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ACTIVITIES OF INSTITUTE OF GENERAL AND INORGANIC CHEMISTRY IMENI N.S. KURNAKOV, ACADEMY OF SCIENCES USSR

/Comment: This report presents information, taken from USSR periodicals for the years 1948 and 1952 - 1953, on the activities of N.S. Kurnakov and the Institute of General and Inorganic Chemistry imeni N.S. Kurnakov. Included are (1) a brief survey of the development and work of the institute; (2) the text of the resolution of the Second Conference on the Physicochemical Analysis of Solid Solutions, called by the Department of Chemical Sciences, Academy of Sciences USSR and the institute; (3) summaries of 14 papers (some presented at the conference) on solid solutions published in Izvestiya Sektora Fiziko-Khimicheskogo Analiza; and (4) summaries of nine papers on the work of Kurnakov and the institute, published in Uspekhi Khimii.

Numbers in parentheses refer to appended sources./

Development and Work of Institute of General and Inorganic Chemistry

The expansion of scientific work in the field of chemistry in the USSR can be traced by following developments at the chemical institutes of the Academy of Sciences USSR. In 1935, the Academy of Sciences was transferred to Moscow /from Leningrad/. In 1936, the Department of Chemical Sciences of the academy was founded. Within the scope of this department, the following important research institutes unfolded their activity: Institute of General and Inorganic Chemistry imeni N. S Kurnakov (IONKh), Institute of Organic Chemistry, Institute of Physical Chemistry, the Radium Institute, and several others.

During the years of industrialization and of the Stalin Five-Year Plans, work on the investigation of equilibriums in complex systems was pursued on an extensive scale at the Institute of General and Inorganic Chemistry imeni

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N. S. Kurnakov. From the practical standpoint, study of equilibriums in alloys in connection with the practical application of these alloys was particularly important. The institute developed a number of alloys which have been applied as catalysts in the chemical industry, such as high-resistance alloys, lightweight alloys, etc. New types of iron-chromium-nickel alloys were developed for use in the construction of highly stressed parts and of complete units of equipment which are exposed to the action of high temperatures.

The institute achieved particular success in the investigation of salt equilibriums as applied to the study of minerals and ores. The work of the institute permitted clarification of the chemical nature and origin of many minerals and ores, particularly iron ores, bauxites, and various clays.

Important investigations were also carried out by the institute in a field founded by L. A. Chugayev, namely, that of the chemistry of complex compounds. The work in this field is of theoretical interest, because it elucidates the stereochemistry of complex platinum compounds. One of Chugayev's pupils, I. I. Chernyayev, subjected to thorough investigation the stereochemistry of divalent and quadrivalent platinum. In the course of this work, he discovered the phenomenon of transinfluence.

As early as 1918, N. S. Kurnakov [1860 - 1941] had organized the Institute of Physicochemical Analysis [which later became the Sector of Physicochemical Analysis of the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov]. After its foundation, the Institute of Physicochemical Analysis began to further the development of theory and the application of research results in its special field. The work on salt equilibriums done by this institute clarified the conditions under which salts are deposited from brines derived from the water of sulfate lakes and of Kara-Bogaz-Gol [a gulf of the Caspian Sea]. In this respect, the work done on the subject proved to be of practical importance.

Also of practical importance were investigations by N. S. Kurnakov, G. G. Urazov, and N. N. Yfremov [deceased] on the composition of concentrated solutions and samples of solid minerals from Solikamsk and other localities. These investigations were carried out with the purpose of establishing the possibilities of the production of potassium salts from these solutions and minerals.

