 12, 18). It is found that in addition to the piezomagnetic moment perpendicular to the direction of the sub-lattice magnetization and equivalent to the known transverse weak ferromagnetism, there exists also a moment parallel to the direction of the sub-lattice magnetization and equivalent to the longitudinal weak ferromagnetism not observed so far. The author thanks Academician P. L. Kapitsa for his interest in the work; I. Ye. Dzyaloshinskiy for valuable discussions, and V. I. Kolokol'nikov for help in the experimental work. B. A. Tavger (Ref. 6), V. I. Ozhogin, and A. N. Vetchinkin are mentioned. There are 10 figures and 23 references: 11 Soviet, 3 French, 7 US, and 1 German.

ASSOCIATION: Institut fizicheski n problem Akademii nauk SSSR (Institute for Physical Problems of the Academy of Sciences, USSR)

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Piezomagnetism in Antiferromagnetic Cobalt and Manganese Fluorides

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Borovik-Romanov, A. S.

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S/056/60/039/01/03/029
B006/B070

AUTHORS: Borovik-Romanov, A. S., Ozhogin, V. I.

TITLE: The Weak Ferromagnetism in an Antiferromagnetic $CoCO_3$ Single Crystal

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1 (7), pp. 27-36

TEXT: The present work is the continuation of an earlier work (Ref. 1) where the discovery of weak ferromagnetism in polycrystalline cobalt- and manganese carbonate crystals is reported. The authors have now investigated the magnetic properties of $CoCO_3$ single crystals in the temperature range of 1.3 to 300°K by a balance method due to Faraday. The results of measurements are shown in diagram form. Fig. 1 shows the dependence of the molar magnetic moment m on the magnetic field strength H. The five upper curves are for $H \perp z$, and the lower ones for $H \parallel z$, z being the trigonal axis. Fig. 2 shows the angular dependence of the projection of the magnetic moment on the H-direction in the (yz) plane

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The Weak Ferromagnetism in an Antiferromagnetic $CoCO_3$ Single Crystal S/056/60/039/01/03/029 B006/B070

for H = 9480 oe and T = 4.2°K. The measured points lie exactly on the curve given by the formula $m(\varphi) = \chi_{\parallel}H + \delta|\sin\varphi| + (\chi_{\perp} - \chi_{\parallel})H\sin^2\varphi$, φ being the angle between $\vec{H}$ and z. Fig. 3 shows the temperature dependence of the spontaneous ferromagnetic moment. Figs. 4a and 4b show the temperature dependence of the magnetic susceptibilities $\chi_{\perp}$ and $\chi_{\parallel}$ in the paramagnetic and ferromagnetic states of the crystal. In the temperature range of 50 ÷ 300°K, $\chi_{\perp}$ obeys the Curie-Weiss law: $\chi_{\perp} = C_{\perp}/(T - \theta_{\perp})$, and $\chi_{\parallel}(T)$ does so for temperatures over 100°K. In the range of the transition temperature, $\chi_{\perp}(T)$ has a strongly marked peak, while, $\chi_{\parallel}(T)$ shows only a slight variation. In the following, the results are discussed and compared with those of the spin wave theory and also with those of Ref. 1 (preliminary work in collaboration with M. P. Orlova) and Ref. 8. A thermodynamic theory of weak ferromagnetism is developed, and some peculiarities which distinguish the behavior of $CoCO_3$ from that of $MnCO_3$ are discussed. Thus, $CoCO_3$ shows in the paramagnetic range ($T \gg T_N$)

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The Weak Ferromagnetism in an Antiferromagnetic $CoCO_3$ Single Crystal

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an anomalously large anisotropy of susceptibility (~ 30% at 300°K). T_N lies at 18.1°K. $CoCO_3$ is further distinguished by its large spontaneous ferromagnetic moment ($\sigma_0 \approx 1440$ CGSM/mole) and the sharp peak near T_N. The latter can be explained by the thermodynamic theory of weak magnetism, and can be related to the fact that, when a magnetic field acts on a substance in a disordered state, it induces an antiferromagnetic ordering in it. The anomaly observed in the temperature dependence of the spontaneous moment at low temperatures (Fig. 6) can be explained within the framework of the spin wave theory as being due to a transition from the excitation of a single branch to the excitation of both branches of the spin wave spectrum. Here, as well as in the case of $MnCO_3$, the predictions of the spin wave theory do not show quantitative agreement. The authors thank, in conclusion, Academician P. L. Kapitsa for his interest in the work, I. Ye. Dzyaloshinskiy and N. M. Krevnes for discussions, N. Yu. Ikornikova for having supplied the sample, and V. I. Kolokol'nikov for help in the experimental work. There are 7 figures and 10 references: 8 Soviet and 2 French.

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The Weak Ferromagnetism in an Antiferromagnetic $CoCO_3$ Single Crystal

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ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences, USSR)

SUBMITTED: February 13, 1960

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BOROVIK-ROMANOV, A. S.

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

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

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

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

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

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

USSR (cont.)

LODACHEV, B., and VAYNSHTEYN, B., Institute of Crystallography, Moscow - "Electron diffraction study of thiourea $CO(NH_2)_2$"

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

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

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

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

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

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

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

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

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

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

paper to be submitted for the IUPAP Intl. Conference on Magnetism and Crystallography, Kyoto, Japan, 25-30 Sep 1961

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B109/B102

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AUTHORS: Borovik-Romanov, A. S., Kalinkina, I. N.

TITLE: Specific heat of the spin waves in antiferromagnetic $MnCO_3$

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5 (11), 1961, 1694 - 1696

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TEXT: The authors studied the temperature dependence of the specific heat of antiferromagnetics in order to verify the hypotheses on spin-wave dispersion. The measurements were carried out between 1.6 and 80°K with $MnCO_3$ samples which had been prepared by a method according to N. Yu. Ikornikova at the Institut kristallografii AN SSSR (Institute of Crystallography AS USSR). Fig. 1 shows the temperature dependence of the molar specific heat of $MnCO_3$ (circles and boldface line; the lightface line holds for $CaCO_3$). The characteristic maximum corresponds to the conversion of $MnCO_3$ from the antiferromagnetic into the paramagnetic state. In order to obtain the purely magnetic heat capacity one has to

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subtract the contributions of the lattice and of the nuclei from the overall specific heat. The first contribution can be calculated, according to F. Simon and R. C. Swain (Zs. Phys. Chem. B 28, 189, 1935), from $C_{latt} = 2.08 \cdot 10^{-4} T^3$ joule/deg.mole, since below 25°K the specific heat of $CaCO_3$ increases proportional to T^3, as can be seen from Fig. 1. This contribution amounts to not more than 10% of the total specific heat. The second contribution is $C_{nucl} = b/T^2$, since the nuclear moments start ordering already at helium temperatures. The value of $(2.7 \pm 0.5) \cdot 10^{-2}$ joule.deg/mole is given for b. After subtracting these heats one obtains the temperature dependence of the magnetic specific heat C_M as shown in Fig. 2, where the lightface straight line renders the same dependence as to be expected from the spin-wave theory. One can see that experiments and theory match each other quantitatively up to 3.7°K, $(C_M \sim T^3)$, when the values $\chi_\perp = 43 \cdot 10^{-3}$, $\eta = 0.24$, $T_N = 32.4$°K and $a = 17.5 \cdot 10^{-4}$ joule/deg^{4}mole are used in the equation

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Specific heat of the spin...

