ACCESSION NR: AP4030395

ENCLOSURE: 02

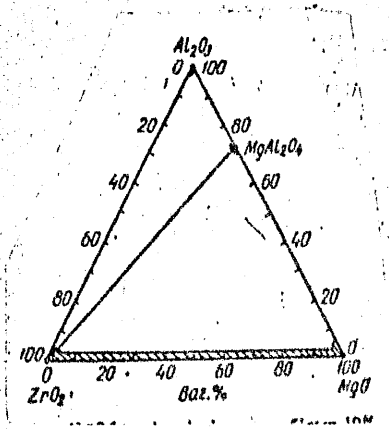


Fig. 3. Region of compositions containing not more than 10% of melt at 2000C.

Card 4/4

ACCESSION NR: AP4030395

ENCLOSURE: 01

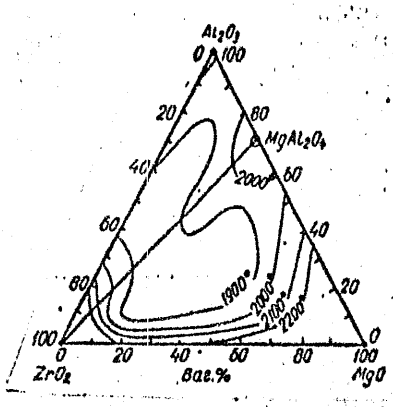


Fig. 1. Melting diagram

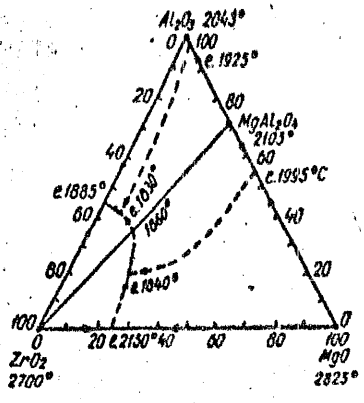


Fig. 2. Boundary lines

Card 3/4

ACCESSION NR: AP4030395

not more than a few % of the third oxide. In the investigated system the relative value of the region of compositions containing not more than 10% of the melt at 2000°C is about 7.5% (see Fig. 3 of Enclosure).

ASSOCIATION: Ukrayins'ky*y insty*tut vognetry*triv (Ukrainian Institute of Fire Resistant Materials)

SUBMITTED: 10Aug63 DATE ACQ: 30Apr64 ENCL: 02

SUB CODE: MM NO REF SOV: 002 OTHER: 000

Card 2/4

ACCESSION NR: AP4030395 S/0021/64/000/004/0506/0508

AUTHOR: Berezhnoy, A. S. (Corresponding member of AN UkrSSR); Kordyuk, R. A.

TITLE: Melting diagram of the system MgO -- Al_2O_3 -- ZrO_2

SOURCE: AN UkrRSR. Dopovidi, no. 4, 1964, 506-508

TOPIC TAGS: magnesium oxide, corundum, alumina, zirconium oxide, fusibility

ABSTRACT: A melting diagram of the system MgO--Al_2O_3-ZrO_2 (see Fig. 1 of Enclosure) is constructed, and the location of the boundary lines tentatively determined (see Fig. 2 of Enclosure). Contrary to the report by P. Ya. Sal'dav and others (Izv. AN SSSR, Otd. khim. nauk, 6, 669 (1945) these writers found that ZrO_2 and $MgAl_2O_3$ form a simple pseudobinary system with an eutectic melting at 1860°C and containing about 52% by weight of ZrO_2. Two ternary eutectics in this system are formed by the following solid phases (and by the melt) with the following melting points and the approximate composition (% by weight): 1) Al_2O_3 -- ZrO_2 -- $MgAl_2O_3$; 1830°C; 7% MgO, 43% Al_2O_3 and 50% ZrO_2. 2) MgO -- ZrO_2 -- $MgAl_2O_3$; 1840°C; 20% MgO, 20% Al_2O_3 and 60% ZrO_2. The solid solutions contain

Card 1/4

KELER, E. K. and BEREZHNOY, A. S.