Research on metal equilibriums and alloys was also considerably expanded as a result of the activities of the Institute of Physicochemical Analysis. The work done at this institute formed the basis for a number of extended investigations in the field of physicochemical analysis which are still being pursued at present by the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov.(1)

Second Conference on Physicochemical Analysis of Solid Solutions

The Second Conference on the Physicochemical Analysis of Solid Solutions, which was called by the Department of Chemical Sciences, Academy of Sciences USSR and by the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov on the occasion of the 25th anniversary of the founding of the Institute of General and Inorganic Chemistry, took place in Moscow on 13 - 18 November 1944. This conference passed the following resolution:

"During 25 years, the important branch of general and inorganic chemistry created by Academician N. S. Kurnakov, i.e., physicochemical analysis, has been extensively developed. Reports illustrating this development were presented at the Jubilee Meeting [i.e., at the Second Conference on the Physicochemical Analysis of Solid Solutions]. These reports deal with the theory of

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solid solutions of metals, salts, and organic substances and with the application in industry and in the people's economy of results obtained in the course of work in this field.

The existence of a large group composed of Kurnakov's pupils and followers completely safeguards continuation of work on the theory of physicochemical analysis and further application on a wide scale of the results of this work. At present, physicochemical analysis has acquired great importance not only in inorganic chemistry, but also in metallurgy, geochemistry, petrography, halurgy, the chemistry and technology of silicates, and other branches of science and technology.

The role played by physicochemical analysis grows with every year. Its application opens up new horizons in science and new applications in industry as well as in connection with the rapid rebuilding of the economy of areas liberated from the fascist invaders.

The conference notes the immense work accomplished by the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov in investigating equilibriums within metallic and nonmetallic systems during the 25 years of the institute's existence. It also notes that the results of this work have been introduced into practice. This work could be carried out only by carefully training skilled personnel. At present, representatives of at least three generations of doctors of chemical sciences compete with each other in the development of physicochemical analysis as a fundamental method for the investigation of the composition, structure, and transformations of chemical substances. The conference particularly notes the work on the mobilization of salt resources, and on ores, alloys, and alloy steels, as well as on military applications of chemistry carried out by the institute during World War II.

To expedite the work of the institute in further advancing methods of physicochemical analysis in the USSR, it is necessary to expand theoretical work dealing with the nature of the chemical bond and with the theory and methods of physicochemical analysis; to train more personnel skilled in methods of physicochemical analysis; to transform Izvestiya Sektora Fiziko-Khimicheskogo Analiza (News of the Sector of Physicochemical Analysis) into a regular periodical organ of the Academy of Sciences; to publish regularly monographs on individual problems of theory, methods, and applications in the field of physicochemical analysis as well as in the fields of inorganic and general chemistry; to accelerate the publication of textbooks, handbooks, and manuals on physicochemical analysis; to introduce physicochemical analysis into the general chemical courses given at higher educational institutions, including higher technical educational institutions; to apply physicochemical analysis more extensively in individual branches of geological sciences and of technology; and to organize special laboratories of physicochemical analysis at higher educational institutions, including higher technical educational institutions.

Furthermore, annual awards named after N. S. Kurnakov (one major award and two minor awards per year) should be introduced for the best investigations in the field of physicochemical analysis and its applications; a museum attached to the Institute of General and Inorganic Chemistry should be founded, to illustrate the results of the work done by the institute during the period of its existence; and a request should be sent to the Moscow soviet for the installation of a bust of Kurnakov in front of the building of the Institute of General and Inorganic Chemistry.

In regard to choice of subjects, particular attention should be given to the expansion of work dealing with the topology and quantitative evaluation [literally, metrics] of phase diagrams; investigation of equilibriums at high temperatures in systems containing liquid and gas phases; and further development of the study of equilibriums and properties of phases of changeable composition in metal, salt, silicate, and organic systems.

There should also be concentration on the investigation of (a) iron systems to which manganese, chromium, silicon, aluminum, niobium, or other rare metals have been added; (b) alloy systems based on aluminum and magnesium, with particular attention to processes of aging; (c) systems containing the rare elements beryllium, lithium, boron, titanium, and others; (d) the systems of alloys containing noble metals; of the atomic and electronic structure of metallic and nonmetallic phases; (e) naturally occurring salts (sulfates, borates, and carbonates) of potassium, magnesium, and other metals, as well as of salt equilibriums in naturally occurring aqueous salt systems and in those which have been artificially prepared in the laboratory; and (f) equilibriums related to combined and concentrated fertilizers, particularly in connection with the formation of solid solutions.