$C_M = (4\pi^2k^2/5\mu_B)\Omega_0\eta T_N(T/T_N)^3 = aT^3$ which was given by A. S. Borovik-Romanov (ZhETF, 36, 766, 1959). Accordingly, the spin-wave theory is verified. It is plain to see in Fig. 2 that C_M increases considerably between 3.7 and 6°K, and that it is again proportional to T^3 between 6 and 8.5°K as was predicted in the theory. Academician P. L. Kapitsa is thanked for his interest, Professor P. G. Strelkov for advice. There are 2 figures and 8 references: 6 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: F. Simon, R. C. Swain. Zs. Phys. Chem. B 28, 189, 1935; A. H. Cooke, D. J. Edmonds. Proc. Phys. Soc., 71, 517, 1958.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

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(5)

SHAREVSKAYA, D. I.; STRELKOV, P. G.; DOROVIK-ROMANOV, A. S.; ASTREV, D. N.; MOROZOVA, G. KH.

"Methode de reduction des resultats obtenus au cours de l'etalonnage individuel des thermometres a resistance a l'echelle internationale pratique de temperature dans le domaine 10- 90°Ka
Report presented at the 6th Session of the Advisory Committee on Thermometry to the International Committee on Weights and Measures, Sevres, France, 25-27 Sep 62

Institut des Mesures Physicotechniques (U. R. S. S.)

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CHAREVSKAYA, D. I.; ASTROV, D. N.; BOROVIK-ROMANOV, A. S.; ORLOVA, M. P.; STRELKOV, P. G.

"Realisation de l'echelle pratique de temperature dans le domaine de 10 a 90°K,"
Report presented at the 6th Session of the Advisory Committee on Thermometry to the International Committee on Weights and Measures, Sevres, France, 25-27 Sep 1962.

Institut des Mesures physicotechniques (U. R. S. S.)

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BOROVIK-ROMANOV, A. S.

BOVIK-ROMANOV, A. S.; KALINKINA, I. N.

"Magnetic Specific Heat of Carbonates of Transition Elements"

Report presented at the Symposium on Ferrolectricity and Ferromagnetism, Leningrad, 30 May - 4 June 1963

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BOROVIK-ROMANOV, A. S., KREYNES, N. M., PROZOROVA, L. A., and RUDASHEVSKIY, E. G.,

"Antiferromagnetic Resonance in $MnCO_3$ and $CoCO_3$.

report presented at the Symosium on Ferroelectricity and Ferromagnetism, Leningrad, 30 May-5 June 1963

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ACCESSION NR: AP3005245 S/0056/63/045/002/0064/0070

AUTHOR: Borovik-Romanov, A. S.; Kreynes, N. M.; Prozorova, L. A. 68 64

TITLE: Antiferromagnetic resonance in manganese carbonate 27

SOURCE: Zhur. eksper. i teoret. fiz., v. 45, no. 2, 1963, 64-70

TOPIC TAGS: magnanese carbonate, antiferromagnetic resonance, nuclear moment interaction, crystallographic anisotropy

ABSTRACT: A detailed study was made of the low-frequency branch of antiferromagnetic resonance in $MnCO_3$, in the range 4.5 to 15 Ges. The results are described by the equation

$$(\nu/\gamma)^2 = H_{res}(H_{res} + H_D) + H^2_{\Delta 1} \qquad (3)$$

where H_{res} is the external field applied to the basal plane of the crystal, H_D the Dzyaloshinskiy field that gives rise to weak ferromagnetism, and for this case is 4.4 kOe, γ the gyromagnetic square of the ratio, ν the frequency, and H^2_{Δ} is the gap in the energy spectrum and amounts to 1.6 ± 0.3 kOe^2. The effective field that gives rise to the gap is due not to the crystallographic anisotropy but to

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hyperfine interaction with the nuclear moments that are being ordered. This is confirmed by the strong temperature dependence of H_{A1}, (the resonance field is shifted by 400 Oe when the temperature is decreased from 4.2 to 15°K). The effective exchange field is found to be 300 kOe, and the magnetization of the sublattices in the ground state is found to be 13000 G, which agrees with the value 14000 G obtained assuming total saturation of the spin moments, but it is pointed out that the accuracy of the results is still low. "The authors sincerely thank P. L. Kapitsa for constant interest in the work, and M. S. Khaykin and S. P. Kapitsa for valuable advice in the development of the apparatus." Orig. art. has 5 figures and 6 formulas.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Inst. of Physics Problems, Acad. Sci. SSSR)

SUBMITTED: 21Feb63 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: PH NO REF SOV: 006 OTHER: 006

Card 2/2

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOV, A.S.; KREYNES, N.M.; PROZOROVA, L.A.

Antiferromagnetic resonance in $MnCO_3$. Zhur. eksp. i teor. fiz. 45 no.2:64-70 Ag '63. (MIRA 16:9)

1. Institut fizicheskikh problem AN SSSR.
(Manganese carbonate crystals--Magnetic properties)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

ACCESSION NR: AP4025954 S/0056/64/046/003/1151/1152

AUTHOR: Borovik-Romanov, A. S.; Prozorova, L. A.

TITLE: Threshold stauration of resonance in antiferromagnetic manganese carbonate

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 46, no. 3, 1964, 1151-1152

TOPIC TAGS: manganese carbonate, antiferromagnetic manganese carbonate, threshold resonance stauration, resonance absorption, antiferromagnetic resonance, parametric spin wave excitation

ABSTRACT: The resonance absorption in a single crystal of $MnCO_3$ was measured at high microwave power levels. Antiferromagnetic resonance was observed in the $MnCO_3$ at 9.4 Gc. The field was in the basal-plane and amounted to 1.5 kOe. The crystal used was relatively large (23 mg weight). The width of the resonance was ΔH_0 = 200 Oe. The microwave power came from a pulsed magnetron (2 μ sec). It is concluded that the saturation of the resonance in the ferromagnetic $MnCO_3$ is due to parametric excitation of spin waves with lifetime 5×10^{-5} sec. A more detailed

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

ACCESSION NR: AP4025954

be given later. The authors are grateful to Academician P. L. Kapitsa for his continuous interest in the work and to V. I. Zakirov for assistance with the experiments." Orig. art. has: 1 figure. and 1 formula.

ASSOCIATION: Institut fizicheskikh problem AN SSSR (Institute of Physics Problems AN SSSR)

SUBMITTED: 23Jan64 DATE ACQ: 16Apr64 ENCL: 01

SUB CODE: PH NR REF SOV: 001 OTHER: 002

Card 2/3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOV, A. S.; PROZOROVA, L. A.

Threshold resonance saturation in antiferromagnetic $MnCO_3$. Zhur. eksp. i teor. fiz. 46 no. 3:1151-1152 Mr '64. (MIRA 17:5)

1. Institut fizicheskikh problem AN SSSR.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

L 59571-65 EWT(1)/EPA(s)-2/EWT(m) Pt-7 IJP(c) JD/JW/GG

ACCESSION NR: AT5009433 CZ/0000/64/000/000/0017/0029

AUTHOR: Borovik-Romanov, A. S.; Kalinkina, I. N.; Kreines, N. M.; Prozorova, L. A.; Rudashevski, E. G.