"Problems of high-temperature refractory oxide ceramics."

(Institute of Silicate Chemistry) (Ukrainian Institute of Refractory Materials)
for KELER for BEREZHNOY

At the Division of Physical Chemistry and Technology of Inorganic Materials, Acad. Sci. USSR, a scientific council on the problem of sitalls has been established. The Council is a coordinating body for basic scientific research on sitalls, glass, fiber glass, stoneware, refractory and superrefractory materials, and coatings. The purpose of the Council is primarily to contribute to the improvement of the strength and impact resistance of existing materials. In 1963, the council held two sessions.

(Steklo i keramika, no. 6, 1964, 48-49)

BEREZHNOY, A.S.; KORDYUK, R.A.

Characteristics of the system CaO - MgO - Al_2O_3 - ZrO_2. Dop. AN URSR no.12:1617-1620 '63. (MIRA 17:9)

1. Ukrainskiy institut ogneuporov. 2. Chlen-korrespondent AN UkrSSR (for Berezhnoy.

BEREZHNOY, A.S.

On some cases of the formation of tetrahedral four-component systems. Dop. AN URSR no.8:1055-1057 '63. (MIRA 16:10)

1. Ukrainskiy institut ogneuporov; Chlen-korrespondent AN Ukr SSR.
(Systems (Chemistry)) (Phase rule and equilibrium)

L 18075-63
ACCESSION NR: AP3005883

goals for refractory technology. Two-element refractory compounds are either known already or are capable of synthesis by analogy. No search is required for these. The search for new refractories must be made among compounds consisting of three elements. Selection of the best type of refractory for actual conditions must be made after a study of the appropriate multicomponent systems. A very important significance attaches to the interaction between the refractory and the slag or metal, but this subject has not been pursued here. Statistics and modern physical and chemical methods of analysis will facilitate the search for new refractories and the discovery of proper means of using them. Orig. art. has: 11 figures.

ASSOCIATION: Ukrainskiy nauchno-issledovatel'skiy institut ogneuporov (Ukrainian Scientific Research Institute of Refractories)

SUBMITTED: 00	DATE ACQ: 06Sep63	ENCL: 00
SUB CODE: MA	NO REF SOV: 006	OTHER: 005

Card 2/2

L 18075-63 EWP(q)/EWT(m)/EDS AFFTC/ASD WH

ACCESSION NR: AP3005883 S/0131/63/000/008/0341/0347

54
53

AUTHOR: Berezhnoy, A. S.

TITLE: Some principles in the search for new refractories

SOURCE: Ogneupory*, no. 8, 1963, 341-347

TOPIC TAGS: refractory, Mg, Al, Si, O, Ca, Fe, Ti, Zr, crystal lattice, oxide, melting point, thermodynamic potential, slag, metal

ABSTRACT: This is a discussion of the general characteristics of refractories, drawing material from the literature and generalizing upon it. It is noted that refractory materials are combinations containing no more than four different elements (no solid solutions) in the crystal lattice. The melting point declines with addition of elements. The probability of forming refractor compounds from two simple oxides is almost 100 times that of forming them from three. New oxygen-bearing refractors should be sought primarily in binary systems of simple oxides. Conditions are similar for other systems. Because of high melting point and greater thermodynamic potential, compounds of two elements are the chief

Card 1/2

Thermodynamic properties of some ... S/021/62/000/003/009/010
D202/D302

esite under natural conditions existing in the earth's crust; $ZrTiO_4$ being the least stable under those conditions. There is 1 table.

