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Thermodynamic theory of...

$$\left.\begin{aligned}
\varphi_1^{(21)} &\equiv \zeta_{11}^{(2)}(x_1^{(1)} - x_1^{(2)}) + \zeta_{12}^{(2)}(x_2^{(1)} - x_2^{(2)}),\\
\varphi_1^{(23)} &\equiv \zeta_{11}^{(2)}(x_1^{(3)} - x_1^{(2)}) + \zeta_{12}^{(2)}(x_2^{(3)} - x_2^{(2)}),\\
\varphi_2^{(21)} &\equiv \zeta_{(12)}^{(2)}(x_1^{(1)} - x_1^{(2)}) + \zeta_{22}^{(2)}(x_2^{(1)} - x_2^{(2)}),\\
\varphi_2^{(23)} &\equiv \zeta_{12}^{(2)}(x_1^{(3)} - x_1^{(2)}) + \zeta_{22}^{(2)}(x_2^{(3)} - x_2^{(2)}),
\end{aligned}\right\} \qquad (4)$$

$$\eta_{21} \equiv \eta^{(1)} - \eta^{(2)} - \sum_{i=1}^{2}(x_i^{(1)} - x_i^{(2)})\left(\frac{\partial\eta}{\partial x_i}\right)^{(2)},$$

$$\eta_{23} \equiv \eta^{(3)} - \eta^{(2)} - \sum_{i=1}^{2}(x_i^{(3)} - x_i^{(2)})\left(\frac{\partial\eta}{\partial x_i}\right)^{(2)}; \qquad (5)$$

$$U_2^{(2)} \equiv \zeta_{11}^{(2)}\zeta_{22}^{(2)} - [\zeta_{12}^{(2)}]^2, \qquad (6)$$

Abstracter's note: СОСУЩ = coexistent]. ζ denotes the thermodynamic Gibbs potential, $\zeta_{ik} = (\partial^2\zeta/\partial x_i \partial x_k)_{P,T}$; x_i = molar part of the i-th component; η = molar entropy; the superscripts denote the coexistent phases.

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Thermodynamic theory of...

For the equalization of the second with the third phase, the following is written down: $(dT/dx_1^{(2)})^{(c,1)}_{coex.P} = (dT/dx_1^{(3)})^{(c,1)}_{coex.P} = (dT/dx_2^{(2)})^{(c,1)}_{coex.P} = (dT/dx_2^{(3)})^{(c,1)}_{coex.P} = 0$ (7). The index (c,1) denotes that the derivatives are taken in the critical end-point where the critical and the first phase are coexistent. It is found: $(dx_2/dx_1)^{(c,1)}_{coex.P} = -\zeta^{(c)}_{11}/\zeta^{(c)}_{12} = -\zeta^{(c)}_{12}/\zeta^{(c)}_{22}$ (9). This equation is identical with that for the isothermal isobaric line of the coexistence of two phases in the critical point. In the critical point the following condition is satisfied: $(dx_2/dx_1)^{(c,1)}_{coex.P} = (dx_2/dx_1)^{(c)}_{coex.P,T}$ (10). This means that the isothermal isobaric line of the diphase equilibrium of the projection of the isobaric line of the triphase equilibrium is tangent to the $x_1 - x_2$ plane in the critical point.

II) Behavior of the triphase curve expressed in the variables of that phase which does not attain the critical state. The first and the second phase

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become identical, the third phase coexists (Fig.) The following is written down: $(dx_2^{(2)}/dx_1^{(2)})_{coex.P} = -(\varphi_1^{(21)}\Delta\eta - \eta_{21}\Delta\varphi_1)/(\varphi_2^{(21)}\Delta\eta - \ _{21}\varphi_2)$ (12). Division of numerator and denominator of the right side of Eq. (12) by Δx_1, and passage to the limit gives: $\lim\limits_{\Delta x_1 \to 0}(\Delta\eta/\Delta x_1) = (\partial\eta/\partial x_1)^{(c)} - (\partial\ /\partial_{x1})^{(2)} + k\left[(\partial\ /\partial x_2)^{(c)} - (\partial\eta/\partial x_2)^{(2)}\right]$; $\lim\limits_{\Delta x_1 \to 0}(\Delta\varphi_1/\Delta x_1) = \zeta_{11}^{(2)} + k\zeta_{12}^{(2)}$; $\lim\limits_{\Delta x_1 \to 0}(\Delta\varphi_2/\Delta x_1) = \zeta_{12}^{(2)} + k\zeta_{22}^{(2)}$ (13), where $k = (dx_2/dx_1)^{(c,2)}_{coex.P}$. Applying the relations: $(\partial\eta/\partial x_1)^{(c)} - (\partial\ /\partial x_1)^{(2)} = (L_1^{(2c)} - L_3^{(2c)})/T$; $(\partial\eta/\partial x_2)^{(c)} - (\partial\ /\partial x_2)^{(2)} = (L_2^{(2c)} - L_3^{(2c)})/T$ (14), where $L^{(2c)}$ is the partial molar heat of the transition of the i-th component from the second into the critical phase, it is obtained: $(dx_2^{(2)}/dx_1^{(2)})^{(c,2)}_{\text{coex.}P} = \{\varphi_1^{(2c)}[L_1^{(2c)} - L_3^{(2c)} + k(L_2^{(2c)} - L_3^{(2c)})] - Q_{2c}[\;^{(2)}_{11} + k\;^{(2)}_{12}]\} / \{\varphi_2^{(2c)}[L_1^{(2c)} - L_3^{(2c)} + k(L_2^{(2c)} - L_3^{(2c)})] - Q_{2c}[\;^{(2)}_{12} + k\;^{(2)}_{22}]\}$ (15). $Q_{2c} = T\;_{2c}$; $\varphi_1^{(2c)}$, $\varphi_2^{(2c)}$, and $\;_{2c}$ may be calculated from Eqs. (4) and (5) by replacing the indices of the 2nd and 3rd phase by those of the critical phase. If the composition of the critical and the 2nd phase is equal, it holds: $(dx_2^{(2)}/dx_1^{(2)})^{(c,2)}_{\text{coex.}P} = -(\;^{(2)}_{11} + k\;^{(2)}_{12})/(\;^{(2)}_{12} + k\;^{(2)}_{22})$, (16). For the temperature dependence of the triphase equilibrium on the composition of that phase coexisting with the critical one, it is obtained:

$$\left(\frac{dT}{dx_1^{(2)}}\right)^{(\text{к},\,2)}_{\text{сосущ.}\,P} = \frac{T\,[k\,(x_1^{(\text{к})} - x_1^{(2)}) - (x_2^{(\text{к})} - x_2^{(2)})]\,U_2^{(2)}}{\varphi_2^{(2\text{к})}\,[L_1^{(2\text{к})} - L_3^{(2\text{к})} + k\,(L_2^{(2\text{к})} - L_3^{(2\text{к})})] - Q_{2\text{к}}\,[\zeta_{12}^{(2)} + k\zeta_{22}^{(2)}]}, \quad (18)$$

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$$\left(\frac{dT}{dx_2^{(2)}}\right)^{(к,\,2)}_{\text{сосущ.}\,P} = -\frac{T\,[k\,(x_1^{(к)} - x_1^{(2)}) - (x_2^{(к)} - x_2^{(2)})]\cdot U_2^{(2}}{\varphi_1^{(2к)}\,[L_1^{(2к)} - L_3^{(2к)} + k\,(L_2^{(2к)} - L_3^{(2к)})] - Q_{2к}\,[\zeta_{11}^{(2)} + k\zeta_{12}^{(2)}]}. \quad (19)$$

It follows from this that, contrary to binary systems a temperature maximum in the critical end-point is possible in ternary systems. The right sides of Eqs. (18) and (19) vanish, if 1) the compositions of the critical and non-critical phases are equal in the critical point; 2) the following condition is satisfied: $(x_2^{(c)} - x_2^{(2)})/(x_1^{(c)} - x_1^{(2)}) = k$ (17). It is written for the temperature extremum in the critical end-point: $k(x_1^{(c)} - x_1^{(2)}) - (x_2^{(c)} - x_2^{(2)}) = 0$ (20). III) The critical end-point of the isothermal line of the triphase equilibrium in the ternary system is calculated by replacing in the equation system Eqs. (1)-(3), temperature by pressure, entropy by volume, and changing the signs. The following ansatzes result:

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Thermodynamic theory of...

$(dP/dx_1)^{(c,1)}_{coex.T} = (dP/dx_2)^{(c,1)}_{coex.T} = 0$ (21) and $(dx_2/dx_1)^{(c,1)}_{coex.T} = -{}^{(c)}_{11}/{}^{(c)}_{12} = -{}^{(c)}_{12}/{}^{(c)}_{22}$ (22). Condition Eq. (10) is now extended: $(dx_2/dx_1)^{(c,1)}_{coex.P} = (dx_2/dx_1)^{(c,1)}_{coex.T} = (dx_2/dx_1)^{(c)}_{coex.P,T}$ (23). Similar equations as Eqs. (15), (18), and (19) result. For the pressure extremum in the critical point: $(dx_2^{(2)}/dx_1^{(2)})^{(c,2)}_{coex.T} = -({}^{(2)}_{11} + k\,{}^{(2)}_{12})/({}^{(2)}_{12} + k\,{}^{(2)}_{22})$ (27) is found. The curve of the non-critical phase is not tangent in the critical point to the curves of the phases becoming identical, but intersects them. Comparison of Eqs. (16) and 27) gives the important relation:

$$(dx_2^{(2)}/dx_1^{(2)})^{(c,2)}_{coex.P} = (dx_2^{(2)}/dx_1^{(2)})^{(c,2)}_{coex.T}\Big]_{\substack{dP = 0\\ dT = 0}} \quad (28).$$

It may be seen therefrom that in the case of extreme temperature and pressure values the isobaric- and the isothermal lines of the phase that is not in the critical state are tangent to each other in the concentration diagram of

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Thermodynamic theory of...

the triphase equilibrium. There are 4 Soviet-bloc references.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: July 9, 1958

X

Card 9/10

RIK, G.R.; RUSANOV, A.I.; STEPANOV, S.I.

Photographic action of slow ions. Trudy Radiev.inst.AN SSSR 9: 238-249 '59. (MIRA 14:6)
(Photographic emulsions) (Photography, Particle track)

RUSANOV, A.I.

Thermodynamic consideration of the membrane equilibrium taking into account the surface discontinuity. Vest.LGU 16 no.10:77-86 '61.
(MIRA 14:5)

(Phase rule and Equilibrium)

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STORONKIN, A.V.; RUSANOV, A.I. (Leningrad)

Thermodynamic theory of critical phenomena in three-component systems. Part 2: Shape of the isotherm and isobar curve for the coexistence of two phases in the vicinity of the critical point. Zhur. fiz. khim. 34 no.4:749-753 Ap '60. (MIRA 14:5)

1. Leningradskiy gosudarstvennyy universitet imeni A.A. Zhdanova.
(Phase rule and equilibrium) (Systems (Chemistry))

STORONKIN, A.V.; RUSANOV, A.I.

Thermodynamic theory of critical phenomena in three-component systems. Part 1. Zhur. fiz. khim. 34 no.3:530-536 Mr '60. (MIRA 13:11)

1. Leningradskiy gosudarstvennyy universitet imeni A.A.Zhdanova.
(Systems (Chemistry)) (Thermodynamics)

PHASE I BOOK EXPLOITATION SOV/5043

Rusanov, Anatoliy Ivanovich

Termodinamika poverkhnostnykh yavleniy (Thermodynamics of Surface Phenomena) [Leningrad] Izd-vo Leningradskogo univ., 1960. 179 p. Errata slip inserted. 3,000 copies printed.

Sponsoring Agency: Leningradskiy ordena Lenina gosudarstvennyy universitet imeni A. A. Zhdanova.

Ed.: V. D. Piastro; Tech. Ed.: S. D. Vodolagina.

PURPOSE: This book is intended for students specializing in physics and chemistry, and for aspirants, engineers, and scientific workers interested in surface phenomena of dispersed and capillary systems.