TITLE: Investigation of spin-wave spectrum in antiferromagnetic carbonates

SOURCE: Conference on Low Temperature Physics and Techniques. 3d, Prague, 1963. Physics and techniques of low temperatures; proceedings of the conference. Prague, Publ. House of the Czechosl. Academy of Sciences, 1964, 17-29

TOPIC TAGS: carbonate, spin wave spectrum, temperature dependence, spontaneous magnetization, antiferromagnetic resonance, specific heat

ABSTRACT: The authors survey the principal results obtained at the Institut fizicheskikh problem (Institute of Physics Problems) AN SSSR on the spin-wave spectrum in antiferromagnetic carbonates of transition elements. Three research methods have been used: study of antiferromagnetic resonance, study of the temperature dependence of the spontaneous magnetization, and study of the temperature dependence of the heat capacity. All three methods were used to determine the dispersion law as well as to verify it quantitatively. References to the original reports of these investigations are given. The results have confirmed experimentally that the antiferromagnetic spin-wave spectrum has linear dispersion. Numerical values are given

Card 1/2

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L 59571-65
ACCESSION NR: AT5009433

of the magnitude of the gap in the spectrum of antiferromagnets possessing weak ferromagnetism, and also of all the constants characterizing the spin-wave energy spectrum of $MnCO_3$ and $CoCO_3$. Orig. art. has: 11 figures, 12 formulas, and 2 tables.

ASSOCIATION: Institute for Physical Problems, Acad. Sci. SSSR, Moscow

SUBMITTED: 0000064 ENCL: 00 SUB CODE: EM, TD

NR REF SOV: 016 OTHER: 003

Card 2/2

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

L 59568-65 EWT(1)/EPA(s)-2/EWT(m)/EPF(c)/EPR/T/EWP(t)/EWP(b)/EWA(c) Pr-4/Pad
Ps-4/Pt-7 IJP(c) JD/JW/HW/GG
ACCESSION NR: AT5009440 CZ/0000/64/000/000/0081/0083

56
55
B+1

AUTHOR: Borovik-Romanov, A. S.; Javelov, B. E.

TITLE: Linear magnetostriction in antiferromagnetic CoF_2

SOURCE: Conference on Low Temperature Physics and Techniques. 3d, Prague, 1963. Physics and techniques of low temperatures; proceedings of the conference. Prague, Publ. House of the Czechosl. Academy of Sciences, 1964, 81-83

TOPIC TAGS: magnetostriction, antiferromagnetism, piezomagnetism, low temperature research

ABSTRACT: The authors used the capacitor method of measurement of small deformations to observe experimentally magnetostriction in CoF_2 single crystals. The measuring capacitor consisted of a copper ring glued to a parallel plate, with the single crystal glued inside the ring. When the system was cooled to helium temperature a gap of approximately 20 μ was formed between the ring and the plate as a consequence of the difference in the thermal expansion coefficients. The capacitance across this gap was 200 pF, and was incorporated in an oscillator circuit, the frequency variation of which was a measure of the relative deformation. The test results proved the existence of the magnetostriction and its linearity. Quantitatively the effect proved to have half the value expected from the calculations,

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L 59568-65

ACCESSION NR: AT5009440

probably because the sample was not single-domain. It is concluded that the study of linear magnetostriction and of piezomagnetism may yield useful information on the domain structure of antiferromagnetic materials. Orig. art. has: 2 figures and 4 formulas.

ASSOCIATION: Institute for Physical Problems, Acad. Sci. SSSR, Moscow

SUBMITTED: 00Nov64 ENCL: 00 SUB CODE: SS, EM

NR REF SOV: 003 OTHER: 001

Card 2/2

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOV, A. S.; KREINES, N. M.; PROZOROVA, L. A.; RUDASHEVSKIY, Ye. G.

"The electron resonance in rhombohedral antiferromagnets with weak ferromagnetism."

report submitted for Intl Conf on Magnetism, Nottingham, UK, 6-13 Sep 64.

Inst of Physical Problems, Moscow.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

L 41344-65 EWT(1)/EPA(s)-2/EWT(m)/EPF(c)/EEC(t)/T/EWP(t)/EWP(b)/EWA(c) Pi-4/
Pt-10 IJP(c) JD/WW/GG
ACCESSION NR: AP5001833 S/0056/64/047/006/2095/2101

AUTHOR: Borovik-Romanov, A. S.; Rudashevskiy, Ye. G.

TITLE: Effect of spontaneous striction on antiferromagnetic resonance in hematite

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 6, 1964, 2095-2101

TOPIC TAGS: spontaneous striction, antiferromagnetism, resonance line, line shift, magnetic structure

ABSTRACT: An experimental study was made of the effect of compression and dilatation in the basal plane on the variation of the antiferromagnetic resonance frequency in hematite with the external magnetic field. The tested synthetic hematite single crystals were grown by M. Vihr at the Institute of Solid State Physics of the Czechoslovak Academy of Sciences. The measurements were made with a direct-amplification magnetic spectrometer at wavelengths 0.86, 1.2, and 1.4 cm. The test set-up is described in detail. The results show that upon deformation of the specimen in the basal plane the resonance line shifts in a direction that

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ACCESSION NR: AP5001833

depends on the mutual orientation of the applied force and the external magnetic field. To interpret the results, the authors calculate the energy spectrum of the crystal with account of the elastic and magnetoelastic energies, on the basis of the complete Hamiltonian for rhombohedral antiferromagnets possessing weak ferromagnetism. It is shown that the resonance spectrum of such a magnetic structure may have a gap, independent of the directions, which can be changed by deforming the crystal perpendicular to the threefold axis. The theoretical results agree with experiment. "The authors thank Academician P. L. Kapitsa for continuous interest and I. Ye. Dzyaloshinskiy for useful discussions." Orig. art. has: 2 figures and 7 formulas.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems, Academy of Sciences SSSR)

SUBMITTED: 24Jul64 ENCL: 00

SUB CODE: SS, EM NR REF SOV: 007 OTHER: 005

Card 2/2

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

L 58515-65 EPF(c)/EWT(1)/EEC(t) Pi-4 IJP(c) GG/WW

ACCESSION NR: AP5016279 UR/0386/65/001/005/0018/0022

29
35
B

AUTHOR: Borovik-Romanov, A. S.; Tulin, V. A.