ASSOCIATION: Ukrayins'kyy institut vognetryviv (Ukrainian Institute of Refractories)

SUBMITTED: September 14, 1961

Card 2/2

37122
S/021/62/000/003/009/010
D202/D302

AUTHOR: Berezhnoy, A.S. Corresponding Member of the UkrSSR

TITLE: Thermodynamic properties of some calcium and zirconium titanates and calcium zirconate

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 3, 1962, 387 - 390

TEXT: The author calculated heats of formation from oxides ΔH^{o}_{298}, for $CaTiSiO_5$, $CaTiO_3$, $CaZrO_3$ and $ZrTiO_4$ on the basis of data published in Western literature, obtaining -54.2, -50.0, -10.4 and -3 Kcal/mol respectively. He also calculated entropics of activation, ΔS^{o}_{298}, for $CaZrO_3$ and $ZrTiO_4$: 22.4 e.u and ee.2 e.u. (from elements) and 2.5 e.u and 1.8 e.u. (from oxides) respectively; the values of ΔH^{o}_{298} and ΔS^{o}_{298} for $ZrTiO_4$ being only tentative; Discussing the reactions of formation of the above four compounds the author states that titanate may decompose only into perovskite and co-

Card 1/2

The system CaO - MgO - ZrO_2 - SiO_2 ...

Np = 1.653, Ng - Np = 0.005, specific refraction: 0.214. Optical studies show that ZrO_2 and Ca_2SiO_4 do not form solid solutions of noticeable concentration. In the system CaO - ZrO_2 - SiO_2 the range of refractory compositions at 1600°C is rather small and decreases rapidly at 2000°C. Melting point, number of existing phases, number of elementary tetrahedrons in which phases occur, the volumes ΣV_i and the existence probability Wi ($Wi = \Sigma V_i/n$, where n is the number of components) are given (Table 2) for the 18 phases of the system CaO - MgO - ZrO_2 - SiO_2. The lowest melting point of the eutectic $CaSiO_3$, $CaMg(SiO_3)_2$, $Ca_2ZrSi_4O_{12}$, and SiO_2, is ~1300°C. At 2000°C only binary combinations of CaO, MgO, and ZrO_2 are suited, and some ternary ones with a maximum concentration of the third oxide of ~5%. There are 8 figures, 3 tables, and 5 Soviet references.

ASSOCIATION: Ukrainskiy nauchno-issledovatel'skiy institut ogneuporov (Ukrainian Scientific Research Institute of Refractories)

Card 2/3

S/131/62/000/002/003/004
B105/B101

15.2230

AUTHORS: Berezhnoy, A. S., Kordyuk, R. A.

TITLE: The system CaO - MgO - ZrO_2 - SiO_2 and its importance for the production of refractories

PERIODICAL: Ogneupory, no. 2, 1962, 85-90

TEXT: The system CaO - ZrO_2 - SiO_2 was studied and two ternary compounds with the following properties have been detected in it: $Ca_3ZrSi_2O_9$, specific gravity 3.40, melts incongruently at ~1600°C with formation of Ca_2SiO_4 and ZrO_2 arises from oxides (α-quartz, tetragonal ZrO_2, and CaO) with a 2.6% increase in volume, linear expansion coefficient $\alpha = 11.9 \cdot 10^{-6}$, orthorhomic system, Ng = 1.758, Nm = 1.737, Np = 1.735, Ng - Np = 0.023, specific refraction: 0.215; $Ca_2ZrSi_4O_{12}$, specific gravity: 3.06, melts incongruently at ~1430°C with formation of $ZrSiO_4$ arises from oxides with a 7.3% increase in volume, $\alpha = 5.9 \cdot 10^{-6}$, orthorhombic system, Ng = 1.658,

Card 1/2

BEREZHNOY, A.S.

Thermodynamic characteristics of zirconium dioxide, zircon, aluminum titanates, and magnesium titanates. Dop. AN URSR no.1:65-68 '62. (MIRA 15:2)

1. Ukrainskiy institut ogneuporov. Chlen korrespondent AN USSR.

(Thermodynamics)
(Zircon)
(Magnesium titanates)
(Aluminum titanates)

and refractory products are reviewed. There are 167 references, mostly Soviet.