COVERAGE: The book contains a systematic discussion of problems relating to the thermodynamics of surface phenomena and the thermodynamics of dispersed and capillary systems. New equations are obtained, characterizing the interrelationship of surface tension, temperature, pressure, composition

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of phases and the curvature of the surface. The properties of systems containing minute nuclei of new phases are given. No personalities are mentioned. There are 92 references: 25 Soviet (3 translations), 54 English, 12 German, and 1 French.

TABLE OF CONTENTS:

PART I. PLANE SURFACE OF DISCONTINUITY

RUSANOV, Anatoliy Ivanovich; PIASTRO, V.D., red.; VODOLAGINA, S.D., tekhn.red.

[Thermodynamics of surface phenomena] Termodinamika poverkhnostnykh iavlenii. Leningrad, Izd-vo Leningr.univ., 1960. 179 p. (MIRA 14:1)
(Thermodynamics) (Surface chemistry)

STORONKIN, A.V.; RUSANOV, A.I. (Leningrad)

Thermodynamic theory of critical phenomena in three-component systems. Part 3: On the shape of the cusp at the critical point of a ternary system. Zhur.fiz.khim. 34 no.5:977-982 My '60. (MIRA 13:7)

1. Leningradskiy gosudarstvennyy universitet im.A.A.Zhdanova. (Systems (Chemistry))

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S/076/60/034/008/002/014
B015/B054

AUTHORS: **Storonkin, A. V.** and **Rusanov, A. I.** (Leningrad)

TITLE: **Thermodynamic Theory** 21 of Critical Phenomena in Three-component Systems. VI. Critical End Points of Ternary Systems

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 8, pp. 1677-1683

TEXT: The authors investigated the critical end points of ternary three-phase systems by calculating the isothermal and isobaric lines of the three-phase equilibrium. They discuss the extreme temperatures and pressures at the critical end point. On the basis of the equations (16) and (27) obtained, they derive an important final equation (28) which shows that, in the case of an extreme pressure and temperature at the critical end point, the isobaric and isothermal lines (for the phases not attaining the critical state) are touching at the critical end point on the concentration diagram of the three-phase equilibrium. There are

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Thermodynamic Theory of Critical Phenomena in Three-component Systems. VI. Critical End Points of Ternary Systems

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B015/B054

1 figure and 4 Soviet references.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: July 9, 1958

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STORONKIN, A.V.; RUSANOV, A.I. (Leningrad)

Thermodynamic theory of critical phenomena in three-component systems. Part 4: Critical curves of a three-component system. Zhur.fiz.khim. 34 no.6:1212-1218 Je '60. (MIRA 13:7)

1. Leningradskiy gosudarstvennyy universitet imeni A.A. Zhdanova.

(Systems(Chemistry))

STORONKIN, A.V.; RUSANOV~~, A.I.~~

Thermodynamic theory of critical phenomena in three-component systems. Part 5. Zhur.fiz.khim. 34 no.7:1407-1413 Jl '60. (MIRA 13:7)

1. Leningradskiy gosudarstvennyy universitet im. A.A. Zhdanova.
(Phase rule and equilibrium) (Thermodynamics)

S/076/60/034/05/06/038
B010/B002

AUTHORS: Storonkin, A. V., Rusanov, A. I.

TITLE: Thermodynamic Theory of Critical Phenomena in Ternary Systems. III. On the Shape of the Cusp in the Critical Point of a Ternary System

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 5, pp. 977-982

TEXT: An investigation of the shape of cusps allows the derivation of thermodynamic inequalities determining the type of the critical point, while a comparison of the "coexistence" curve and the cusp yields important information on the metastable and unstable field near the critical point. In this manner, ternary systems were studied in the present case. Explanations are given in the following sections: shape of the isothermal-isobaric cusp in the critical point of a ternary system, shape of the isobaric cusp in the critical point of a ternary system; shape of the isothermal cusp of a ternary system. The inequalities derived characterize the possible relations between the unstable and meta- √B

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Thermodynamic Theory of Critical Phenomena in Ternary Systems. III. On the Shape of the Cusp in the Critical Point of a Ternary System

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stable fields near the critical point of a ternary system. There are 1 figure and 3 references: 2 Soviet and 1 German.

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ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: June 2, 1958

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RUSANOV, A.I., Cand Chem Sci -- (diss) "Thermodynamic study of critical phenomena in multicomponent systems." Len, 1958, 10 pp (Len Order of Lenin State Univ im A.A. ~~Zhx~~ Zhdanov) 100 copies (KL, 28-58, 103)

Rusanov, A.I.

PHASE I BOOK EXPLOITATION SOV/3503

Akademiya nauk SSSR. Radiyevyy institut

Trudy, t. IX (Transactions of the Radium Institute, Academy of Sciences USSR, Vol. 9) Moscow, Izd-vo AN SSSR, 1959. 287 p. Errata slip inserted. 1,700 copies printed.

Ed.: N.A. Perfilov, Doctor of Physical and Mathematical Sciences; Ed. of Publishing House: G.M. Aron; Tech. Ed.: A.V. Smirnova.

PURPOSE: The volume is intended for physicists.

COVERAGE: The book represents volume 9 of the Transactions of the Radium Institute and contains the results of studies conducted at the Institute chiefly from 1955 to 1956. There are a number of articles dealing with the study of nuclear reactions occurring with particles of different energies ranging from several eV up to hundreds of MeV. Others treat different problems of the physics of neutrons. Results of studies of various neutron sources, neutron energy distribution in a moderator (water), and other problems connected with the theory of neutron interaction with matter are presented. The majority of the articles are concerned with problems of method. The authors provide a complete description of the construction of equipment and of the results of tests performed under laboratory conditions. No personalities are mentioned. References accompany individual articles.

RUSANOV, A.I.; SHUL'TS, M.M.

Simplified Le Chatelier - Braun principle. Vest. LGU 15 no.4:60-65 '60. (MIRA 13:2)

(Thermodynamics)

RUSANOV, A.I.

Thermodynamics of surface phenomena. Vest.LGU 14 no.16:71-79 '59. (MIRA 12:10)

(Surface chemistry)

5(4) SOV/54-59-3-13/21

AUTHOR: Rusanov, A. I.

TITLE: On the Thermodynamics of Surface Phenomena

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1959, Nr 3, pp 71 - 79 (USSR)

ABSTRACT: According to Gibbs it is possible to calculate the surface tension from the adsorption equation for a geometric surface in the inhomogeneity layer of the phases:

$Sd\sigma = -\eta^{(S)}dT - \sum_{i=1}^{n} m_i^S d\mu_i$ (1); where S denotes the area of the tension surface, η^S and m_i^S the excess of entropy and mass of the i-th component with respect to the tension surface and σ the surface tension, and μ_i the chemical potential of the i-th component. This equation may be used for plane and curved surfaces. The second method according to Van der Waalsand references 3, 4, 5 has been developed from the concept of tension surfaces of finite thickness and has the following form for the plane surface:

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$S d\sigma = -\eta^{(S)} dT + v^{(S)} dP - \sum_{i=1}^{n} m_i^{(S)} d\mu_i$ (2). Both equations have - although they are mathematically very simple - the disadvantage that their independent variables are themselves functions of pressure, temperature and phase composition. Guggenheim made a transformation of equation (2) into a direct function of $\sigma(p,T)$, and of the phase composition; it holds, however, strictly only for plane tension surfaces. In the present paper the attempt is made of setting up an equation of direct dependence for plane and curved tension surfaces. The representation made leads from the theory of the heterogeneous equilibrium of Van der Waals to the multicomponent systems which were basically developed by A. V. Storonkin. The surface tension of a plane surface is determined on the basis of equation (2) for a molar surface and the molar part x_i of the i-th component. The calculation is made for a two-phase equilibrium under consideration of the tension surface. In the case of thermal and chemical equilibrium it is possible to determine the chemical potential for the two phases by two separate equations which contain σ implicitly as a function of p,T and the composition. The thermodynamical relations according to reference 7 are introduced for the explicit representation of this dependence, furthermore a variable of the composition x_i of one of the existing phases. Finally, the three thermodynamical fundamental equations are obtained representing the equilibrium of two phases with the existence of a tension surface. They are mentioned individually. For curved tension surfaces the effect of the curvature upon the thermodynamic equations is investigated which is given by equation $p^{(1)} - p^{(2)} = \frac{2\sigma}{r}$. The thermodynamical equations obtained for a plane tension surface are a first approximation to weakly curved tension surfaces. The further investigation is also based upon the Van der Waals equation (2). Also for equation (1) it is possible to set up three equations for the state of the surface layer which, in combined form are the general equation (2) for curved surfaces. Next, the new variables pressure, temperature and phase composition are introduced like in the first case taking curvature into account. There are 7 references, 3 of which are Soviet.

SUBMITTED: March 12, 1959

5 (2)

AUTHORS: Storonkin, A. V., Rusanov, A. I., Markuzin, N. P. SOV/79-29-8-5/81

TITLE: On the Equilibrium "Liquid - Liquid" in Three-component Systems

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 8, pp 2480 - 2485 (USSR)

ABSTRACT: Many papers have hitherto described the equilibrium between two liquids in ternary systems. However, only few of these papers dealt with the thermodynamic standpoint. The empirical mathematical interrelationships and peculiarities observed in the equilibrium diagrams were in most cases discussed with respect to two liquids in ternary systems without the aid of thermodynamics. The rules set up by Krupatkin (Ref 5) and Tarasenkov are discussed in this connection. In the present paper, the authors attempted to fill this gap and to complete and define the existing results. It was attempted to solve the following problems mathematically and by means of diagrams in a demonstrative manner: (1) The course of the isothermal-isobaric lines for the coexistence of two liquid phases in the three-component system (Fig 1); (2) The grouping of the nodes in the concentration diagram (Fig 2). The results of investi-

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gation offered the following rule: if the content of one of the components of the three-component system is equal in the coexistent phases, the chemical potentials of the two other components change by equal values as they move along the isothermal isobar of the coexistent phases. V. F. Alekseyev's rule for binary systems holds also near the critical point of the ternary system. There are 2 figures and 13 references, 11 of which are Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: July 14, 1958

RUSANOV, A.I.

Final critical point of a binary system. Vest.LGU 14 no.4:
62-66 '59. (MIRA 12:5)
(Systems (Chemistry))

RUSANOV, A.I.

Investigation of the three-phase equilibrium in the system isopropyl alcohol - phenol - water. Vest.LGU 14 no.4:132-138 '59.
(MIRA 12:5)

(Phase rule and equillibrium)

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B004/B068

5.4210(1273,1320,1160)

AUTHORS: Storonkin, A. V, and Rusanov, A. I.