TITLE: Mixed electron-nuclear resonance in antiferromagnetic $MnCO_3$

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 1, no. 5, 1965, 18-22

TOPIC TAGS: electron nuclear resonance, antiferromagnetism, manganese compound, absorption line, resonant frequency

ABSTRACT: The authors studied the dependence of the resonance frequency on the magnetic field in the region of the lowest frequencies. The experiment was carried out with a spectrometer with low-frequency modulation of the magnetic field, and the derivative of the absorption line was recorded with slow passage through the magnetic field. The $MnCO_3$ single crystal was placed in a coil, which was connected through an attenuator to a 150-700 Mcs generator. The coil was coupled inductively with a receiving loop connected to a crystal detector. The ac signal from the detector, at the magnetic-field modulation frequency, was amplified and automatically recorded. Such a simple scheme made possible measurements over a very wide fre-

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ACCESSION NR: AP5016279

4

quency range. The constant magnetic field and the radio-frequency field were mutually perpendicular and located in the (111) plane of the sample; this excited the low-frequency branch of the resonant spectrum. The experimental results for 4.2K and 1.8K are in good agreement with previously derived equations (ZhETF v. 45, 64, 1964). The results show that the resonance observed in weak fields is a mixed electron-nuclear resonance. At sufficiently strong fields, when the frequencies of the nuclear and electronic resonances differ grately, we have a weakly perturbed nuclear magnetic resonance spectrum. With increasing magnetic field, the radio-frequency power is absorbed by the electrons and nuclei together. "The authors are grateful to Academician P. L. Kapitsa for interest in the work, to Ye. A. Turov for useful discussions, and to N. Yu. Ikornikova for supplying the single crystals. Orig. art. has: 2 figures and 5 formulas.

ASSOCIATION: Institut fizicheskikh problem im. S. I. Vavilova Akademii nauk SSSR (Institute of Physics Problems, Academy of Sciences, SSSR)

SUBMITTED: 22Apr65 ENCL: 00 SUB CODE: NP, EM

NR REF SOV: 003 OTHER: 005

Card 2/3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOV, A.S. (Moskva); PITAYEVSKIY, L.P. (Moskva)

Soviet physicist is awarded the Niels Bohr Gold Medal. Priroda 54 no.2:113-114 F '65. (MIRA 18:10)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

KHARITON, Yu.B.; KONDRAT'YEV, V.N.; BOROVIK-ROMANOV, A.S.; ZAVARITSKIY, N.V.; MALKOV, M.P.; KHAYKIN, M.S.; SHARVIN, Yu.V.

Aleksandr Iosifovich Shal'nikov; on his 60th birthday. Usp. fiz. nauk 87 no.1:171-172 S '65. (MIRA 18:9)

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

L 36228-66 EWT(1) IJP(c) WW/GG

ACC NR: AP6024515 SOURCE CODE: UR/0386/66/004/002/0057/0061

25
21
B

AUTHOR: Borovik-Romanov, A. S.; Prozorova, L. A.

ORG: Institute of Physics Problems im. S. I. Vavilov, Academy of Sciences SSSR (Institut fizicheskikh problem Akademii nauk SSSR)

TITLE: Coupling between two spin oscillation modes in antiferromagnetic resonance

SOURCE: Zh eksper i teor fiz. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 2, 1966, 57-61

TOPIC TAGS: manganese compound, ferromagnetic resonance, antiferromagnetism, crystal symmetry, temperature dependence, frequency shift

ABSTRACT: The authors report observation of a strong shift of the resonant frequencies in the vicinity where the two branches of the antiferromagnetic-resonance spectrum of an antiferromagnet intersect. This shift is due to the mutual coupling in the two oscillation branches. The tests were made on single-crystal $MnCO_3$ in a waveguide at 4.2K. The antiferromagnetic resonance was observed by noting the change of the reflected microwave signal as a function of the applied static field. The results obtained at 125 and 117 Gcs in the case when the external field was strictly parallel to the basal plane of the crystal are in good agreement with the theoretical formulas of the antiferromagnetic resonance frequency without allowance for the hyperfine interaction. Even a slight inclination of the direction of the external field relative to the basal plane caused a strong change in the temperature dependence of the resonant

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field. All these data are interpreted as proof of a strong mutual coupling between the two oscillation modes of the two sublattices of the antiferromagnet. The resultant shift amounts to ~1.5 kOe when the angle between the field and the basal plane is ~2° and ~5 kOe at an angle ~6°. The results agree qualitatively with calculations in which the Hamiltonian for rhombohedral crystals of the D_{3d}^{6} group are used. A more detailed comparison of the experiment with the calculations will be made after measurements at other frequencies are completed. The authors thank P. L. Kapitsa for continuous interest, I. Ye. Dzyaloshinskiy for useful discussions, and K. I. Rassokhin and V. S. Zakirov for help with the experiments. Orig. art. has: 3 figures.

SUB CODE: 20/ SUBM DATE: 16May66/ ORIG REF: 004/ OTH REF: 002

Card 2/2

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

A method for the determination of strontium in the ash of organisms. S. A. Borovik and T. F. Borovik-Romanova. *Trav. lab. biogéochim. acad. sci. U. R. S. S.* 4, 259-64(1937).—10% solns. of naked marine plants and animals were acidified with 1% HCl. A condensed spark was used as source of light. The lower carbon electrode had a cavity 5 mm. deep and 5 mm. wide to hold the soln. Each photographic exposure required about 0.6 cc. of the soln. Every 10 sec. 0.1 cc. of the soln. was added to sustain the level. A Zeiss spectrograph was used. Exposure time was 1 min., the slit 0.03 mm. The spectra of the samples were photographed in between the spectra of the standard solns. and Sr line intensities were evaluated at equal intensities of Ca lines. In detn. of high concns. of Sr the line 4607, 342 A., is most convenient, and for low concns. the line 4077, 714 A. gives best results.

T. Laanes.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

B/C

A-1

Variations of intensity in titanium and vanadium lines, caused by the introduction of sodium and potassium salts into the arc. S. A. Borovik and T. E. Borovik-Romanova (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 543—546).—The intensities of four lines of at. Ti are increased by the presence of foreign substances in the C arc in the order: $Pb_3O_4 < K_2CO_3 < SiO_2 < NaCl < KCl$; in the case of four lines of ionised Ti the order is NaCl, $SiO_2 > Pb_3O_4 > K_2CO_3$. KCl has a depressant action. The intensities of three lines of at. V are considerably raised by KCl and NaCl, whereas those of five lines of ionised V are unaffected by NaCl, and reduced by KCl. R. C. M.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Borovik-Romanova, T. F.

3

ca

Effect of sodium, potassium and lithium salts introduced into the flame on the intensity of the rubidium line. T. F. Borovik-Romanova. *Compt. rend. acad. sci. U. R. S. S.* 21, 328-31(1938)(in English).- The Rb lines from RbCl were weakened by NaCl, NaBr, NaI and LiCl, while KCl, NaF and Na_2SO_4 showed little or no effect. The difference is ascribed to the greater heat of formation of the latter compds. A. O. Allen