TABLE OF CONTENTS [Abridged]:

Berezhnoy, A.S.

PHASE I BOOK EXPLOITATION SOV/6202

Budnikov, P. P., Academician, Academy of Sciences UkrSSR, Corresponding Member, Academy of Sciences USSR, A. S. Berezhnoy, I. A. Bulavin, G. P. Kalliga, G. V. Kukolev, and D. N. Polubo-yarinov.

Tekhnologiya keramiki i ogneuporov (Technology of Ceramics and Refractory Materials). 3d ed., rev. and enl. Moscow, Gosstroyizdat, 1962. 707 p. Errata slip inserted. 15,000 copies printed.

Ed. (Title page): P. P. Budnikov; Ed. of Publishing House: N. A. Gomozova; Tech. Ed.: G. D. Naumova.

PURPOSE: This book is a textbook intended for students taking courses in the technology of silicates at institutions of higher education.

COVERAGE: The book describes the physicochemical and mechanical properties of various ceramic and refractory products, including cermets, pure refractory oxides, glazes, aramic pigments, porcelain, and faience. The raw materials and methods of manufacturing ceramic

Card 1/82

BEREZHNOY, A.S.; KORDYUK, R.A.

Formation of calcium silicates, ferrites, aluminate, and titanates in the solid phase. Dop.AN URSR no.7:924-927 '61. (MIRA 14:8)

1. Ukrainskiy institut ogneuporov. 2. Chlen-korrespondent AN USSR (for Berezhnoy).
(Calcium compounds)

BEREZHNOY, A.S.

New data on silicon binary systems. Zhur. VKhO 6 no.6:618-628 '61. (MIRA 14:12)

1. Chlen-korrespondent AN USSR.
(Silicon) (Systems (Chemistry))

HERIZHNOY, A.S.; GUL'KO, N.V.

Sub-solidus structure of the system CaO - MgO - Al_2O_3 - TiO_2 - SiO_2. Sbor.nauch.trud. UNIIO no.5:65-78 '61. (MIRA 15:12)
(Refractory materials) (Phase rule and equilibrium)

HEREZHNOY, A.S.

Data on the sub-solidus structure of the system CaO - MgO - FeO - Fe_2O_3 - SiO_2. Sbor.nauch.trud. UNIIO no.5:26-64 '61.

(MIRA 15:12)

(Refractory materials) (Phase rule and equilibrium)

S/081/62/000/013/029/054
B177/B101

AUTHOR: Berezhnoy, A. S.

TITLE: Some statistical and other regularities for refractory materials

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 13, 1962, 416, abstract 13K230 (Sb. nauchn. tr. Ukr. n.-i. in-t ogneuporov, 1961, no. 5(52), 1961, 5-25)

TEXT: Considerable but not unlimited prospects exist that modern engineering requirements for refractory materials will be met. The problems which face refractory technology are to make use of established relationships and to find new relationships and materials able of ensure further progress in high-temperature engineering. [Abstracter's note: Complete translation.]

Card 1/1

BEREZHNOY, A.S.; KORDYUK, R.A.

Characteristics of reactions underlying the manufacture and use of forsterite refractories. Dop. AN URSR no. 12:1614-1617 '60.
(MIRA 14:1)

1. Ukrainskiy institut ogneuporov, Khar'kov. 2. Chlen-korrespondent AN USSR (for Berezhnoy).
(Forsterite)

BEREZHNOY, A. S.; KORDYUK, R.A.