TITLE: Thermodynamic Theory of Critical Phenomena in Three-component Systems. V. Equilibrium of Heterogeneous Systems Containing a Critical Phase

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 7, pp. 1407-1413

TEXT: The authors start from the fact that the direct experimental investigation of the properties of a critical phase is sometimes impracticable. In this case, an indirect method which is based on the study of the phases coexisting with the critical one may be used to study the critical state. In this paper, the general method of describing binary phase equilibria with a critical phase being present is treated. Moreover, some cases of such equilibria in ternary systems are investigated. The coexisting phases bear the indices 1 and 2, and the generalized van der Waals differential equation is written using the variables of the first phase:

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$v_{12}dP = \eta_{12}dT + \sum_{i=1}^{n-1}\sum_{k=1}^{n-1}(x_i^{(2)} - x_i^{(1)})\zeta_{ik}^{(1)}dx_k^{(1)}$ (1), where

$\eta_{12} \equiv \eta^{(2)} - \eta^{(1)} - \sum_{i=1}^{n-1}(x_i^{(2)} - x_i^{(1)})(\partial\eta/\partial x_i)^{(1)}$;

$v_{12} \equiv v^{(2)} - v^{(1)} - \sum_{i=1}^{n-1}(x_i^{(2)} - x_i^{(1)})(\partial v/\partial x_i^{(1)})$, where v is the molar volume; η is the molar entropy; x_i is the molar portion of the i-th component; ζ is the molar thermodynamic Gibbs potential; $\zeta_{ik} \equiv (\partial^2\zeta/\partial x_i \partial x_k)_{P,T}$; P is the pressure; T is the temperature; n is the number of components. In addition, it holds that $d(\partial\zeta/\partial x_i)^{(1)} = d(\partial\zeta/\partial x_i)^{(2)}$, $(i = 1,2,\dots,n-1)$ (2). Equations (1) and (2) result from the equilibrium conditions: $dT^{(1)} = dT^{(2)}$, $dP^{(1)} = dP^{(2)}$, $d\mu_i^{(1)} = d\mu_i^{(2)}$; $(i = 1,2,\dots,n)$ (3). μ_i is the chemical potential of the i-th component. By substituting index k of

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Thermodynamic Theory of Critical Phenomena in Three-component Systems. V. Equilibrium of Heterogeneous Systems Containing a Critical Phase

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B004/B068

the critical phase for index 2 in equations (1) and (2), a set of equations is obtained

$$\left.\begin{aligned}
&\eta_{1\kappa} dT - v_{1\kappa} dP + \sum_{i=1}^{n-1}\sum_{j=1}^{n-1}\left(x_i^{(\kappa)} - x_i^{(1)}\right)\zeta_{ij}^{(1)} dx_j^{(1)} = 0;\\
&\left(\frac{\partial U_{n-1}}{\partial T}\right)^{(\kappa)} dT + \left(\frac{\partial U_{n-1}}{\partial P}\right)^{(\kappa)} dP + \sum_{i=1}^{n-1}\left(\frac{\partial U_{n-1}}{\partial x_i}\right)^{(\kappa)} dx_i^{(\kappa)} = 0;\\
&\left(\frac{\partial V_{n-1}}{\partial T}\right)^{(\kappa)} dT + \left(\frac{\partial V_{n-1}}{\partial P}\right)^{(\kappa)} dP + \sum_{i=1}^{n-1}\left(\frac{\partial V_{n-1}}{\partial x_i}\right)^{(\kappa)} dx_i^{(\kappa)} = 0;\\
&d\left(\frac{\partial \zeta}{\partial x_i}\right)^{(1)} = d\left(\frac{\partial \zeta}{\partial x_i}\right)^{(n)} \quad (i = 1, 2, \ldots, n-1).
\end{aligned}\right\} \quad (6)$$

A set of n+2 equations (6) sufficiently characterizes the two-phase equilibrium in a system containing a critical phase. For the coexistence of one critical with two non-critical phases in a ternary system, it is assumed that the critical phase contains all three components of the system. Equation (8) is derived:

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Thermodynamic Theory of Critical Phenomena in Three-component Systems. V. Equilibrium of Heterogeneous Systems Containing a Critical Phase

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$$\left.\begin{aligned}&\eta_{\text{к}1}dT - v_{\text{к}1}dP + \varphi_1^{(\text{к}1)}dx_1^{(\text{к})} + \varphi_2^{(\text{к}1)}dx_2^{(\text{к})} = 0,\\ &\left(\frac{\partial U_2}{\partial T}\right)^{(\text{к})}dT + \left(\frac{\partial U_2}{\partial P}\right)^{(\text{к})}dP + \left(\frac{\partial U_2}{\partial x_1}\right)^{(\text{к})}dx_1^{(\text{к})} + \left(\frac{\partial U_2}{\partial x_2}\right)^{(\text{к})}dx_2^{(\text{к})} = 0,\\ &\left(\frac{\partial V_2}{\partial T}\right)^{(\text{к})}dT + \left(\frac{\partial V_2}{\partial P}\right)^{(\text{к})}dP + \left(\frac{\partial V_2}{\partial x_1}\right)^{(\text{к})}dx_1^{(\text{к})} + \left(\frac{\partial V_2}{\partial x_2}\right)^{(\text{к})}dx_2^{(\text{к})} = 0,\end{aligned}\right\} \qquad (8)$$

where

$$\varphi_1^{(\text{к}1)} \equiv \zeta_{11}^{(\text{к})}(x_1^{(1)} - x_1^{(\text{к})}) + \zeta_{12}^{(\text{к})}(x_2^{(1)} - x_2^{(\text{к})}),$$
$$\varphi_2^{(\text{к}1)} \equiv \zeta_{13}^{(\text{к})}(x_1^{(1)} - x_1^{(\text{к})}) + \zeta_{22}^{(\text{к})}(x_2^{(1)} - x_2^{(\text{к})}).$$

Solving system (8) with respect to the derivatives $(dT/dx_1)_{\text{coexist}}$, $(dP/dx_1)_{\text{coexist}}$, and $(dx_2/dx_1)_{\text{coexist}}$, one obtains:

$$\left(\frac{dT}{dx_1}\right)_{\text{сосущ.}} = -\frac{\begin{vmatrix}\varphi_1^{(\text{к}1)}, & -v_{\text{к}1}, & \varphi_2^{(\text{к}1)}\\ \left(\frac{\partial U_2}{\partial x_1}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial P}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial x_2}\right)^{(\text{к})}\\ \left(\frac{\partial V_2}{\partial x_1}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial P}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial x_2}\right)^{(\text{к})}\end{vmatrix}}{\Delta_3^{(\text{к})}}; \qquad (9)$$

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Thermodynamic Theory of Critical Phenomena. S/076/6 034/007/012/042/XX
in Three-component Systems. V. Equilibrium B004/[illegible]
of Heterogeneous Systems Containing a Critical
Phase

$$\left(\frac{dP}{dx_1}\right)_{\text{сосущ}} = -\frac{\begin{vmatrix} \eta_{\text{к}1}, & \varphi_1^{(\text{к}1)}, & \varphi_2^{(\text{к}1)} \\ \left(\frac{\partial U_2}{\partial T}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial x_1}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial x_2}\right)^{(\text{к})} \\ \left(\frac{\partial V_2}{\partial T}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial x_1}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial x_2}\right)^{(\text{к})} \end{vmatrix}}{\Delta_3^{(\text{к})}}; \qquad (10)$$

$$\left(\frac{dx_2}{dx_1}\right)_{\text{сосущ}} = -\frac{\begin{vmatrix} \eta_{\text{к}1}, & -v_{\text{к}1}, & \varphi_1^{(\text{к}1)} \\ \left(\frac{\partial U_2}{\partial T}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial P}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial x_1}\right)^{(\text{к})} \\ \left(\frac{\partial V_2}{\partial T}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial P}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial x_1}\right)^{(\text{к})} \end{vmatrix}}{\Delta_3^{(\text{к})}}; \qquad (11)$$

$$\Delta_3^{(\text{к})} \equiv \begin{vmatrix} \eta_{\text{к}1}, & -v_{\text{к}1}, & \varphi_2^{(\text{к}1)} \\ \left(\frac{\partial U_2}{\partial T}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial P}\right)^{(\text{к})}, & \left(\frac{\partial U_2}{\partial x_2}\right)^{(\text{к})} \\ \left(\frac{\partial V_2}{\partial T}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial P}\right)^{(\text{к})}, & \left(\frac{\partial V_2}{\partial x_2}\right)^{(\text{к})} \end{vmatrix}.$$

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Thermodynamic Theory of Critical Phenomena in Three-component Systems. V. Equilibrium of Heterogeneous Systems Containing a Critical Phase

S/076/60/034/007/012/042/XX
B004/B068

If the critical phase contains only two components of the system, one obtains:

$$\left.\begin{aligned} &\eta_{1\text{к}}dT - v_{1\text{к}}dP + \varphi_1^{(1\text{к})}dx_1^{(1)} + \varphi_2^{(1\text{к})}dx_2^{(1)} = 0,\\ &-\left(\frac{\partial^2\eta}{\partial x_1^2}\right)^{(\text{к})}dT + \left(\frac{\partial^2 v}{\partial x_1^2}\right)^{(\text{к})}dP = 0,\\ &-\left(\frac{\partial^3\eta}{\partial x_1^3}\right)^{(\text{к})}dT + \left(\frac{\partial^3 v}{\partial x_1^3}\right)^{(\text{к})}dP + \left(\frac{\partial^4\zeta}{\partial x_1^4}\right)^{(\text{к})}dx_1^{(\text{к})} = 0,\\ &\left[\left(\frac{\partial\eta}{\partial x_1}\right)^{(\text{к})} - \left(\frac{\partial\eta}{\partial x_1}\right)^{(1)}\right]dT - \left[\left(\frac{\partial v}{\partial x_1}\right)^{(\text{к})} - \left(\frac{\partial v}{\partial x_1}\right)^{(1)}\right]dP + \zeta_{11}^{(1)}dx_1^{(1)} +\\ &\qquad + \zeta_{12}^{(1)}dx_2^{(1)} = 0, \end{aligned}\right\} \qquad (14)$$

Where

$$\varphi_1^{(1\text{к})} \equiv \zeta_{11}^{(1)}\left(x_1^{(\text{к})} - x_1^{(1)}\right) - \zeta_{12}^{(1)}x_2^{(1)},$$

$$\varphi_2^{(1\text{к})} \equiv \zeta_{12}^{(1)}\left(x_1^{(\text{к})} - x_1^{(1)}\right) - \zeta_{22}^{(1)}x_2^{(1)},$$

$$\eta_{1\text{к}} \equiv \eta^{(\text{к})} - \eta^{(1)} - \left(\frac{\partial\eta}{\partial x_1}\right)^{(1)}\left(x_1^{(\text{к})} - x_1^{(1)}\right) + \left(\frac{\partial\eta}{\partial x_2}\right)^{(1)}x_2^{(1)},$$

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$$v_{1\text{к}} \equiv v^{(\text{к})} - v^{(1)} - \left(\frac{\partial v}{\partial x_1}\right)^{(1)}\left(x_1^{(\text{к})} - x_1^{(1)}\right) + \left(\frac{\partial v}{\partial x_2}\right)^{(1)}x_2^{(1)}.$$

8 763

Thermodynamic Theory of Critical Phenomena in Three-component Systems. V. Equilibrium of Heterogeneous Systems Containing a Critical Phase

S/076/60/034/007/012/042/XX
B004/B058

The following conclusion is drawn which is important for practical purposes: The investigation of the critical state of a binary phase with a coexisting third phase leads to the same result as the investigation of a binary phase alone. There are 3 Soviet references.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova
(Leningrad State University imeni A. A. Zhdanov)

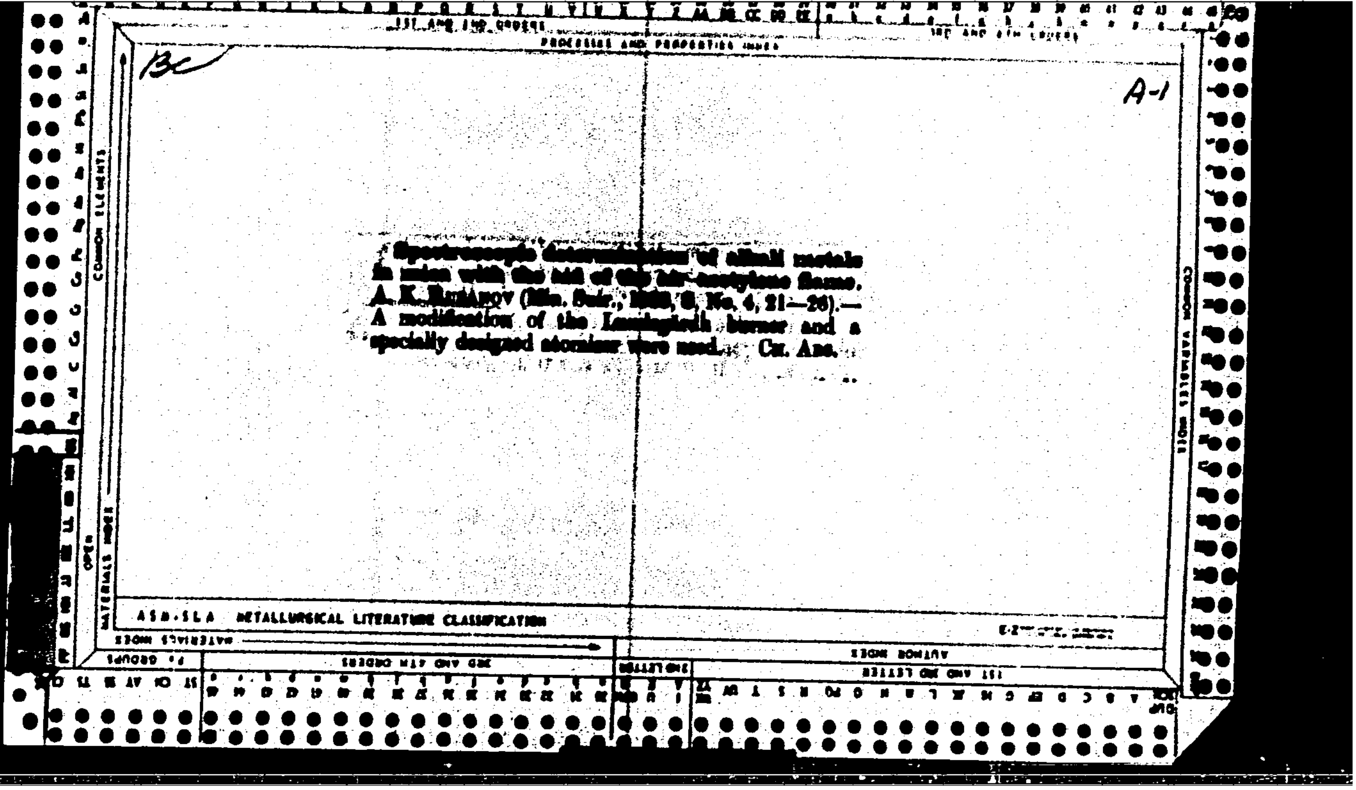
SUBMITTED: July 9, 1958

Card 7/7

RUSANOV, A.K., DANOVA, N.T.