In addition, the contact with experimental stations should be re-established in order to check the agrochemical effect of solid solutions; broaden the study of the chemistry of rare elements and of equilibriums in salt and silicate systems; and expand the investigation by expeditions of natural deposits of salts, ores, and minerals. For the purpose of facilitating the development of magnesium alloys, the conference considers it necessary to ask the People's Commissariat of the Aviation Industry to organize, in 1945, at one of the plants, an experimental department for the production of castings and pressed products from magnesium alloys.

The conference notes the theoretical and practical importance of the work done by the State Institute of Rare Metals (Giredmet), People's Commissariat of Nonferrous Metals (NKTsM), on beryllium bronzes with a lowered beryllium content. The results obtained in these investigations indicate that it is possible to replace expensive copper-beryllium bronzes and the copper-tungsten alloy "kirit" with cheaper alloys. The work of the State Institute of Rare Metals, which has been interrupted by the war, must be resumed.

The conference considers it necessary to publish the transactions of the Second Conference on the Physicochemical Analysis of Solid Solutions in the current volume of Izvestiya Sektora Fiziko-Khimicheskogo Analiza. The conference furthermore considers it advisable to call annual meetings and conferences on the most pressing problems of inorganic chemistry and physicochemical analysis. In particular, an all-union conference on problems connected with the utilization and study of natural salt occurrences should be called in 1945."(2)

Summaries of Conference Papers and Others on Solid Solutions

/Izvestiya Sektora Fiziko-Khimicheskogo Analiza, Vol 16, Issue 4, 1948, contains 14 published papers, which represent a part of the transactions of the Second Conference on Physicochemical Analysis. Papers marked with an asterisk were actually given at the conference. The rest were either read by title at the conference or merely contributed to the periodical as a part of the symposium on solid solutions (3). The 14 papers listed in the table of contents of source 3 are summarized below./

G. G. Urazov, one of the editors of Izvestiya Sektora Fiziko-Khimicheskogo Analiza, reviews the life and activity of N. S. Kurnakov.(*4) He points out that in addition to being associated with the Institute of Physicochemical Analysis

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and the Institute of Platinum, Academy of Sciences USSR, Kurnakov participated in the work of the State Institute of Applied Chemistry, the All-Union Institute of Halurgy, the Leningrad Institute of Metals, the All-Union Aluminum and Magnesium Institutes, and others.

He further says that, as a result of investigations conducted under Kurnakov's direction at the Institute of General and Inorganic Chemistry, the State Institute of Applied Chemistry, and other institutes and laboratories on the subject of the potassium deposits of Solikamsk and of other potassium deposits in the extensive area south of the Urals, north of the Caspian Sea, and east of the Volga, problems in connection with the industrial exploitation of these deposits have been solved. He adds that, under the circumstances, the forthcoming exploitation of the Inder salt occurrences, which are characterized by the presence of chlorides, sulfates, borates, and bromides of potassium, magnesium, calcium, and sodium, will not present great difficulties to Soviet halurgists.

Urazov discusses in detail Kurnakov's work on complex compounds, alloys, phase diagrams of metal systems, and compounds of a transitional type and fractional composition, i.e., compounds of the Berthollet type as distinguished from Dalton compounds. He states that compounds of the Berthollet type have an "irrational" or fractional composition at the phase diagram maximum; and that, furthermore, the maximum does not exhibit a singular point in the case of compounds of this type.(*4)

In another paper, B. M. Kedrov discusses Kurnakov's ideas on compounds of the Berthollet type and other phases of variable composition in greater detail, emphasizing the historical, ideological, and philosophical aspects of the fundamental concept involved.(5)