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

CA

11 A

Spectroscopic determination of barium in the ash of marine organisms. T. F. Borovik-Romanova. *Trav. lab. biogéochim. acad. sci. U.R.S.S.* 5, 171-2 (in French, 173) (1939).—A 220-v., 4-amp. arc and a Zeiss spectrograph were used. **Most comparisons** were made at line 4934.1 A. Shells of *mollusks* **and the skeletons** of *Echinodermata* contained 0.001-0.006% **Ba**, rarely 0.02-0.03% as in some terrestrial **and fresh-water** animals. *Lithothamnium*, a marine **alga composed of Ca** and Mg carbonates, contained 0.005-0.009% **Ba. Spectroscopic determination** of barium in **the ash of plants.** *Ibid.* 175-8 (in French, 178). Since Sr was detd. simultaneously, the standards were mixed **with Sr** in proportions approximating the contents of the ash to be detd. Powd. graphite contg. 10% Y (as nitrate) was mixed (1:1) with the samples and standards to equalize **volatility** and the intensity of Ba lines at 4934.09 and 4554.037 A. A green filter was also used requiring an exposure time of 80 sec. The Y lines at 4883.69 and 4043.69 were used for comparison and checking. In 25 species from various regions the ash contained 0.032-0.5% Ba. **Distribution of lithium in plants.** B. I. Bodunkov. *Ibid.* 179-185 (in French, 180).—The ash of 113 species contained Li, detd. by visual spectroscopy. Quant. spectroscopic detn. of the ash of 50 species showed a content of from 4×10^{-4} to 7.5×10^{-3}% Li. T. Laanes

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

Change of intensity in rubidium lines caused by the presence of certain salts and acids in solution. S. A. Borovik and T. F. Borovik-Romanova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, [illegible], 732—733).—The source was a spark with modified Gerlach cup and Feussner circuit. The presence of K (as KCl) or Na (as NaCl or Na_2SO_4) increases the intensity of the Rb line 7947·63 A. considerably; AcOH and HCl have only slight effects. N-KCl gives an intensification equal to that obtained by increasing the [Rb] to 0·05%. The influence reaches saturation at ~0·1N. H. V. S.-R.

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1ST AND 2ND ORDER

PROCESSES AND PROPERTIES INDEX

BC

a-1

Rubidium content of sea-water. T. F. Borovik-Romanova (*Compt. rend. Acad. Sci. U.R.S.S.*, 1944, 43, 216—218).—Spectrographic determinations of the Rb content of the H_2O of different open and inland seas are recorded. The [Rb] of the H_2O of all the open seas investigated is $\sim 2 \times 10^{-6}$%. The Black Sea, with $9\cdot4 \times 10^{-6}$%, contains less Rb than the others. [Rb] does not vary with depth in this sea. The silting waters of the Barents Sea and of the Sea of Okhotsk approach sea-H_2O in their [Rb]. The ratio [Rb] : [K] is practically const. at 0·0005, but for inland seas the ratio is lower.

I. S. T.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

The Rb content of plants. T. F. Borovik-Romanova. *Doklady Akad. Nauk S. S. S. R.* 43, 168-71(1944).—Tabulated data show that the Rb content of various salt water plants (varieties of Laminariales, Fucales, Rhodymeniales, Bangiales, Ulotrichales, Charales and Potamogetonaceae from the Pacific Ocean and the Barents and Caspian Seas) is 1.2 × 10⁻⁶% to 6.6 × 10⁻⁶%, i. e., approx. 10 times the Rb content of sea water. Fresh are: lengthening of the prophase and interphase of meiosis; decrease of terminalization of chiasmata at metaphase; formation of chromosome fragments, bridges, lagging chromosomes and restitution nuclei; induction of irregularities in chromosome distribution; and formation of giant microspores, as a result of failure of cytokinesis of the sporocyte. The reaction of dividing cells to lack of Cl indicated that cells undergoing meiosis were much more sensitive than cells in mitosis as detd. previously in expts. on *Hordeum*.

I. E. Webster

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

Content of rubidium in plants. I. T. F. BOROVIK-ROMANOVA (Compt. rend. Acad. Sci. U.R.S.S., 1944, 43, 163-165). -- Rb in seaweeds and fresh-water plants was determined by Spectrum analysis. Seaweeds of the order Laminariales contained (fresh basis) 0·32-5·6 mg., and those of the order Fucales 0·12-0·19 mg. of Rb per 100 g.; the average Rb: K ratio was $3·7 \times 10^{-4}$. Fresh-water plants contained 0·14-0·52 mg. of Rb per 100 g., with a Rb: K ratio of $7·8 \times 10^{-4}$. The % of Rb in seaweeds is about 10 times as great as in the surrounding medium, whilst that in fresh-water plants is about 1000 times as great. R. H. H.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

~~ROMANOVA-BOROVIK, T.F.~~

BOROVIK-ROMANOVA, T. F.

Content of rubidium in plants. II. T. F. BOROVIK-ROMANOVA (Compt. rend. Acad. Sci. U.R.S.S., 1944, 44, 285-288; cf. A., 1945, III, 267).- The concn. of Rb is approx. the same [usually (fresh basis) 0·1-1·0 mg. per 100 g.] in sea algae, fresh-water plants, and land plants, despite wide difference in Rb content of the surrounding media. Plants absorb Rb and K in about the same ratio as that in which these elements occur in the surrounding medium; thus, the Rb: K ratio is 0·00037 in sea algae and 0·0005 in sea-water, whilst it is 0·002 in land plants and 0·0028 in the soils. R. H. H.

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

PROCESSES AND PROPERTIES INDEX

8

Geochemistry of strontium. A. P. Vinogradov and T. F. Borovik-Romanova. *Doklady Akad. Nauk S.S.S.R.* 46, 211-4(1945); *Compt. rend. acad. sci. U.R.S.S.* 46, 103-6(1945)(in English).—The mode of occurrence of $SrSO_4$ (I) as celestite in conjunction with dolomite, limestone, and gypsum suggests the following deposition mechanism. The amt. of Sr in sea water (1.3×10^{-10} g) and the relative soly. of Ca and Sr are such that deposition of Sr does not begin so long as limestone or dolomite is being deposited. Deposition of Sr begins along with $CaSO_4$, with the result that the upper zones of carbonate rocks directly underlying anhydrite-gypsum are particularly rich in I. Migration of I can occur rather easily because of its soly. in NaCl soln. J. W. Perry

METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

PROCESSES AND PROPERTIES INDEX

Effect of total composition on the intensity of lithium lines in the spectrum of a sample. S. A. Borovik and T. F. Borovik-Romanova. *Zhur. Anal. Khim.* 1, 25-9(1946). — The influence of NaCl, KCl, and Cu_2Cl_2 on the spectral line at 6707.7 A. was found to be considerable and high values for the Li content of soil were indicated. In a series of spectra taken from the same sample by shifting the plate every 30 sec. it was found that in case of soil and soil + NaCl, the line 6707.7 A. appears only on the first 3 spectra while in soil + Na_2SO_4 this line appears only in the 4th, 5th, and 6th spectra. M. Hesch

METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOV, T F

Aug 1946

USSR/Geochemistry
Rubidium

"Rubidium in the Biosphere," T F Borovik-Romanov, 38 pp

"Trudy Biogeokhimicheskoy Lab" No 8

Spectroscopic methods of determining rubidium and rubidium content in sea water and the water of salt lakes, in soils, in plants and animal organisms. Tables and photographs of equipment. Bibliography.