Effect of chemical reactions on the intensity of spectral lines when powders are injected into the arc plasma. Zhur. anal. khim. 20 no.7:769-773 '65. (MIRA 18:9)

1. All-Union Scientific-Research Institute of Mineral Resources, Moscow.



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3RD AND 4TH LETTERS

Bc

A-1

Spectroscopic determination of alkali metals in mica with the aid of the air-acetylene flame. A. K. Rusanov (Min. Syr., [illegible], [illegible], No. 4, 21—26).—A modification of the Lundegårdh burner and a specially designed atomiser were used. Ch. Abs.

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A-1

Spectroscopic determination of lithium. A. K. Rusakov (Min. Suir., 1933, 8, No. 4, 27—32).—Lundegårdh's method was applied to solutions obtained by decomposing mica with H_2SO_4-HF and diluting with H_2O. $8{\cdot}5\times10^{-4}$ mg. of Li could be determined. Ch. Abs.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Rapid visual spectroscopic analysis of solutions. A. K. Rusanov. *Zavodskaya Lab.* 3, 915–18(1934).—The detns. of Li, Na, K, Ca, Sr, Ba and Tl in solns. were made with the aid of the Lundegårdh burner and atomizer and Hilger spectrometer, and are based on fixing the point of disappearance of the line or band in the spectrum of the acetylene flame on interposing before the collimator slit a 2-compartment wedge chamber (illustrated) filled with a light-absorbing soln. ($CuSO_4$, MnO_4) and H_2O. The layer thickness of the light-absorbing soln. serves as the measure of the intensity of spectral lines. The relation between the former and the concn. of a tested element in soln. is presented by graphs and tables. The method is accurate to 10–15%, depending on the concn. of contaminating salts. Chas. Blanc

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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BC

B-1-2

PREPARATION OF SPECTRALLY PURE CARBON ELECTRODES. A. K. Rusanov (J. Appl. Chem. Russ., 1935, 8, 520--523).--The electrodes are freed from Fe, Al, Si, Ti, and V by heating at 2700° for 10--20 sec., and from Cu by heating for 35 sec. Ca, Mg, and B are not entirely eliminated after 2 min. R. T.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

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The question of the distribution of germanium in fossil coals. V. A. Zilbermints, A. K. Rusanov and V. M. Kostrikin. *Akad. V. I. Vernadskomu k Pyatidesyatiletiyu Nauch. Deyatelnosti* I, 169-96(1936); *Chem. Zentr.* 1938, I, 1709.—The Ge contents of a large no. of fossil coals from almost all the deposits in the U. S. S. R. were detd. by a specially developed spectrographic method. Of the large no. of specimens tested only 19 from the Donets region, 13 from the Ural and Petchora regions, 1 from Barents Island and 1 from Northern Dvina showed a high Ge content (0.1-1%) in the ash. In 58 samples the Ge content was 0.01-0.1%. The greater part of the coals rich in Ge were especially low in ash. The enrichment of the coal with Ge is assumed to be the result of adsorption and of metasomatic conversion of the circulating solns. by the coal mass.

M. G. Moore

into a liquid fuel. II. **Aleksandriiak brown coal.** M. K. D'yakova and S. A. Senyavin. *Ibid.* 555-62.—The coal dissolved best at 360-80°; other conditions were the same as above. The treatment permitted soln. of 65% of the org. substance of coal; 10% was decompd. during the process into gas and water and 25% remained solid. The solns. obtained (12-20%) were concd. *in vacuo* to 42-60% and hydrogenated; they gave liquid products 88.7, solid coal 1.30, water 2, gas and losses 8%. Thus 58% of the org. substance of coal was transformed into a liquid fuel.

A. A. Podgorny

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8

The occurrence of beryllium in fossil coals. V. A. Zilbermintz and A. K. Rusanov. *Compt. rend. acad. sci. U. R. S. S.* [N. S.], 2, 27-31(1936)(in English).—The same coal samples were used in this work that were used in the work on V and Ge. The Be was detd. spectrographically by heating the ash (contg. 1% Pt) in a pure C arc. The amt. of Be was estd. visually by comparing Be line 2650.31 with Pt line 2659.44 and Be 3130.42 with Pt 3064.71. Tests were made with known amts. of Be. Of the 604 coals examd. none showed over 0.1% Be, only 38 showed over 0.001%, while over half showed none. As with V and Ge, the coals with the least ash had the most Be. Of the coals from the Donetz Basin those from the margins had the most Be and Ge, with a gradual decrease toward the center.

John E. Milbery

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Cr

9

Spectral analysis of alkaline and alkaline earth metals in aluminum and lead. A. K. Rusanov and B. I. Bodunkov. *Zavodskaya Lab.* 5, 841-3(1936); cf. *C. A.* 29, 71 2471°. The previous method of visual spectral detn. of Na, Li, Ca and Sr in the presence of Al and Pb gave satisfactory results. Chas. Blanc

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION

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3C

Quantitative flame spectral analysis of solutions. A. K. RUSANOV (J. Gen. Chem. Russ., 1936, 6, 1067—1063).—The solutions are atomised at const. velocity into a C_2H_2 flame, and the thickness *d* of layers of coloured solutions (aq. $CuSO_4$, $KMnO_4$) required to extinguish characteristic lines of the spectrum for different concns. *C* of salts is shown to be given approx. by $d = A \log C + B$, where *A* and *B* are consts. The limiting dilutions are: Li 0·00007, Na 0·00023, K 0·030, Ca 0·0004, Sr 0·0029, Ba 0·014, and Tl 0·02% (mean error +10—15%). R. T.

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CA

7

Spectroscopic determination of germanium and beryllium in minerals and ores. A. K. Rusanov and V. M. Kostrikin. *J. Applied Chem.* (U. S. S. R.) 9, 2305-10 (in German 2311) (1936).—Ge and Be were detd. in the presence of Pt by comparing the following line pairs: Ge 3039.08-Pt 3064.71; Ge 2051.60 and 2051.15-Pt 2650.44; Be 2650.31 Pt 2659.44 and Be 3130.42-Pt 3064.71 A. A const. amt. of Pt was introduced into the sample by mixing with pure C powder contg. 2% Pt. The intensities of these line couples in the presence of various amts. of Ge and Be are tabulated, and used as a standard.

A. A. Podgorny

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*Visual Spectroscopic Determination of Indium in Solutions. A. K. Rusanov and S. M. Sokolovnik (*Redkie Metally*, 1937, 6, (5/6), 29-31; C. Abs., 1938, 32, 5320).—[In Russian.] The In solution is sprayed into an acetylene flame and a wedge-shaped chamber containing a 0·2% solution of $K_2Cr_2O_7$ is interposed between the flame and the collimator of the spectroscope. The determination is based on the thickness of solution required to obscure the In line. The method can be used in the range 0·002–0·2% In in solution, with an accuracy of about 10%.

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Visual spectroscopic methods in the quantitative analysis of solutions. A. K. Rusanov and S. I. Kunina. *Zavodskaya Lab.* 6, 836-40(1937); cf. *C. A.* 29, 71^{1}, 2171^{9}.—The application of previous methods to the *detn.* of *In* in solns. obtained in the analysis of sulfidic ores and silicates is described. Chas. Blanc

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A-1

Quantitative spectrum analysis of solutions. A. K. Rusanov, S. I. Kunina, and K. N. Vasiliev (Zavod. Lab., 1937, 6, 1420—1423).—A quant. photometric method of determining Ga in solutions is described. The range investigated covers Ga contents varying between 0·00620 and 0·400%. The spectroscopic experiments were carried out in an C_2H_2 flame in presence of K and Rb, respectively, the following pairs of lines being investigated: (*a*) Ga 4033·01 A.–K 4044·16 and 4047·22 A., (*b*) Ga 4172·05 A.–Rb 4201·81 A., and (*c*) Ga 4172·05 A.–Rb 4215·58 A. The average error is ±5%. The min. Ga content determinable is 0·0075%. D. G.

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Methods for the Quantitative Spectrographic Analysis of Solutions. III. Estimation of Thallium and Indium. A. K. Rusanov and B. I. Bolunkov (*Zavod. Lab.* (*Works' Lab.*), 1938, 7, 573–579; *Chem. Zentr.*, 1939, 110, (II), 691). —[In Russian.] It is shown that the spark discharge is applicable not only in the visual quantitative spectrography of metals, but also for solutions. An analytical method has been developed, which is suitable for the quantitative estimation of Tl and In in solutions, based on the comparison of the intensities of the following lines: Tl 5350·47 A. with Fe 5270·361 5269·54 A., and In 4511·31 A. with Cs 4555·3 A. Fe and Cs are added to the solution as comparison elements. The estimation is carried out in 10 minutes with an accuracy of ±5·5% for Tl (concentrations 0·006–0·1%) and of ±7·0% for In (concentrations 0·0008–0·2%).