S. T. Konobeyevskiy states that the formation of solid solutions as a result of lattice substitution may be regarded as a chemical interaction, and proceeds to discuss intermetallic solid phases of variable composition from the standpoint of lattice energies, electron interactions, and quantum mechanics.(*6)

In another paper dealing with intermetallic solid solutions, Ya. G. Dorfman points out that the zone theory of solids is too rough an approximation to explain in a satisfactory manner the behavior of the atoms of admixtures that had been added to solid metal solutions; that in solid metal solutions a rudimentary form of a chemical bond exists between the atoms of the admixture and the atoms of the solvent; that this bond is due to the opposite mutual orientation of atom spins; and that the characteristics of the mutual orientation of atom spins are an essential property which supplements the crystallographic description of metal phases.(*7)

In another article, A. A. Lebedev and Ye. A. Poray-Koshits present views on the structure of glasses /which differ in many respects from those held by American investigators/ (*8)

On the basis of data cited in his paper, which were taken mostly from foreign publications, V. G. Kuznetsov (IONKh), after a discussion of binary aluminum alloys, arrives at the conclusion that the mutual solubility of metals cannot be explained by any single factor, and that the relative position of elements in the periodic table, together with all atomic properties dependent on this position, determines the crystal-chemical interrelationship and mutual solubility.(*9)

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N. N. Kurnakov (IONKh) reported on original research in the Cr-Si system which established the existence of solid solutions containing up to 7.5% of silicon, as well as the fact that the compounds Cr_3Si, Cr_2Si, CrSi, and $CrSi_2$ are formed. Furthermore, as a result of this research the existence of the compound Cr_3Si_2 was made plausible.(*10)

Papers by I. I. Kornilov and A. A. Azovskaya (IONKh) and V. D. Sadovskiy (Laboratory of Metal Studies, Institute of Metallurgy and Metal Physics, Ural Affiliate, Academy of Sciences USSR) deal with ferrous metallurgy.(11,*12) On the basis of their results, Kornilov and Azovskaya conclude that measurement of the time of transformation may serve as a method of physicochemical analysis for the characterization of the state of the system under investigation.(11)

Another paper by I. I. Kornilov (IONKh) reports experimental results on the oxidation of iron-chromium-aluminum alloys. The purpose of the investigation is development of heat-resistant alloys. The author arrives at the result that a relative increase in the aluminum content in the ternary Fe-Cr-Al solid solution leads to an increased stability of the solution and to a reduction of the rate of oxidation of the aluminum contained in the alloy. He also concludes that alloys which have a high content of chromium and aluminum dissolved in the form of a ternary solution in iron exhibit a high degree of resistance to heat.(*13)

Papers by N. V. Ageyev, I. I. Kornilov, and A. N. Khlapova (IONKh) and by I. I. Kornilov and A. N. Khlapova (IONKh) deal with magnesium-aluminum-manganese alloys (14, 15). The authors carried out an investigation with the purpose of determining the optimum content of manganese in Mg-Al-Mn alloys.(14) They also investigated the grain structure, thermal properties, and characteristics of such alloys from the standpoint of heat-treatment.(15)

The work reported by V. G. Kuznetsov (IONKh) in his paper on platinum-copper-nickel alloys is fundamental research on ternary solid solutions.(*16)

Tensiometric measurements on hydrates of complex salts of platinum and cobalt which were carried out by B. A. Muromtsev (IONKh) indicate that the hydrates investigated represent an uninterrupted series of solid solutions of the salt and water (17)

Summaries of Papers on Work of Kurnakov and Institute of General and Inorganic Chemistry

/On the occasion of the 10th Anniversary of N. S. Kurnakov's death, reports dedicated to his memory and reviewing his activity were presented on 27 March 1951 by G. G. Urazov, S. A. Pogodin, and N. V. Ageyev at a general meeting of the Department of Chemical Sciences, Academy of Sciences USSR, and by I. I. Kornilov, V. K. Semenchenko, I. N. Lepeshkov, N. K. Voskresenskaya, M. I. Ravich, and G. B. Ravich at a session of the Scientific Council, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR, held 19 March 1951.