3T36

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Influence of total composition of a sample on the intensity of the spectral lines in spectrum analysis of mineral raw materials. S. A. Borovik and T. F. Borovik-Romanova. *Izvest. Akad. Nauk S.S.S.R., Otdel Khim. Nauk* 1948, 161-4(1948). The influence of Na and K salts on the line intensity of Li, Rb, Ti, and V under various conditions of excitation was studied. NaCl and KCl in an arc (d.c.) enhance the intensity of neutral Ti and V atoms and weaken the lines of the ionized atoms (the material used was a sample of soil); the intensifying effect was also observed in examn. of soln. by the spark method. Various salts of Na mixed with the soil sample gave different degrees of variation of intensity of the 6707.8-A. line in an a.-c. arc, depending apparently on the variation of rate on evapn.; only NaCl intensified the line, while Na_2HPO_4, AcONa, $Na_2C_2O_4$, and Na_2CO_3 failed to change the intensity of this line of Li; similar results were obtained in d.-c. arc. KCl was somewhat more effective than NaCl, while $CuCl_2$ weakened the line considerably and Cu_2Cl_2 had a smaller effect. The admixt. of 1:1 KCl intensified the Li line so as to give an apparent increase of Li concn. by 6-fold; NaCl effect was a 4-fold intensification. When natural $CaSO_4$ was used as the Li-bearing sample, Na_2SO_4 was found to have a greater intensification effect than NaCl, and Na_2CO_3 gave a slight intensification. It was shown that in arc excitation the soil sample loses its Li rather rapidly (in samples used it was absent in the last 3 exposures of a series of 6, spaced every 30 sec.); this holds for admixts. with NaCl, but when Na_2SO_4 was added, the Li line was absent in early exposures and appeared in the later ones. Study of spectra with high-voltage (flame) arc on solns. contg. 0.001% Li and 0.01-1.0 *N* solns. of NaCl or Na_2SO_4, showed a gradual loss of intensity of the Li line in both cases, with Na_2SO_4 being more effective than NaCl. The use of the high-voltage arc (which is poor in lines of neutral atoms) in a study of NaCl and Na_2SO_4 effects on the 3273.96 line of Cu, 3414.76 line of Si, and 2801.1 line of Mn, showed that both salts reduce line intensity, with Na_2SO_4 being most effective. The 6230.73 line of Ca vanishes at 0.1 *N* concn. of NaCl or Na_2SO_4.

G. M. Kosolapoff

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T. F.

USSR/Chemistry-Lithium Nov/Dec 48
Chemistry-Spectroscopic Equipment

"Method of Quantitative Spectroscopic Identification of Lithium in the Soil," T. F. Borovik-Romanova, Inst of Geochem and Anal Chem, Acad Sci USSR, 4 pp

"Zhur Anal Khim" Vol III, No 6, 362-65

Method described does not require complex preparations. Sources of excitation are AC arcs used in connection with an activator. Use of hooded carbon electrodes increases reliability of determining presence of lithium. Average margin of error of this method is ± 8%. Submitted 1 Jan 48.

49/49T27

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T. F.

23109 O soderzhanii redkikh elementov v nasekomykh po dannym spektral'nogo analiza. Trudy biogeokhim. Laboratorii (In-t geokhimii i analit. Khimii im. Vernadskogo), IX, 1949, C. 147-54. - Bibliogr: C. 154

SO: LETOPIS' NO. 31, 1949

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T. F. 176T33

USSR/Electronics - Oscillator, Tesla 1 Aug 50

"Application of High-Frequency Tesla Oscillator to Quantitative Spectral Analysis of Solutions," S. A. Borovik, T. F. Borovik-Romanova, Inst Geol Sci, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXIII, No 4, pp 683-684

Describes app developed during their work of finding more suitable methods of spectrographic detn of strontium in samples of sedimentary rocks, which (i.e., methods) would exclude influence of different volatility of samples. App possesses great sensitivity relative to accuracy of quant detn and small consumption of products. Submitted 5 Jun 50 by Acad D. S. Belyankin.

PA 176T33

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA T. F.,

USSR/Chemistry - Spectrography in Geochemistry Sep/Oct 50

"Some Applications of Spectral Analysis in Geochemistry," S. A. Borovik, T. F. Borovik-Romanova, Inst Geol Sci, Inst Geochem and Anal Chem, Acad Sci USSR

"Iz Ak Nauk SSSR, Ser Fiz" Vol XIV, No 5, pp 665-669

Worked out 3 methods: detection of small amt of rare alkali metals, Li, Rb, Cs; application of Sventitskiy's activating ac arc to analysis of solutions; application of hf generator to analysis of solutions.

172T12

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

Borovik - Romanova, T.F.

K-7

USSR/Optics - Optical Methods of Analysis. Instruments.

Abs Jour : Referat Zhur - Fizika, No 3, 1957, 7956

Author : Borovik, S.A., Borovik - Romanova, T.F., Mikhay-lova, G.V., Pavlonko, L.I.

Title : Spectral Method of Quantitative Determination of Small Concentrations of Strontium and Barium Without Converting the Sample Into a Solution.

Orig Pub : Zavod. laboratoriya, 1953, 19, vyp. 10, 1200-1201

Abstract : A method is proposed for quantitative spectral analysis of strontium and barium in carbonate rocks with introducing into the discharge a pulverized sample, coated on carbon bands. During four minutes the charge of 0.01 gram is completely burned in a 6 amp ac arc. The photography was made with the ISP-51 using a camera with f = 270 mm, and the lines employed were the Sr 4607.331, Ba 4554.042, and Ba 4934.086; the comparison line was Ca 4581.45 A. The method makes it possible to determine 5 x 10^{-4}% strontium and 2 x 10^{-4}% barium. The mean arithmetic relative error is ± 8%.

Card 1/1

- 102 -

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

USSR/Chemistry - Spectroscopy

Card 1/1 : Pub. 145 - 2/10

Authors : Borovik-Romanova, T. F.; Korolev, V. V.; and Kutsenko, Yu. I.

Title : Spectroscopic determination of Sr and Li in natural waters

Periodical : Zhur. anal. khim. 9/5, 265-269, Sep-Oct 1954

Abstract : Spectroscopic determination of Sr and Li in various natural waters (~ 200 samples) of different origin, is described. The Sr-content in the investigated water samples was fixed at $1 \cdot 10^{-5}$ to $1 \cdot 10^{-3}$% and that of Li at $1 \cdot 10^{-7}$ to $1 \cdot 10^{-4}$%. The ratio of the Ca content to the Sr content in the studied waters made the determination of the water origin (sea or continental) possible. Seven USSR references (1934-1951). Tables; graph; illustration.

Institution : Acad. of Sc. USSR, The V. I. Vernadskiy Institute of Geochemistry and Analytical Chemistry, Moscow

Submitted : July 9, 1954

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.

Ninth conference on spectroscopy. Zhur.anal.khim. 9 no.6:382 N-D '54. (MLRA 8:1)
(Spectrum analysis)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

USSR/ Minerals - Analysis

Card 1/1 Pub. 43 - 26/97

Authors : Borovik, Romanova, T. F.

Title : Entry of separate component parts of mineral samples from the cavity of a carbon electrode into the flame of a DC-arc

Periodical : Izv. AN SSSR, Ser. fiz. 18/2, page 261, Mar-Apr 1954

Abstract : The entry of basic elements of a mineral sample into the flame of a DC arc was investigated for granites, mica, basalt and clay. It was found that the entry into the flame of Al, Si, Mg, and Na was different for the minerals mentioned. The effect of adding foreign substances to the samples and the effect of preliminary heating of the sample on the entry of individual elements of the sample into the arc flame was also investigated. Preheating of the sample was found to change the evaporation of the sample but otherwise it was considered as useful since it increased the evaporation stability. Addition of foreign admixtures to samples affect the nature of evaporation of the sample.