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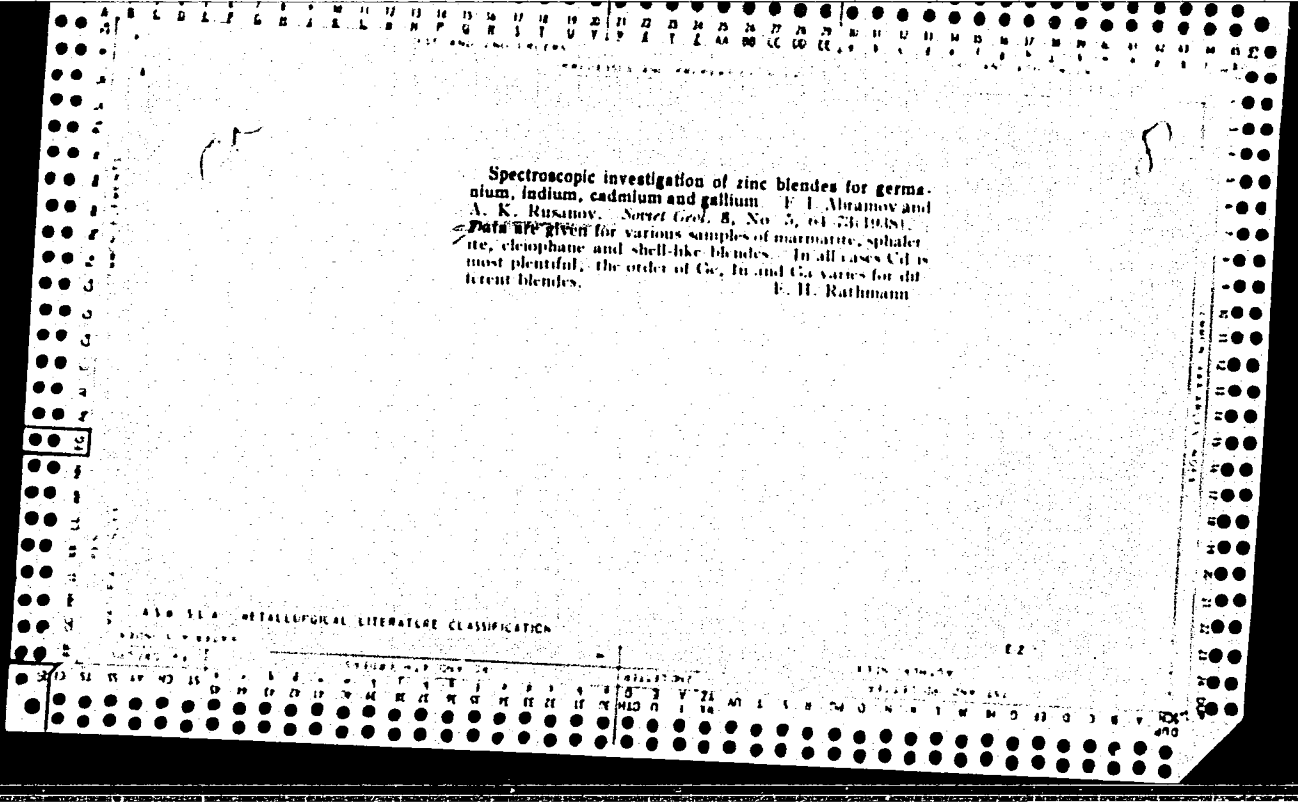
BC

A 1

Quantitative spectrum analysis of solutions. IV. Determination of cadmium and zinc. A. K. RUSANOV and V. M. ALEKSEEVA (Zavod. Lab., 1938, 7, 963—967).—Cd and Zn are determined in solutions by comparison of the intensity of the lines Cd 4799·91–Mn 4823·50 A., Zn 4722·16–Mn 4783·43 A., Zn 4810·53–Mn 4823·50 A. The error is ±4·5% for solutions containing 0·03—1% of Cd, and ±2·7% for solutions containing 0·01—1% of Zn. R. T.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



Spectroscopic investigation of zinc blendes for germanium, indium, cadmium and gallium. F. I. Abramov and A. K. Rusanov. *Sovet Geol.* **8**, No. 5, 64-73(1938). Data are given for various samples of marmatite, sphalerite, cleiophane and shell-like blendes. In all cases Cd is most plentiful, the order of Ge, In and Ga varies for different blendes.

F. H. Rathmann

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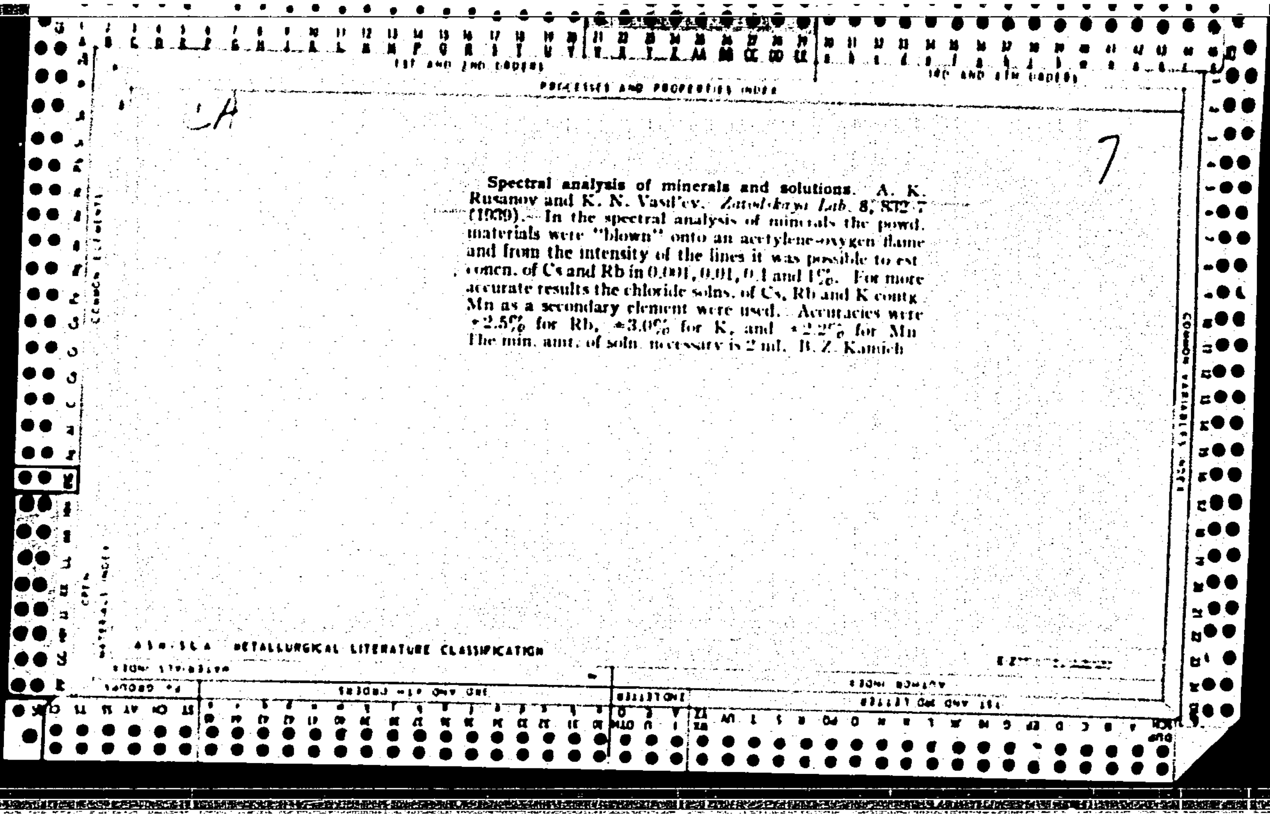

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7

Spectral analysis of minerals and solutions. A. K. Rusanov and K. N. Vasil'ev. *Zavodskaya Lab.* 8, 872-7 (1939).—In the spectral analysis of minerals the powd. materials were "blown" onto an acetylene-oxygen flame and from the intensity of the lines it was possible to est. concn. of Cs and Rb in 0.001, 0.01, 0.1 and 1%. For more accurate results the chloride solns. of Cs, Rb and K contg. Mn as a secondary element were used. Accuracies were ±2.5% for Rb, ±3.0% for K, and ±2.2% for Mn. The min. amt. of soln. necessary is 2 ml. B. Z. Kamich

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a

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Spectral analysis of solutions and minerals. A. K. Rusanov and V. M. Alekseeva. *Zavodskaya Lab.* 8, 963-5(1939).—The intensities of the lines Na 5890.0 and 5895.9 A.—Cr 5787.98 A. and Li 6103.60 A.—Mo 6030.68 A. were measured to det. Na and Li. With a 2-ml. sample the Na can be detd. down to a concn. of 0.001% and Li to 0.003%. These elements can be detd. in the presence of other alk. metals with a probable error of ± 1.6% for Li within the concn. range of 0.001-0.2% and ± 1.3% for Na for the concn. range of 0.001-0.1%. B. Z. K.

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G-1

Rare and nonferrous metals. Spectral analysis of solutions and minerals. A. K. Rusanov. *Trans. All-Union Sci. Research Inst. Econ. Mineral.* (U. S. S. R.) 147, 60-82(1939).—See *C. A.* 34, 1589^{7}. Chas. Blanc

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7

Use of a carbon arc in a direct quantitative study of the composition of minerals. A. K. Rusanov. *Bull. acad. sci. U. R. S. S., Sér. phys.* 4, 145-8(in English, 148-9) (1940).—The spectral analysis of composite minerals, studied directly in the form of ore, can be realized by continuous introduction of ore powder on paper bands into the arc. The use of a C arc between electrodes filled with NaCl insures an accuracy of ±5-8% in detg. Ge, with lines of Bi serving for comparison. The ratio of intensities of the lines of Bi and Ge depends on the admixtures of different elements in the ore, and varies in proportion to the volatilities of these elements. R. G.

All-Union Institute of Economic Mineralogy, Moscow.

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Use of a spark discharge and an acetylene flame in the analysis of solutions and minerals. A. K. Rusanov. *Bull. acad. sci. U. R. S. S., Sér. phys.* 4, 195-7(1940); cf. *C. A.* 34, 50^6, 2727^9, 8624^1.—The quant. spectroscopic analysis of solns. for Li, Na, Tl, In, Zn and Cd, was carried out: (1) by the method of visual estn. of the relative intensities of spectral lines in a spark discharge, (2) by photographic photometry with a logarithmic sector in an acetylene flame. Mineral powders were analyzed by the method of photographic photometry in an oxy-acetylene flame. The results obtained are tabulated.

Roksalana Gamow

All-Union Institute of Economic Mineralogy, Moscow.

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7

Methods for the quantitative spectral analysis of minerals and solutions. VII. Direct determination of thallium, indium and gallium in zinc blende. A. K. Rusanov and V. M. Alekseeva. *Zavodskaya Lab.* 9, No. 1, 66-9 (1940); cf. *C. A.* 35, 5055[4].—ZnS powder (0.2 g.) was distributed evenly over thin cigaret paper satd. with $(NH_4)_2SO_4$ and the paper placed in the center of an oxy-acetylene flame and kept there for 30-40 sec. The detectable concns. of Tl (green), In (blue) and Ga (violet) are, resp.: in zinc blende (ZnS) 0.0005, 0.0005 and 0.01%; in pyrite (FeS_2) 0.0005-0.001, 0.0005-0.001 and 0.01%; in chalcocite (Cu_2S) 0.0005, 0.0005 and 0.01%; in galenite (PbS) 0.005, 0.001 and 0.01%. The intensities of the Tl, In and Ga lines at various concns. are, resp.: at 1% dazzling bright, dazzling bright and easily perceptible; at 0.1% bright, bright and perceptible; at 0.01% easily perceptible, easily perceptible and very weak; at 0.001% weak, weak and absent. At 0.0001% all lines are absent. Addn. to ZnS of const. amts. of Co_3O_4 (0.05 g. of Co_3O_4 added to 0.2 g. of ZnS powder) makes possible the detn. of the concns. of Tl, In and Ga from the relative intensities of the selected pairs of lines with a probable error of ±8-13%. The wave lengths, the intervals of concn. and the probable errors are, resp.: Tl 3775.73-Co 3704.06 A., 0.001-0.3%, ±13%; In 41018-Co 4092.4 A., 0.001-0.03%, ±12%; Ga 4033.01-Co 4092.4 A., 0.01-0.03%, ±9%; Ga 4172.02-Co 4092.4 A., 0.01-0.3%, ±8%. Tl, In and Ga can be detd. in the presence of galenite and In and Ga can be detd. in the presence of pyrite in ZnS. Tl cannot be detd. in the presence of large amts. of pyrite in ZnS, because the weak Fe line interferes with the Co line (3704.06 A.). The presence of abnormally large amts. of pyrite in ZnS produces in the spectrum another weak Fe line (3082.23 A.). In such cases Tl can be detd. only by comparison of the Tl 3775.73 A. and Co 3841.46 A. lines. Detns. of Tl, In and Ga can be made simultaneously in 1 hr. in 0.50-0.03 g. of ZnS. Seven references.