These nine reports were published in Uspekhi Khimii, Vol 21, No 9, 1952. They comprise the total contents of that issue of Uspekhi Khimii.(18) By reason of N. S. Kurnakov's close association with the Institute of General and Inorganic Chemistry named after him, the account of his activity given in the nine published papers also represents a review of work done, with or without his participation, at this institute. The contents of the nine papers are summarized below./

In giving a general outline of Kurnakov's work, G. G. Urazov states that investigation of the system formed by the salt . and water is of particular

$$2\ NaCl + MgSO_4 \rightleftarrows MgCl_2 + Na_2SO_4$$

interest at present, because the problem of natural sulfates has acquired great practical importance. He reviews Kurnakov's research on phase diagrams and chemical composition-property diagrams.

In a separate section of the article devoted to the progress of physicochemical analysis since 1940, he says that USSR work on the construction and evaluation of metallurgical and chemical phase diagrams is far in advance of similar work done abroad. He further says that a rational classification of isotherms of the electrical conductivity of binary liquid systems has been devised; that collation of extensive viscosimetric data has permitted the drawing up of various types of isotherms of internal friction pertaining to the most diverse rational and irrational binary liquid systems (water-salt solutions, organic substances, silicate melts, etc.); and that the work of N. N. Yefremov (deceased) on the thermal analysis, specific gravities, internal friction, and temperature coefficients of liquid solutions of organic substances has resulted in valuable experimental data illustrating the connection between internal friction and other properties of the systems involved.

In describing results obtained by the application of physicochemical analysis to the study of solid solutions of metals, Urazov mentions that the existence of the compound Mg_2Si in Al-Mg-Si solution has been established, the presence of Mg_2Cd, MgCd, and $MgCd_3$ in Mg-Cd solutions has been determined, etc. He states that in the investigation of metal alloys by the method of phase diagrams and of composition-property diagrams with a view toward applying the alloys for practical purposes, the Institute of General and Inorganic Chemistry occupies the foremost position not only in the USSR but also in the world.

Urazov further states that investigation of mechanical properties was applied not only in research on metals but also in work on organic substances, in connection with the solution of problems pertaining to plastic deformation and to the mechanical strength of salts, and in the study of effects which pressure exerts on reactions between salts in the solid state. According to Urazov, this type of work is of practical importance in the mining of salts and furthermore aids in arriving at a better understanding of processes leading to the formation of salt domes.

Urazov also states that one of the most important tasks of the Institute of General and Inorganic Chemistry in the near future will be accumulation of data referring to metals, salts, and organic substances and pertaining to the applicability at high temperatures of laws governing the interdependence of the properties and the composition of alloys or melts. He adds that, during recent years, new techniques and equipment were developed and used for the purpose of studying solubilities in saturated salt solutions and vapor pressures of such solutions at temperatures reaching 600-650° and pressures reaching 300-350 atm. Urazov then states that investigations of this type establish the connection between aqueous and nonaqueous salt systems, that they are of practical importance for the technology of steam at high and superhigh pressures, and that they clarify problems of ore formation and geochemistry.

In concluding his account of recent work in the field of physicochemical analysis, Urazov stresses applications of this method of analysis in connection with the industrial utilization of natural salt occurrences and emphasizes

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that large quantities of sulfates and chlorides of potassium, magnesium, strontium, lithium, rubidium, and cesium as well as other useful elements (Br, I, B) are contained in natural salt.(19)

In an article which follows Urazov's paper S. A. Pogodin [an editor of Izvestiya Sektora Fiziko-Khimicheskogo Analiza in 1948] discusses the question of priorities in various fields of research in which Kurnakov and his collaborators and successors were active. He says that, notwithstanding the fact that Kurnakov's results and theories have been accepted by Western science, Kurnakov has often not received the credit he deserves. According to Pogodin, this unwillingness to give due recognition to one of the foremost Russian scientists is by no means limited to foreign investigators; two authors of USSR textbooks (B. V. Nekrasov and G. A. Kashchenko) are also guilty of the same fault.(20)