Modification transformations of magnesium metasilicate. Dop. AN URSR no.10:1417-1420 '60. (MIRA 13:11)

1. Ukrainskiy institut ogneuporov, g. Khar'kov.
2. Chlen-korrespondent AN USSR (for Berezhnoy).
(Magnesium silicate)

29425

S/081/61/000/017/077/166
B101/B102

Experimental studies of molybdenum ...

heating. At 20°C, σ_{compr} = 4500-10,000 kg/cm^2, depending on the grain composition of the charge and on the firing temperature; at 1650°C, σ_{compr} = 350-525 kg/cm^2. Under loads of 2 and 10 kg/cm^2 no deformation was observed at 1650°C. $MoSi_2$ can be used as a refractory material.
[Abstracter's note: Complete translation.]

Card 2/2

15 2400

29425
S/081/61/000/017/077/166
B101/B102

AUTHORS: Berezhnoy, A. S., Repenko, K. N., Getman, I. A., Gul'ko, N. V.

TITLE: Experimental studies of molybdenum disilicide as a refractory material

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 17, 1961, 334, abstract 17K200 (Sb. nauchn. tr. Ukr. n.-i. in-t ogneuporov, no. 4, 1960, 296-317)

TEXT: The conditions under which $MoSi_2$ is synthesized from mixture of Mo and Si powders in a stoichiometric ratio without pressure at 1200-1600°C in an H_2 atmosphere have been studied. It has been found that laboratory samples of $MoSi_2$ can be obtained (without preliminary synthesis) by hot pressing at 40 kg/cm^2 in graphite molds. High-density samples of $MoSi_2$ with a porosity of 7% were obtained by hot pressing at 200 kg/cm^2 and 1700°C. For $MoSi_2$ samples fired in a vacuum furnace, the coefficient of thermal expansion in vacuo between 20 and 1580°C was found to be $12.2 \cdot 10^{-6}$. High-density samples showed maximum stability against atmospheric O_2 on

Card 1/2

S/081/61/000/002/010/023
A005/A105

Translation from: Referativnyy zhurnal, Khimiya, 1961, No. 2, p. 334, # 2K237

AUTHORS: [redacted], Repenko, K. N.

TITLE: The Manufacture of Fireproof Articles of Calcium Oxide

PERIODICAL: "Sb. nauchn. tr. Ukr. n.-i. in-t ogneuporov", 1960, No. 3 (50), pp. 109 - 128

TEXT: The authors developed the fundamental conditions of production technology of crucibles of a capacity of up to 400 ml from chemically pure and commercial CaO: a) on the basis of fine-milled lime, and b) with the application of a grainy briquet made of $Ca(OH)_2$. Additions of TiO_2, ZrO_2, and BeO positively affect the sintering process of the articles. An addition of Al_2O_3 is less effective. The hydration resistance of the crucibles depends on the initial material and the porosity of the articles. The hydration of crucibles of chemically pure CaO is higher than that of crucibles of commercial CaO. The application of the additions decreases the hydration rate. Special coatings are developed for decreasing the hydration rate.

Translator's note: This is the full translation of the original Russian abstract. From the authors' summary

Card 1/1

Theoretical Fundamentals of the Technology of Production of Wear-resistant Refractories From the Standpoint of Modern Trends in the Development of Steel-melting Processes

S/131/60/000/03/001/013
B015/B005

possible solution of urgent tasks in this field. There are 5 tables and 36 references, 15 of which are Soviet.

ASSOCIATION: Ukrainskiy nauchno-issledovatel'skiy institut ogneuporov (Ukrainian Scientific Research Institute of Refractories)

Card 3/3

Theoretical Fundamentals of the Technology of Production of Wear-resistant Refractories From the Standpoint of Modern Trends in the Development of Steel-melting Processes