W. R. Henn

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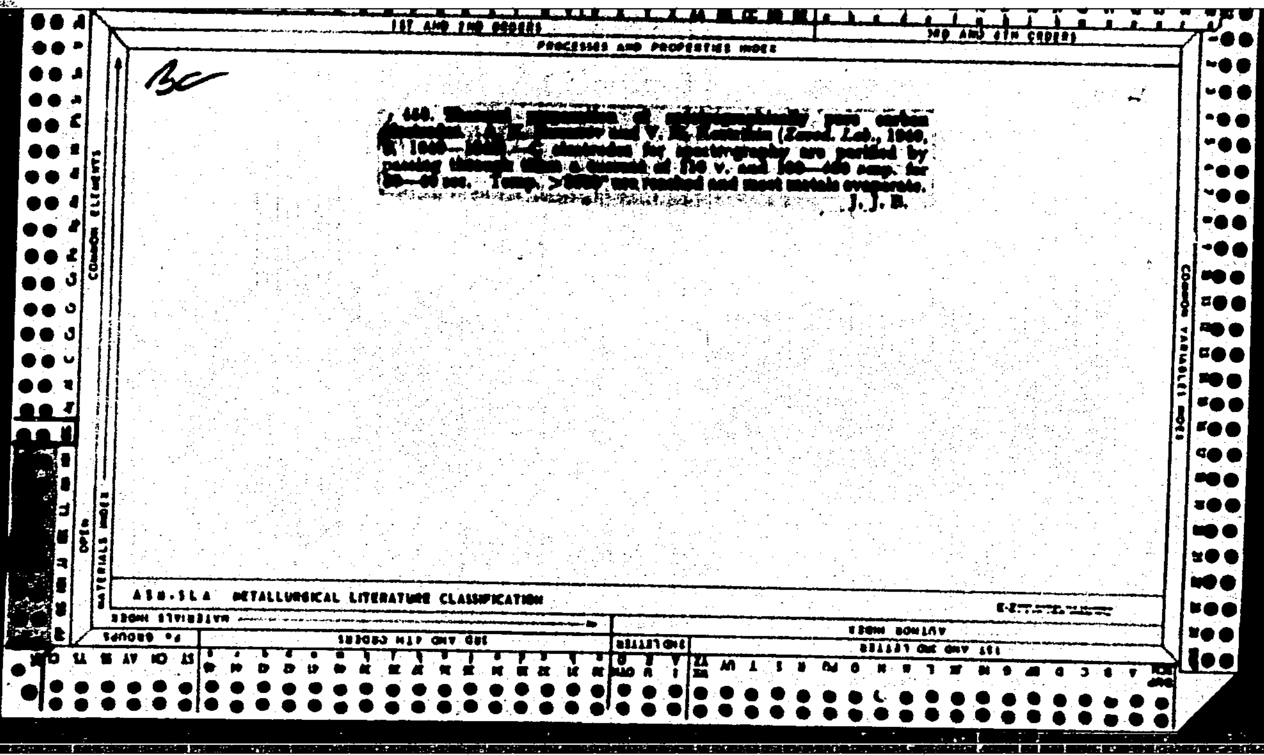
Ca

21

Spectral analysis of solutions and minerals. VIII. Direct determination of germanium in coal ash. A. K. Rusanov and B. I. Bodunkov. *Zavodskaya Lab.* 9, 183-6 (1940); cf. *C. A.* 34, 1580⁵. In the spectral analysis of coal ash for Ge the powd. material was fed into the arc in small amts. on paper strips; this ensures proper feed rate. The concn. of Ge was detd. from the lines Ge 3039.06-Bi 2993.34, Ge 2651.60-Bi 2627.93 and Ge 2651.15-Bi 2627.93. These lines appear even for 0.00015% Ge in the substance. Bi was added to the ash as an oxide in an amt. of 2.24% (calcd. as metal). Ge was detd. for the range 0.01-1.0% with an error of ±5.7 to ±8.2%. It is shown that the ratio of the intensities of the lines Ge-Bi depends upon the volatility of the Ge compds. in the ash and upon the compn. of the waste product. The coincidence of the lines for Ge glass and germanate of Mg with the line for Ge ashes indicates that there is a bond between the compds. of Ge (germanates) and the silicate component of the ash. B. Z. Kamich



1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

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Bc

460. Thermal [illegible] of spectroscopically pure carbon electrodes. [illegible] and V. N. Kostenko (Zavod. Lab., 1940, 9, 1060–[illegible]).—C electrodes for spectrography are purified by passing through them a current of 750 v. and 300–400 amp. for 30–40 sec. Temp. >3000° are reached and most metals evaporate.

J. J. B.

COMMON ELEMENTS

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AUTHOR INDEX

Fe GROUPS

3RD AND 4TH ORDERS

2ND LETTER

1ST AND 2ND LETTER

1ST AND 2ND ORDERS

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3RD AND 4TH ORDERS

BE

B-1-4

Relation between intensity of spectral lines and volatility of the [illegible] (Bull. Acad. Sci. [illegible]) The arc sample was fixed in the positive electrode, and the length of time t noted during which the metal lines were visible in the arc spectrum. For metals and oxides t is, generally, the longer the less volatile is the metal, but t of sulphides depends on the volatility of the sulphides themselves. If mixtures are taken, their t depends on the volatility of the original compounds and those produced in the arc. J. J. B.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

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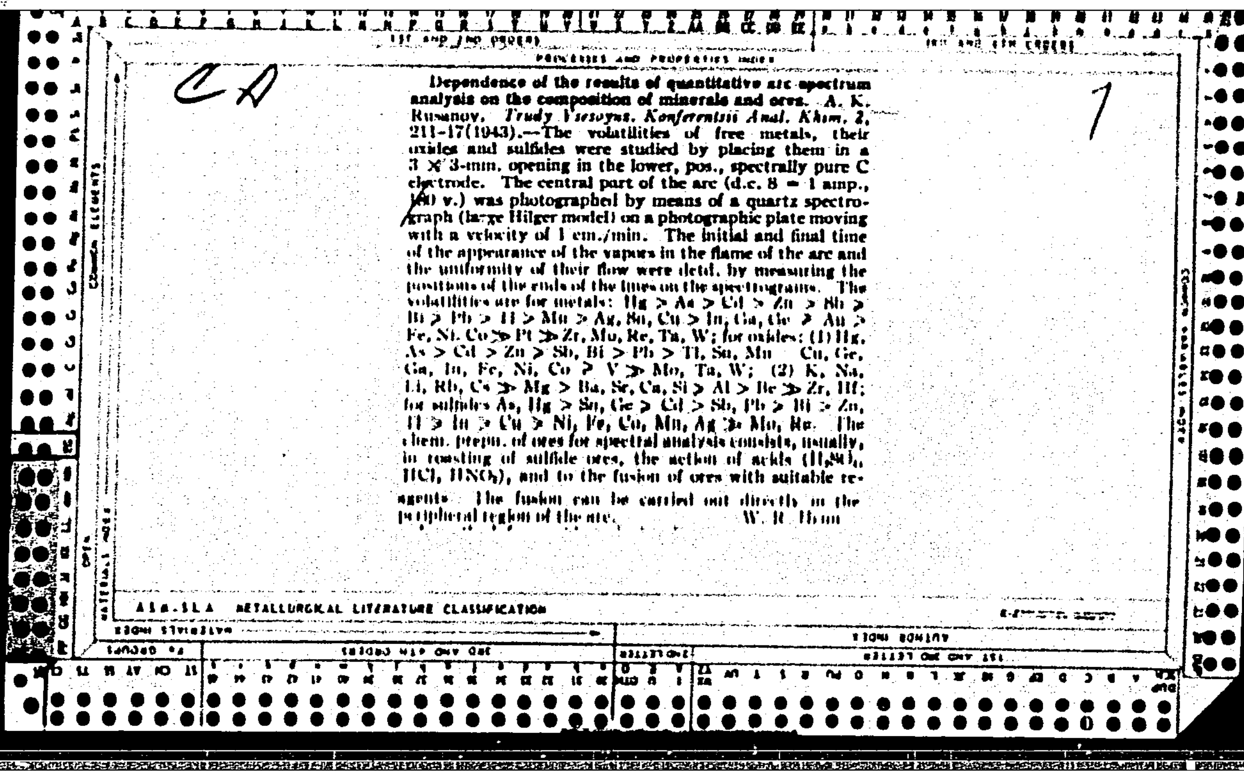
Ca

7

Methods of quantitative spectral analysis of minerals and solutions. IX. Effect of the volatility of the components of the ore on the intensity of the spectral lines. A. K. Rusanov and V. M. Alekseeva. *Zavodskaya Lab.* 10, 51-61, 171-8(1941); cf. *C. A.* 34, 5024^{3}.—The introduction of minerals and ores on paper sheets into the flame of the arc makes it possible to det. the quant. compn. of the ores regardless of the particle size or the distribution of the elements in the ore (mech. mixt. or penetration into cryst. lattice). The volatility of compds. in the flame of the elec. arc has a substantial effect on the relative and abs. intensities of the spectral lines. The change in relative intensities of the lines caused by a chem. change in compn. of the ore may be predicted by a study of the vapor pressures of the starting compds., chem. reaction occurring in the arc, and the vapor pressures of the newly formed compds. in the arc. The volatilities of free elements, their oxides, and sulfides are arranged in series. 24 references.

B. Z. Kamich

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



CA

1

Dependence of the results of quantitative arc spectrum analysis on the composition of minerals and ores. A. K. Rusanov. *Trudy Vsesoyuz. Konferentsii Anal. Khim.* **2**, 211-17(1943).—The volatilities of free metals, their oxides and sulfides were studied by placing them in a 3 × 3-mm. opening in the lower, pos., spectrally pure C electrode. The central part of the arc (d.c. 8 = 1 amp., [illegible]0 v.) was photographed by means of a quartz spectrograph (large Hilger model) on a photographic plate moving with a velocity of 1 cm./min. The initial and final time of the appearance of the vapors in the flame of the arc and the uniformity of their flow were detd. by measuring the positions of the ends of the lines on the spectrograms. The volatilities are for metals: Hg > As > Cd > Zn > Sb > Bi > Pb > Tl > Mn > Ag, Sn, Cu > In, Ga, Ge > Au > Fe, Ni, Co ≫ Pt ≫ Zr, Mo, Re, Ta, W; for oxides: (1) Hg, As > Cd > Zn > Sb, Bi > Pb > Tl, Sn, Mn Cu, Ge, Ga, In, Fe, Ni, Co > V ≫ Mo, Ta, W; (2) K, Na, Li, Rb, Cs ≫ Mg > Ba, Sr, Ca, Si > Al > Be ≫ Zr, Hf; for sulfides As, Hg > Sn, Ge > Cd > Sb, Pb > Bi > Zn, Tl > In > Cu > Ni, Fe, Co, Mn, Ag ≫ Mo, Re. The chem. prepn. of ores for spectral analysis consists, usually, in roasting of sulfide ores, the action of acids (H_2SO_4, HCl, HNO_3), and in the fusion of ores with suitable reagents. The fusion can be carried out directly in the peripheral region of the arc. W. R. Henn

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

BC

1 4

1875. [illegible] of metallic antimony, using pressed electrodes. [illegible] and A. K. [illegible] (Bull. Acad. Sci. U.R.S.S., Sér. Phys., 1945, 9, [illegible]).—Standard electrodes for spectrochemical analysis of impurities may be prepared, in the case of [illegible] metals [illegible], [illegible] or Te, by pressing mixtures of the powdered pure metal with varying amounts of a powdered alloy containing known and appreciable amounts of the impurities. Suitable Sb electrodes, 8 mm. diameter, are obtained under a pressure of [illegible] kg. per sq. cm. A Feussner circuit, quartz spectrograph, and three-step optical wedge are used. The line pairs used, the second in each case being an Sb line, and the concn. ranges covered are as follows: Pb (0·008—0·3%) [illegible] : 2861·1 ; Bi (0·008—0·3%) 3067·72 : [illegible]; Cu (0·01—0·3%) [illegible] : [illegible]; Sn (0·003—0·3%) 3175·05 ; [illegible]; Ag [illegible] 3280·67 : [illegible]; Cd (0·00—0·3%) [illegible] : 3232·52 ; As (0·01—0·3%) [illegible] : [illegible]; Au (0·00—0·3%) 2427·95 : 2445·53 ; Co (0·01—0·5%) 3405·12 : 3267·48 ; Ni (0·006—0·5%) 3619·39 : 3637·83 ; Mn (0·006—0·5%) [illegible] : 3612·51 ; Fe (0·01—0·5%) 2755·74 : 2769·94. The probable errors are ±3—8% of the content.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

8c

C4

1095. Influence of volatility of the components of ores on the temperature of the flame and the electrodes of the carbon arc. A. K. Rusanov. (Bull. Acad. Sci. U.R.S.S., Sér. Phys., 1940, 4, 707—714). —Spectra photographed on plates moving at 10 mm. per min. are used to determine the relative rates of evaporation and volatility sequences of elements and compounds present in ores when the substance (30 mg.) is placed in a hole made in the lower C electrode (positive) of a pair with a 5-mm. gap through which passes a d.c. current of 5 amp. The substances are arranged in series. When a plate electrode is used the order is somewhat different. It was noticed during the work that with a current of 5 amp. and an arc gap of 5 mm. the p.d. at the ends of the electrodes varied between 65 (for the pure C arc) and 20 v. Curves giving voltage (v) as a function of time are mirror images of the curves obtained by plotting the volatility of that constituent which has the least ionisation potential, V_i in place of v. Hence observation of changes of v permits the rate and sequence of evaporation of the constituents to be controlled to a certain extent. Except in the case of some substances difficult to volatilise, v and V_i for various compounds are linearly related and, since V_i is closely related to the temp. of the C arc (cf. Hörmann, Z. Physik, 1936, 97, 539), this temp. can be determined from v.
G. S. S.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

USANOV, A. K.