Institution : Academy of Sciences, USSR, The V. I. Vernadskiy Institute of Geochemistry and Analytical Chemistry

Submitted : .....

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

6
0
8

1031. Spectrographic analysis of clays for basic components. E. E. Vaisoblain, T. F. Borovik-Romanova and V. V. Korolev (V.I. Vernadskii Inst. Geochem. and Anal. Chem., Acad. Sci. USSR, Moscow). *Zh. Anal. Khim., SSSR*, 1955, 10 (3), 158-163.—A d.c. arc is used to obtain the content of SiO_2, Al_2O_3, MgO, Fe_2O_3 and CaO in clays. The powdered materials are mixed with CuO and carbon powder. Three lines of Cu are used as internal standards. Calibration graphs are obtained by the use of eight synthetic standards.

G. S. SMITH

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

VAYNSHTEYN, E.Ye.;BOROVIK-ROMANOVA, T.F.;KOROLEV, V.V.

Spectrum analysis of the basis components of clay. Izv.AN SSSR.Ser.fiz. 19 no.2:194 Mr-Ap '55. (MLRA 9:1)

1.Institut geokhimii i analiticheskoy khimii imeni V.I.Vernadskogo.
(Tartu--Spectrum analysis--Congresses)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T. F.

3767. Some methods of using the activated a.c. arc for the determination of alkali and alkaline-earth elements (in natural waters). T. F. Borovik-Romanova, V. V. Korolev, Yu. I. Kutsenko and N. M. Tarafonov. *Izv. Akad. Nauk SSSR, Ser. Fiz.*, 1956, 19 (2), 198–197; *Ref. Zhur., Khim.*, 1956, Abstr. No. 18,177.—For determination of Li (8×10^{-3} to 5×10^{-4} per cent.) and Sr ($2{\cdot}3 \times 10^{-4}$ to 6×10^{-3} per cent.) in natural waters, $CsNO_3$ soln. (1·5 per cent.) is added in the ratio 2:1 as an internal standard, the solution is placed in a fulgurator and the activated a.c. arc spectrum is obtained. The line pairs Sr 4607·3 - Cs 4593·2 A and Li 6707·8 - Cs 6723·3 A are measured.

C. S. SMITH

Inst. Geochem + Anal Chem im. V.I. Vernadskiy, Acad. Sci USSR

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, Tat'yana Fedorovna; VINOGRADOV, A.P., akademik, otvetstvennyy redaktor; RAZUMOVA, L.L., redaktor izdatel'stva; ZEMLYAKOVA, T.A., tekhnicheskiy redaktor

[Spectrographic determination of alkali and alkaline earth elements (in water, plants, soils, and rocks)] Spektral'no-analiticheskoe opredelenie shchelochnykh i shchelochnozemel'nykh elementov (v vodakh, rasteniiakh, pochvakh i porodakh). Moskva, Izd-vo Akademii nauk SSSR, 1956. 183 p. (MIRA 9:12)

(Alkali metals) (Spectrum analysis)
(Alkaline earth metals)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

Effect of total composition on the passage of individual elements of the sample into the flame of the arc. Zhur.anal.khim. 11 no.2: 129-134 Mr-Ap '56. (MLRA 9:8)

1. Institut geokhimii i analiticheskoy khimii imeni V.I. Vernadskogo AN SSSR, Moskva.
(Spectrum analysis)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOV, T.F.

USSR/ Analytical Chemistry. General Problems. G-1

Abs Jour: Referat. Zhur.-Khimiya, No. 8, 1957, 27117.

Author : T. F. Borovik-Romanov.

Title : Improved Method of Sample Introduction into Arc Flame at Work with Activated Alternating Current Arc.

Orig Pub: Zh. analit. khimii, 1956, 11, No. 5, 634 - 635.

Abstract: In order to avoid the formation of buttons falling out from the carbon electrode during the exposition, charcoal is introduced into the electrode channel under the sample. In order to keep the sample away from being thrown out of the electrode, the substance is covered with powdered charcoal.

Card 1/1

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.; SOSEDKO, A.F. [deceased]

Amount of rare alkali metals in minerals from pegmatite veins of the Kola Peninsula according to spectral analyses. Geokhimiia no.5:368-379 '57. (MIRA 12:3)

1. V.I. Vernadsky Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, USSR, Moscow and the Kola Branch of the Academy of Sciences, USSR.
(Kola Peninsula--Pegmatites) (Alkali metals)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.; KALITA, Ye.D.

Cesium-rubidium microcline-perthite and the distribution of rare alkali metals in it [with summary in English]. Geokhimiia no.2:107-114 '58. (MIRA 12:4)

1. V.I. Vernadskiy Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, U.S.S.R., and Institute of the Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry, Academy of Sciences, U.S.S.R., Moscow.
(Kola Peninsula—Microcline) (Rubidium)
(Cesium)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

SOV/ 7-58-4-5/13

AUTHORS: Borovik-Romanova, T. F., Sosedko, A. F. (Deceased), Savinova, Ye. N.

TITLE: On the Ratio Between the Potassium- and Rubidium Content in Minerals From Pegmatitic Veins of the Kola Peninsula According to the Data of Spectral Analysis (Ob otnoshenii soderzhaniy kaliya k rubidiyu v mineralakh iz pegmatitovykh zhil Kol'skogo poluostrova po dannym spektral'nogo analiza)

PERIODICAL: Geokhimiya, 1958, Nr 4, pp. 334 - 341 (USSR)

ABSTRACT: A total of 53 samples was investigated by means of the spectrograph ISP -51; the lines 7800,23; 7947,60 Å were used for the determination of rubidium, the lines 7664,91; 7698,98 Å and 6911,30; 6938,98 Å for the determination of potassium. Accuracy in the case of rubidium amounts to ±8 %, in that of potassium to ±9,4 %, ±7,4 % respectively. The results are given in a table. The following fields were investigated:
A) Pegmatite field in the southern part of the Kola peninsula.
I) Northwestern part of the field (microclines)

Card 1/4

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

SOV/7-58-4-5/13

On the Ratio Between the Potassium- and Rubidium Content in Minerals From Pegmatitic Veins of the Kola Peninsula According to the Data of Spectral Analysis

"Zhila na bolote", (microclines)
II) Central part of the pegmatite field (microclines)
III) Southern- and southeastern part of the field pegmatite
Southern veins (microclines)
Vein in the southeastern part of the field (microclines)

B) Pegmatitie field, 30 km southeast of the investigated field (microclines)

C) Microclines from other regions of the Kola peninsula

D) Pegmatite fields of the Ural and the Vostochnoye Zabaykal'e (amazonites), mica of the Kola peninsula (lepidolite, muscovite).

Results obtained by the investigation of the microclines:
1) The potassium content amounts to between 7,84 % and 13,74%, the rubidium content is between 0,1 % and 1,5 %.