In discussing the chemistry of intermetallic compounds and of alloys on the basis of work done by Kurnakov and his successors, I. I. Kornilov points out that research in this field is being continued at present under the direction of Academician G. G. Urazov by a large group of investigators at the Institute of General and Inorganic Chemistry. Kornilov discusses in some detail the subject of solid solutions of limited and unlimited solubility, compounds of definite and variable composition, and solutions and compounds which have characteristics intermediate between the extreme categories mentioned. In conclusion, Kornilov outlines the practical uses of such research and says that relationships established on binary systems, combined with knowledge of intermetallic compounds, can be used to predict the behavior of multicomponent systems, so that actual investigation of a multitude of alloys prepared for experimental purposes can be avoided.(21)

In a paper dealing with the chemical nature of intermetallic compounds, N. V. Ageyev discusses phases of variable composition that belong to the Dalton and Berthollet types. He advances the concept of a compound of variable composition based on a lattice in which ions have a wide range of fractional valency values changing both from ion to ion and throughout the lattice as a whole, depending on its composition. USSR research on electron density in the interion space confirmed the fact that continuous deformation of the electron cloud actually takes place, i.e., that the above-mentioned concept of continuously varying ionization is justified.(22)

On the basis of Kurnakov's idea and of the work done on the subject by members of Kurnakov's group and other scientists (L. Onsager and others), V. K. Semenchenko, who is an editor of Uspekhi Khimii, discusses order-disorder transitions in intermetallic compounds, ferromagnetic substances, seignettoelectric substances of the barium titanate type, and solutions. He disputes the view of L. D. Landau and Ye. M. Lifshits that critical transitions and phenomena cannot occur in the solid state (L. D. Landau and Ye. M. Lifshits, Statisticheskaya Fizika [Statistical Physics], 3d edition, Moscow, 1949) and cites many data based on work done by Kurnakov, N. V. Ageyev, R. G. Annayev, K. P. Belova, Z. Alizade, S. Sidorov, A. G. Bergman, and himself to show that the contrary is true.(23)

In a paper dealing with investigations by Kurnakov's group in the field of natural salts and water salts equilibriums, I. N. Lepeshkov [an editor of Izvestiya Sektora Fiziko-Khimicheskogo Analiza in 1948] reports on the significance of this work in connection with industrial developments in the Volga-Emba region. He says that sinking of wells in the course of prospecting in that area during 1936-1939 resulted in the discovery of many deposits of potassium salts, just as Kurnakov had predicted. Lepeshkov states that these potassium-magnesium salt deposits will form the basis of a new chemical industry that will produce fertilizers needed in connection with the irrigation of extensive areas of the Caspian Plain. The Carpathian salt deposits have also been investigated. According to Lepeshkov, tests initiated by Kurnakov have shown that the use of potassium-magnesium sulfates (polyhalite, kainite, glazerite, etc.) rather than chlorides as fertilizers presents certain advantages in connection with the growing of some crops, particularly on soils which contain large quantities of sodium chloride.

Lepeshkov concludes his account by saying that investigation of natural salt deposits and salt brines of the Caspian Plain, Western Turkmenistan, Northern Coast of Crimea, and southern regions of the Ukraine along the routes of the Stalingrad, Main Turkmen, North Crimean, and Southern Ukrainian canals is of great importance from the viewpoint of industrial exploitation and also from the viewpoint of irrigation, because contamination with salt may make the water unsuitable for irrigation purposes.(24)

A paper by N. K. Voskresenskaya describes work done by Kurnakov's school on the chemistry of salt melts as follows. In the early days of his activity, Kurnakov, in collaboration with S. F. Zhemchuzhnyy, investigated in great detail the crystallization of binary systems composed of the halides of potassium and sodium. These investigations were extended by S. F. Zhemchuzhnyy and F. Rambakh to cover salts of lithium, rubidium, and cesium.