CA

7

Methods of quantitative spectral analysis of minerals and solutions. XI. Direct determination of cadmium in zinc blende and smithsonites. A. K. Rusanov and V. M. Alekseeva. *Zavodskaya Lab.* 11, 181-7(1945); cf. *C.A.* 38, 5460'.—Cu (0.02-0.5%) can be detected in Zn blende, smithsonites, $CaCO_3$, and $MgCO_3$ with a probable error of 9-11% by introducing the mineral on strips of paper into the arc flame and measuring the relative intensities of Cd and Sb spectral lines. The calibration curves were made by plotting the difference in the intensities of the lines Cd 326.05 A., Sb 3232.5 A. on the Y-axis and the corresponding contents of Cd in the ore on the X-axis. Each point on the calibration curves was the mean of the measurements of 2 spectra of the ores. The presence of 15% galenite in Zn blende had no appreciable effect on the results of spectral analysis. More than 15% of galenite resulted in the displacement of the calibrated curves and higher contents of Cd. The considerable weakening in the intensity of the Sb line in the presence of Pb is caused by the absorption of Sb by the undecompd. particles of the Pb ore. The presence of 8.5% of chalcopyrite in Zn blende had no appreciable effect on the relative intensities of the Cd and Sb lines. The presence of considerable quantities of $FeCO_3$ in $ZnCO_3$ has a very small effect on the displacement of the calibration curves. Larger quantities of $FeCO_3$ displaced the curves considerably. Two references.

W. R. Henn

9-15-54

1ST AND 2ND ORDERS

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3RD AND 4TH ORDERS

THE PREPARATION OF STANDARD ALLOYS FOR THE SPECTROGRAPHIC ANALYSIS OF ZINC, CADMIUM, LEAD, AND TIN. A. K. RUSANOV (ZAVOD. LAB., 1946, 11, (4) 349-350) (In Russian) In the preparation of alloys of predetermined composition, R, recommends melting in a stream of hydrogen. N.s.

MATERIALS INDEX

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Cλ

8

Scattered elements in cassiterite deposits of the Far East. (According to spectral-analytical data). M. I. Itsikson and A. K. Rusanov. *Izvest. Akad. Nauk S.S.S.R., Ser. Geol.* 1946, No. 6, 119-30; *Chem. Zentr.* 1947, I, 1108. The results of spectral analyses on 72 samples from 21 Sn deposits are reported. V was found in 67 samples in amts. of 0.001-0.01%, Cr was found in 5, and Mo in about 20 in amts. of 0.001-0.1%. The W content was 0.1-1.0%. Cb and Ta occurred with pegmatite in amts. up to 1.0%. Pb, Ga, and In were always found; Ag, Bi, Sb, Cb, Ta, and Cu were less frequently found, Ni, Co, As, Zn, and Be were seldom found; and Bi, Tl, Cd, and Cr were still less frequently found. In comparison with other Sn deposits of Russia, those of the Far East are distinguished by the fact that Pb, Ga, In, V, and W are always present and Ge is absent. Mo is typical for pegmatite, less so for the sulfide-cassiterite deposits. Higher concns. of W, In, and Co occur in the latter.

M. G. Moore

METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

CA

Indium in the tin ore deposits of the Far East. M. I. Itsikson and A. K. Rusanov. *Compt. rend. acad. sci. U.R.S.S.* 53, 631-2(1946)(in English). Spectrographic analysis proves the presence of In in 72 cassiterite specimens, especially from the Mikoyan deposits. M. M. L.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

RUSANOV, A. K. Dr. Tech. Sci.

Dissertation: "Spectrum Analysis of Ores and Minerals." All-Union Sci. Res. Inst. of Mineral Raw Materials. 9 Jul 47.

SO: Vechernyaya Moskva, Jul, 1947 (Project #17836)

RUSANOV, A. K.

PA 24T20

USSR/Electricity May/Jun 1947
Arcs, Carbon
Electrodes, Carbon

"Process of Vaporizing Elements in a Carbon Arc and Stabilization of the Temperature by the Flame of the Arc," A. K. Rusanov, 8¼ pp

"Iz Ak Nauk SSSR, Ser Fiz" Vol XI, No 3

Well illustrated with graphs showing the speed of cooling of electrodes of various dimensions, change of the intensity of the copper lines, distribution of temperature along the graphite anode and others. Table shows the relationship of the expansibility of vapors of gold, silver, copper and lead to temperature. Submitted at the All-Union Institute for Mineral Ore. Moscow.

24T20

RUSANOV, A. K.

RUSANOV, A. K. Spektral'nyy analiz rud i mineralov. [illegible]
259p and 14 charts.
A reference book on spectral analysis of ore and minerals, including apparatus and materials, quantitive and qualitive spectral analysis, practical directions for establishing elements in ores, etc; published as a Government Edition on Geology.

CA

7

Spectroanalytical determination of rare alkali metals in minerals with the aid of a flame. M. A. Rivkina and A. K. Rusanov. *Izvest. Akad. Nauk S.S.S.R., Ser. Fiz.* 12, 467-70(1948).—In a C_2H_2-air flame, lines of the alkali metals in pollucite (Cs, Rb, Na, Li, K)$_2$ ($Si_4Al_2O_{12}$).H_2O appear only if the sample is fused with Na_2CO_3 + 20% $Na_2B_4O_7$. Rb is conveniently detd. against In as standard, by the line pairs Rb 4201.8-In 4101.0, for Rb 0.07-2.0%, mean probable error 4.1%. For Cs 0.06-5.0%, by Cs 4555.3-In 4511.5 A., error 4.0%; and for Cs 0.18-5.0%, by Cs 4593.2-In 4511.5, error 3.7%. N. Thon

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RUSANOV, A. K.

Spectrum Analysis

"Determination of Small Quantities of Beryllium in Solutions and Alumino-Magnesium Alloys by Spectrum Analysis," E. V. Gusyatskaya, A. K. Rusanov, State Inst of Rare and Fine Metals, 3 P

"Iz Ak Nauk SSSR, Ser Fiz" Vol XII, No 4, 1948

Applied method of spectrum analysis using a preliminary introduction of the metal into a solution to determine beryllium in aluminum, magnesium, and their alloys. Placed 0.1 g of the metal in a graduated test tube and dissolved in 2 ml of

53/49T76

USSR/Metals/Minerals (Contd) Jul/Aug 48

HCl. Used measurements of the relative intensities of beryllium and cadmium (0.1% cadmium chlor ide in every solution) to determine beryllium in the solution.

53/49T76

RUSANOV, A. K.

USSR/Chemistry - Beryllium - Detection Mar/Apr 49
Chemistry - Spectral Analysis

"The Identification of Small Quantities of Beryllium in Solutions and Aluminum and Magnesium Alloys by Spectral Analysis," E. V. Gusyatskaya, A. K. Rusanov, State Inst of Rare and Fine Metals, $8\frac{1}{4}$ pp

"Zhur Anal Khim" Vol IV, No 2

Probability of error using new rapid method is ± 5%. Studies effect on results of analysis of changes in the ratio of magnesium to aluminum

[redacted] 57/49T13

57/49T13

USSR/Chemistry - Beryllium Detection (Contd) Mar/Apr 49

in the alloys, content of hydrochloric acid in solutions, spark discharge time, and magnitude of spark gap. This accelerated method permits analysis of approximately 30 solutions in one day. Submitted 13 Apr 48.

[redacted] 57/49T13

B.A.

Chemical topography of micro-elements in the human brain as determined by spectral analysis. A. O. Voinar and A. K. Rusanov (*Biochimia*, 1949, **14**, 102—106).—Spectral analysis of the ash of human brain showed the presence of Ag, Al, Bi, Cr, Cu, Mn, Mo, Ni, Pb, Si, Sn, Ti, V, and Zr. Mo occurs only in the sensory cortex, Cr chiefly in the caudate nucleus, Si and Ni chiefly in the substantia nigra. The approximate distribution of the other elements mentioned is also given.

D. H. Smyth.

Chair Biochem. Med. Inst., Staline (Donets Basin) and All-Union Inst.
Mineral Ores, Moscow.

USSR/Chemistry - Analytical Methods Photometry Apr 50

"Photometric Flame Method for Determination of Sodium and Potassium in Solutions," A. K. Rusanov, E. V. Gusyatskaya, N. V. Il'yasova, 7 pp

"Zavod Lab" Vol XVI, No 4 -p. 447-53

Use of acetylene flame for spectrum excitation in de-
termining sodium and potassium eliminates use of mon-
ochromators, allows separation of lines of these ele-
ments with aid of light filters installed before
photocells. Amplification of photoelectric currents,
most difficult part of process, may be omitted in this

160T10

[redacted]

USSR/Chemistry - Analytical Methods (Contd) Apr 50

case. Simple apparatus for rapid determination of so-
dium and potassium gives possibility of determining
these elements in several minutes in cases of their
simultaneous presence in solutions.

160T10

[redacted]

RUSANOV, A. K.

RUSANOV, A.K.

SHAYLIKOV, A.S.; KAZANTSEV, G.V.; PROSKURIN, N.V.; RUSANOV, A.K., redaktor;
STEPANOVA, L.S., redaktor; POPOV, N.D., tekhnicheskiy redaktor.

[Work practices in the spectrum analysis laboratory of the Geological Administration] Opyt raboty spektral'noi laboratorii geologicheskogo upravlenii. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po geologii i okhrane nedr, 1954. 1954. 26 p. (Trudy laboratorii geologicheskikh upravlenii, trestov, ekspeditsii i partii, no.5) (MLRA 10:4)

(Spectrum analysis)
(Chemical laboratories)

RUSANOV, A.K.

USSR/Chemistry - Spectral analysis

Card 1/2 : Pub. 145 - 1/14

Authors : Rusanov, A. K., and Alekseyeva, V. M.

Title : Horizontal DC-arc as a source of excitation of the spectrum of ores and minerals

Periodical : Zhur. anal. khim. 9/4, 183-192, Jul-Aug 1954

Abstract : The applicability and advantage of a horizontal carbon-arc, placed between two charged puncture-electrodes and used as a source of excitation of ore and mineral spectra, are described. The general law governing the symmetrical distribution of intensities of arc and spark lines of elements in a horizontal DC-arc, which depends very little upon the properties of the elements and volatility of the compounds, was established.

Institution : All-Union Scientific Research Institute of Mineral Raw Materials, Moscow

Submitted : April 8, 1954

Periodical : Zhur. anal. khim. 9/4, 183-192, Jul-Aug 1954

Card 2/2 : Pub. 145- 1/14

Abstract : The distribution of line intensities in an arc flame, based on measured temperature distribution and relative atom concentration in the arc, is explained. Eight references: 7-USSR and 1-German (1930-1952). Graphs; drawings.

USSR/Chemistry - Spectral analysis

Card 1/1 Pub. 43 - 73/97

Authors : Rusanov, A. K.

Title : Horizontal AC-arc as a source of excitation of spectra of ores and minerals

Periodical : Izv. AN SSSR. Ser. fiz. 18/2, page 288, Mar-Apr 1954

Abstract : The author investigated the possibility of utilizing a carbon arc (AC-arc, 220 v. 15 amp), between horizontal electrodes during the analysis of ores and minerals with the addition to the latter of $SrSO_4$ mixed with carbon powder for the purpose of stabilizing the flame temperature. The suitability of this method for quantitative spectral analysis of powderous samples was confirmed experimentally.