2) The K/Rb-ratio is between 106 (north and northwest) and 7,0 (southeastern field). If the results are plotted on a diagram with % Rb as the abscissa and K/Rb as the ordinate, four groups can be distinguished. The latter are

Card 2/4

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

SOV/7-58-4-5/13

On the Ratio Between the Potassium- and Rubidium Content in Minerals From Pegmatitic Veins of the Kola Peninsula According to the Data of Spectral Analysis

discussed.

3) In the zonary pegmatitic veins of the south- and south-eastern part the K/Rb-ratio is reduced from the contact to the center from 26 to 15.

In the investigation of the K/Rb-ratio in mica it was found that rubidium increases like in the case of microclines, as compared to potassium, from the northwest to the southeast of the field and in the zonary veins from the contact to the center. There are 4 figures, 1 table, and 11 references, 4 of which are Soviet.

ASSOCIATION: Institut geokhimii i analiticheskoy khimii im. V. I. Vernadskogo AN SSSR i Kol'skiy filial AN SSSR (Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy AS USSR and Kola Branch AS USSR)

SUBMITTED: April 10, 1958

Card 3/4

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

SOV/7-58-4-5/13

On the Ratio Between the Potassium- and Rubidium Content in Minerals From Pegmatitic Veins of the Kola Peninsula According to the Data of Spectral Analysis

1. Minerals--Analysis 2. Potassium--Determination 3. Rubidium--Determination
4. Spectrographic analysis--Applications

Card 4/4

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

Methods for the spectrum analysis of the alkali elements.
Fiz.sbor. no.4:361-363 '58. (MIRA 12:5)

1. Institut geokhimii i analiticheskoy khimii imeni V.I. Vernadskogo AN SSSR.
(Alkali metals--Spectra)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

AUTHORS: Borovik-Romanova, T. F., Sosedko, A. F., 20-3-33/59
(Deceased)

TITLE: On the Content of Rubidium in the Beryls of Pegmatite Veins of the Kola Peninsula (O sodershaniyakh rubidiya v berillakh pegmatitovykh zhil Kol'skogo poluostrova).

PERIODICAL: Doklady AN SSSR, 1958, Vol. 118, Nr 3, pp. 534-536 (USSR)

ABSTRACT: The authors observed a permanent occurrence of rubidium in beryl in the above veins. The method of determination of this element in beryl was imperfect so that no reliable figures are available. Here rubidium was determined by means of spectral analysis. An activated arc with carbon electrodes served as source of excitation. Both vast belts of the peninsula containing pegmatite veins are described in detail. There is only a loose connection between the mineralogic petrographic details and the topic of this paper. The results of determination of the content of rubidium are summarized on tables.

Conclusions. 1. Rubidium was found in all beryls investigated. Its content shows a certain dependence on the paragenetic associations of the minerals followed by rubidium. In the North-

Card 1/3

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

On the Content of Rubidium in the Beryls of Pegmatite Veins of the Kola Peninsula 20-3-33/59

Kol'skiy pegmatite belt beryls are marked by their little Rb content ($< 3,3.10^{-3}$ %); in the case of beryls from zonal pegmatite veins an increase of the Rb-content according to the rule from the zone of contact (18.10^{-3} %) towards the centre (to 110.10^{-3} %) is observed. Also in the case of other minerals the Ru content increases in the above direction. 2. With rubidium also potassium was found in all beryls investigated. Apparently these two elements replace Cs (ref. 1).There are 1 table and 1 Slavic reference.

ASSOCIATION: Institute for Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy AN USSR (Institut geokhimii i analiticheskoy khimii im. V. I. Vernadskogo Akademii nauk SSSR). Kola Branch AN USSR, imeni S. M. Kirova (Kol'skiy filial im. S. M. Kirova Akademii nauk SSSR).

PRESENTED: May 13, 1957, by A. P. Vinogradov, Academician

Card 2/3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

On the Content of Rubidium in the Beryls of Pegmatic Veins of the Kola Peninsula 20-3-33/59

SUBMITTED: May 13, 1957

AVAILABLE: Library of Congress

Card 3/3

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206510018-8

BOROVIK-ROMANOVA, T.F.

PHASE I BOOK EXPLOITATION SOV/4443

Akademiya nauk SSSR. Komissiya po analiticheskoy khimii

Metody opredeleniya primesey v chistykh metallakh (Methods of Determining Admixtures In Pure Metals) Moscow, 1960. 411 p. (Series: Its: Trudy, 12) 3,500 copies printed.

Resp. Eds.: A.P. Vinogradov, Academician, and D.I. Ryabchikov, Doctor of Chemical Sciences; Ed. of Publishing House: M.P. Volynets; Tech. Ed.: T.V. Polyakova.

PURPOSE: This collection of articles is intended for chemists, metallurgists, and engineers.

COVERAGE: The articles describe methods for detecting and determining various admixtures and their traces in pure metals. Also discussed are many chemical, physicochemical, electrochemical, spectrochemical and luminescence methods of analyzing materials of high purity. The editors state that these methods have been developed within the last five or six years by various Soviet scientific institutes, and are now widely used in research and factory laboratories of the Soviet Union. No personalities are mentioned. References, mostly Soviet, accompany each article.

Melgard, Sh.G., and S.M. Solodovnik. Analysis of Bismuth for Determining Admixtures 172

Krauz, L.S., A.G. Karabash, Sh. I.Feyzulayev, V.M. Lipatova, and V.S. Molava. The Spectrochemical Method of Determining Admixtures in Metallic Bismuth and Its Compounds 175

Sinyakova, S.I., and Ye.K. Gol'braykh. Determination of Small Quantities of Lead in Metallic Bismuth 187

Sinyakova, S.I., and L.A. Tsvetkova. Determination of Admixtures of Cadmium, Silver, and Gold in Metallic Bismuth With the Aid of Dithizone 191

Sinyakova, S.I., and Ch.Ya. Krol'. Determination of Admixtures of Antimony, Iron, Manganese, and Tellurium in Bismuth 206

Ryabchikov, D.I., and V.K. Belyayeva. Determination of Small Quantities of Rare-Earth Elements in Metallic Bismuth 217

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Mulyuga, D.P., and N.V. Blyuyer (deceased). Polarographic Determination of Copper Admixtures in Metallic Bismuth 224

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1. V.I.Vernadskiy Institute of Geochemistry and Analytical Chemistry, Academy of Sciences, U.S.S.R., Moscow and the Kola Branch of the Academy of Sciences, U.S.S.R.
(Kola Peninsula--Pegmatites) (Thallium)
(Rubidium)

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(Rubidium--Analysis) (Cesium--Analysis)
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1. Vernadsky Institute of Geochemistry and Analytical Chemistry, Academy of Sciences U.S.S.R, Moscow.
(Alkali metals)
(Flame photometry)

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[Spectral determination of rare and dispersed elements in minerals rocks, soils, plants, and natural waters] Spektral'noe opredelenie redkikh i rasseiannykh elementov; v mineralakh i porodakh, pochvakh, rasteniiakh i prirodnykh vodakh. [By] T.F. Borovik-Romanova i dr. Moskva, Izd-vo Akad. nauk SSSR, 1962. 239 p. (MIRA 15:3)

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