A. G. Bergman and others, in the course of very extensive investigations on the thermodynamics of salt melts in general and those consisting of mutually interacting systems in particular, established that crystallization in mutually interacting systems always proceeds with separation of salts formed under evolution of heat. After World War II, the applicability of this rule to systems in which stable double salts of the type of $BaCl_2 \cdot BaF_2$ or $SrCl \cdot SrF_2$ participate was established, and the class of adiagonal systems, in the crystallization of which double salts must participate, was isolated and studied. By comparing phase diagrams of different mutual systems in which the same double salt forms, the heat of formation of the double salt could be determined. This method was applied to the salts $BaCl_2 \cdot BaF_2$, $SrCl_2 \cdot SrF_2$; and $Li_2SO_4 \cdot K_2SO_4$.

V. A. Sokolov and N. Ye. Shmidt conducted a study of the transformations of barium metatitanate, a substance which has attracted considerable attention during recent years because of its anomalous dielectric properties. By investigating in detail the heat capacities and heats of fusion of lithium nitrate, these scientists established that the heat-capacity curves do not exhibit any anomalies in the case of this salt, which indicates that transformations of the II kind are absent.

In work carried out by N. K. Voskresenskaya, the ideal solubility curves of LiCl, NaCl, KCl, NaF, $NaNO_3$, KNO_3, TlCl, AgCl, and $PbCl_2$ were determined and published data were collected on systems which form simple eutectics containing these salts. Using the material that had been collected and experimental data, the ideal solubility curves were then compared with the actual solubility curves on the principle that any deviations from the ideal curves indicate reactions between the salts contained in the melts. In the systems LiCl in Li_2SO_4, LiCl in $SrCl_2$, NaCl in NaF, NaF in NaCl, NaF in KF, and some others, the curves coincided or ran closely to each other, indicating that no reactions take place.

In reviewing recent work on the chemistry of salt melts, Voskresenskaya stated, one notices that increased attention is being paid to the nature of solid phases which separate from these melts.(25)

In an article devoted to salt equilibriums in the presence of high-pressure steam, M. I. Ravich points out that work in this field is of importance in connection with the increased application of high-pressure steam for power generation, i.e., under conditions where harmful salt deposits may form with consequent damage to the equipment. He also states that accumulation of sufficient experimental data will permit application of the techniques studied in other industrial fields besides power generation. He describes in some detail the experimental procedures and methods of investigation used by him and his collaborators in research on salt equilibriums at temperatures of 600-650° and steam pressures of 300-350 atmospheres.(26)

In a paper dealing with the significance of the time factor in the physicochemical analysis of systems composed of organic substances, G. B. Ravich discusses metastable modifications of fatty acids, triglycerides of these acids, and soaps. He demonstrates how one can obtain at will stable or metastable modifications of substances of this class, which are important as flotation reagents, ingredients of lubricating greases, detergents, etc., by controlling the degree of equilibrium and the rate of cooling. He states that the study of phase diagrams of long-chain aliphatic compounds can be applied as a method for establishing relationships which exist in metal systems that form metastable phases, and cites an example of this having actually been done.

Ravich further states that temperature-difference measurements and microstructure determinations on organic substances of this class can be carried out with very small samples and at low temperatures reaching that of liquid nitrogen. He recommends, for quantitative investigations of phase transformations, the method of extinguished monocrystals (i.e., of monocrystals whose transmission of polarized light has been extinguished) with fixation, by means of motion-picture color photography, of the process of appearance of interference colors, which takes place as the result of the phase transformation.(27)

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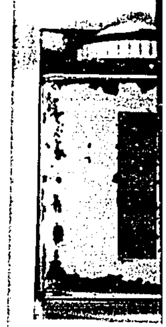

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