Institution : The All-Union Institute of Mineral Raw Materials

Submitted : ......

RUSANOV, A.K.

CH

Determination of hafnium and zirconium by optical spectrum analysis. E. V. Gusyatskaya and A. K. Rusanov (All-Union Inst. Mineral Deposits, Moscow). *Zhur. Anal. Khim.* 10, 75–85(1955); *J. Anal. Chem. U.S.S.R.* 10, 67–75 (1955)(Engl. translation).—Detn. of Hf and Zr in a C arc and a spark discharge are described. When Hf and Zr were detd. in the presence of other elements, as is the case in ores and minerals, fractionation of the elements caused changes in the arc temp. which in turn affected the intensity of the Hf and Zr lines. In order of their vaporization, the elements studied were arranged as follows: As, Cd, Zn, Bi, Pb, Sb, Na, B, Sn, Mo, W, U, Th, Nb, Ta, Hf, and Zr. Attempts at stabilizing the arc temp. with addns. proved unreliable. When only Hf and Zr were present, the C arc gave satisfactory results. In the presence of other elements detn. of Hf and Zr was difficult. For spark-discharge detn. ZrO_2 and HfO_2 were freed of their admixts. and thoroughly mixed with sponge Ag by using Ag 75 and oxides 25%. The mixt. was pressed into rods of 4-mm. diam. and briefly heated at approx. 800°. To conserve Hf and Zr they were incorporated only in 1–1.5 mm. of the electrode, the rest being pure Ag. This method of detg. Hf in Zr and Zr in Hf over a wide range of concns. gave good results.

M. Hosch

①

RUSANOV, A.K.

Spectroscopic analysis of powdered substances by feeding the powder into the discharge zone by means of air. A. K. Rusanov and T. I. Tarasova (All-Union Sci. Research Inst. Mineral Deposits, Moscow). *Zhur. Anal. Khim.* 10, 267–75 (1955).—An app. is described by means of which a powd. sample is down-fed into the discharge zone between 2 electrodes. The advantage of this procedure is better reproducibility of results. Where the sample is placed inside a depression of an electrode the rate of vaporization of the constituents varies which also causes the temp. of the arc to fluctuate, both factors affecting the intensity of spectrum lines. Feeding the sample directly into the discharge obviates these difficulties. The rate at which the sample flows into the discharge is of importance and this phase is discussed at length. M. Hosch

①

RUSANOV,A.K.; RUSYATSKAYA,E.V.; IL'YASOVA,N.V.

Atlas of spark and arc spectra of elements (range 2100--6600 Å). Izv. AN SSSR. Ser. fiz. 19 no.1:44-45 Ja-F '55. (MLRA 8:9)

1. Vsesoyuznyy institut mineral'nogo syr'ya
(Spectrum analysis) (Spectrometer)

RUSANOV, A.K.

Changes in the thermal conditions of excitation in arc spectrum analysis of ores and minerals. Izv. AN SSSR. Ser. fiz. 19 no.1: 106-113 Ja-F '55. (MLRA 8:9)

1. Vsesoyuznyy institut mineral'nogo syr'ya
(Spectrum analysis) (Spectrometer)

POLYAKOV, P.M.; RUSANOV, A.K.

Spectrum analysis for determining impurities in vanadium pentoxide. Izv.AN SSSR.Ser.fiz.19 no.2:180-182 Mr-Ap '55. (MLRA 9:1)
(Tartu--Spectrum analysis--Congresses)

KOSUNOV, N.K.

Spectrographic determination of impurities in vanadium. M. Pav[illegible]

[illegible] considerable interval of varying [illegible] with a probabl[illegible] [illegible]

Rusanov, A.K.

KALININ, S.K.; NAYMARK, L.E.; MARZUVANOV, V.L.; ISMAGULOVA, K.I.; RUSANOV, A.K., professor, doktor tekhnicheskikh nauk, redaktor; POTAPOV, V.S. redaktor izdatel'stva; GUROVA, O.A., tekhnicheskiy redaktor

[Atlas of spectrum lines for a glass spectrograph; explanatory text and 26 diagrams] Atlas spektral'nykh linii dlia stekliannogo spektrografa; poiasnitel'nyi tekst i 26 planshetov. Pod red. A.K. Rusanova. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po geol. i okhrane nedr, 1956. 45 p., 26 l. (MLRA 10:4)

(Spectrum analysis--Tables, etc.)

RUSANOV, A.K.

Spectroscopic method for quantitative determination of beryllium in ores and minerals. V. M. Akseeva and A. K. Rusanov (All-Union Sci. Research Inst. Mineral Raw Materials, Moscow). Zhur. Anal. Khim. [illegible]

To stabilize [illegible]

parts. The final sample is [illegible]

and 11% [illegible]

RUSANOV, A. K.

✓419 **Spectrographic determination of scandium in minerals, ores and products of refining.** S. M. Solodovnik, A. K. [illegible] and A. I. Kondrashina [illegible] State [illegible]

determination [illegible] mite, cassiterite and beryl the sample [illegible] carbon powder [illegible]

[illegible]

a universal [illegible] of deter[illegible] ical treatment is necessary. The mineral is dissolved by a suitable process, $Th(NO_3)_4$ or $CaCl_2$ is added in excess and the mixed oxalates of Th (or Ca) and Sc are pptd. The ignited ppt. (15 mg) is mixed with 5 mg of graphite powder containing 5% of La_2O_3 and excited in a d.c. arc (10 amp and 180 V). G. [illegible] SMITH

ROSANOV, M.K.

1.4E2c

7 18

Spectrographic analysis of ores by the arc discharge by

introduction

[illegible]

RB

RUSANOV, A. K.

274
1-4E2C
1-4E3d

1 The spectrographic analysis of the rare earth elements. P. M. Polyakov and A. K. Rusanov. *Zavodskaya Lab.* 23, 604-9 (1957).—The metals were dissolved in redistd. HNO_3 before testing, and ignited at 700° in a muffle furnace for 30 min. Pr, Nd, Sm, and Er can be tested by measuring their absorption spectra in aq. solns. Directions were developed for the detn. of Y and Yb in a mixt. of rare earths, the admixt. in La (99.98% pure) with Pb, Sn, Bi, Sb, and Cd not exceeding $5 \times 10^{-4}\%$. The analytical lines of the impurities were detd. from their spectra and a table was given for the absorption bands of Pr, Nd, Sm, and Er in their aq. solns.

W. M. Sternberg

MT

AUTHOR: Shmanenkov, I. V., Professor, Deputy Director 32-10-14/32

TITLE: Comments

PERIODICAL: Zavodskaya Laboratoriya, 1957, Vol 23, Nr 10, pp 1186-1186 (USSR).

ABSTRACT: In his report on the occasion of the 40th anniversary of the October revolution, the author states that Soviet geology made great endeavors under Soviet rule in order to procure the necessary sources for the industry of this country. These successes were achieved by Soviet geologists by applying complex investigation methods with respect to the mineral resources of the earth besides a thorough investigation of their occurrence. The means applied for this purpose were the following: mineral-petrographic, petro-chemical, chemico-analytic, spectroscopic, luminescent, radiographic, physico-mechanical, physico-chemical, chemical-technological, and other methods. The foundation of this branch of science was laid by M. V. Lomonosov; the afore-mentioned methods were, however, only rarely applied in pre-revolutionary Russia, above all because of the lack of means and adequate laboratories. Only the "Soviet-times" fully contributed to this development. This was manifested above all in the prodigious development of the industrial branches concerned with the production of: Aluminum, nickel, cobalt, molybdenum, titanium, vanadium,

Card 1/3

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Comments

and rare metals. Soviet geologists at present mostly apply chemical- and spectroscopic analysis and frequently also combinations of these two methods. The perfection of technical work in the laboratories plays an important rôle due to which up to 5oo to 6oo tests can be carried out on a spectrograph, during one shift. Spectral analysis is not only applied in central laboratories, but also in the field-laboratories of expeditions which contributed especially to the discovery of new occurrences, above all indium, gallium, thallium, germanium, and other very much dispersed rare elements. The most important scientists in this report are the following: A. K. Rusanov (Allunion institute of scientific researches in geology), N. F. Zakhariya (Ukrainian branch of the institute of rare metals), and Ya. D. Reikhbaum (Branch of the institute of rare metals in Irkutsk), and others. An important rôle is attributed here also to the development and application of the methods of chemical analysis, especially as regards the application of organic reagents, polarography, photocolorimetry, and luminiscence. The most important Soviet scientists in this field mentioned in this report are: B. G. Karpov, Yu. V. Morachevskiy, Yu. N. Knippovich, N. I. Chervyakov, K. C. Viskont, I. P. Alimar, V. I. Lisitsyn, V. I. Kuznetsov, and E. A. Ostroumov (Allunion institute of mineral raw materials). The following Soviet scientists distin-

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guished themselves particularly with respect to the discovery of new sources of raw materials; V. S. Syrokomskiy, who discovered occurrences of vanadium in the Ural-district, V. A. Nazarenko, who elaborated a new high-sensitive method of colorimetric qualitative analysis of germanium which led to the discovery of several occurrences of germanium. Concluding his report, the author says, that the Soviet scientists are expected to solve the problems of full automation on the strength of the introduction of the latest physical achievements in Soviet laboratories.

ASSOCIATION: Vsesoyuznyy institut mineral'nogo syr'ya (All-Union Institute of Mineral Raw Materials)

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1. Science-USSR-Progress

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VOROB'YEV, V.S.; RUSANOV, A.K.

Spectrographic and quantometric analysis of solutions and silicate rocks after the solubilization of samples. Zhur. anal. khim. 19 no.3:286-292 '64. (MIRA 17:9)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut mineral'nogo syr'ya, Moskva.

Rusanov, A.K.

32-11-21/60

AUTHORS: Polyakov, P.M., Rusanov, A.K., Blokh, I.M.

TITLE: Spectral Analysis of Beryllium (Spektral'nyy analiz berilliya)

PERIODICAL: Zavodskaya Laboratoriya, 1957, Vol. 23, Nr 11, pp.1320-1323 (USSR)

ABSTRACT: A direct determination of the concentration of the admixture, which is small after the sample changed from the metal- into the oxide form, was carried out without any sort of preparation. This method was comparatively well developed (in the USSR) between 1948 and 1951, and is widely in use as a means of control in laboratories and industrial plants. In the first stage of beryllium production the half-volume evaluation of several elements is employed. In finishing production it is sufficient to determine the elements B, Ni, Cu, Pb, Sn, W, Mo, Zn, Ba, Na, K, Li, Al, Fe, Si, Mg, Mn, Cr and Ca; for the determination of the others the method developed by Smith and Fassel (1) is used. In the chapter dealing with preparation of samples for analysis and preparation of standard mixtures these processes are described. In the former case a beryllium dose is burnt in a small quartz can in a "Mars" furnace under the influence of the mixture of oxygen and steam (within 2 hours at 900°), after which it is chemically oxidized. In the case of a content of boron the latter is determined according

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to a special method (2). The standard mixtures are obtained by mixing the base with the oxides of the corresponding elements in a certain proportion. Each of the following standards is diluted 3-fold by the addition of the basis substance, the last series being prepared by dilution with water and by the solutions of the nitrogenous acid salts of the alkali elements. In the chapter: Half-volume evaluation of admixtures in beryllium it is said that in this case the spectrum is photographed twice: First with respect to easily volatile elements, and then with respect to such as occur in the arc in the middle and at the end of the experiment. A table is given. The chapter: Determination of admixtures by volume describes this process. Boron, chromium, and tin is determined by separate vaporation from one sample. The process is based upon the difference in the vapor pressure of various elements and the basic substance. In individual cases so-called carriers of these effects were used, i.e. admixtures by which this effect is accentuated. In this case special graphite electrodes are used, which are shown in form of a drawing. In the chapter: The determination of alkali elements and elements of alkaline earths it is pointed out that when determining lithium and potassium beryllium oxide with admixtures of various portions of sodium carbonate are

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