S/131/60/000/03/001/013
B015/B005

The electrokinetic phenomenon in refractories is being investigated by the UNIIO (Ye. V. Yermolayeva). Table 3 indicates the thermal expansion of ordinary refractories according to measurements by A. N. Lyulichev (UNIIO). Table 4 shows the albedo of refractories, table 5 their thermal data. A. S. Frenkel' made experiments with synthetic forsterite of low iron content at the UNIIO in 1958. In conclusion, the author states that magnesite (periclase) and other magnesium-containing refractories should be considered most important for steel-melting furnaces. The MgO-content in open-hearth furnace bottoms should be increased up to 78-80%. For economic reasons, raw materials should be dressed at raw-material deposits, not in industrial plants. The manufacturing processes of refractories are described and experiments carried out at the UNIIO (G. V. Kukolev, I. S. Kaynarskiy, A. S. Frenkel') mentioned. Theory and experiments show that as a rule refractories should be burnt at temperatures exceeding the working temperatures. Theoretical and experimental work in scientific organizations and production plants should be extended to secure the quickest

Card 2/3

15(2)
AUTHOR: Berezhnoy, A. S.

S/131/60/000/03/001/013
B015/B005

TITLE: Theoretical Fundamentals of the Technology of Production of Wear-resistant Refractories From the Standpoint of Modern Trends in the Development of Steel-melting Processes

PERIODICAL: Ogneupory, 1960, Nr 3, pp 97-105 (USSR)

ABSTRACT: In the present paper the author describes the requirements made of refractories by the intensification of metallurgical processes in Martin furnaces. Table 1 shows the changes of the thermodynamic isobaric potential in the reduction of refractory oxides by fused iron. Table 2 indicates the quantity of melt forming during the absorption of 20% of FeO by various refractories. To reduce corrosion by slags it is necessary to use refractories with low porosity and wetting capacity, e.g. with a high Cr_2O_3-content, which were also used by I. S. Kaynarskiy in his investigation. The dicalcium ferrite has to be preferred to tinder in building open-hearth furnace bottoms as had been shown by experiments of the UNIIO (V. E. Tsynkina) at the zavod im. K. Libknekhta (Works imeni K. Liebknecht) in 1959.

Card 1/3

18(0)

AUTHOR: Berezhnoy, A. S.

SOV/131-59-3-7/18

TITLE: Comment Concerning the Abstract by M. I. Panfilov (Otklik na stat'yu M. I. Panfilova)

PERIODICAL: Ogneupory, 1959, Nr 3, p 124 (USSR)

ABSTRACT: Berezhnoy expresses his opinion on the criticism by Panfilov according to which scientists have hitherto not exploited all possibilities of the high temperatures of basic furnaces and also not yet completely worked out the theory of the structure of furnace bottoms in practice. In principle he regards this criticism as being justified. He mentions that the papers written more than 25 years ago (Grum-Grzhimaylo), more than 20 years ago (Pines), and more than 10 years ago (Berezhnoy) are still referred to, including all errors and he regards it necessary to revise several opinions as to the process of melting of magnesite bottoms. For the purpose of an increase in the stability of magnesite bottoms their periclase content should be increased. Berezhnoy is of the opinion that further intensive investigations of those problems by scientists and men of practice in plant laboratories are necessary. These measures would certainly bring about a solution of the problem.

Card 1/2

Ukr Sci Res Inst Refractories

SOV/21-59-1-17/26

On the Characteristics of the Regions of Phase-Existence in Polycomponent Systems Below the Solidus Surface.

system. It is shown on the example MgO in the system $CaO-MgO-Fe_2O_3-Al_2O_3-SiO_2$ that the ratio $\Sigma V_A/V_o$ decreases with an increase in n. The W_i values permit a comparison of the distribution of separate phases in one or different systems, as well as of one given phase in various systems, which is of use in petrology and in engineering. The article states, that MgO has a much wider area of existence in polycomponent systems than CaO. It provides a numerical characteristic of regions of existence of phases, which constitutes a furthering of their thermodynamic characteristics.

ASSOCIATION: Ukrainskiy institut ogneupornykh materialov (The Ukrainian Institute of Refractories).

PRESENTED: September 11, 1958

Card 2/2

5(2)

SOV/21-59-1-17/26

AUTHOR: Berezhnoy, A.S., Corresponding member of the AS UkrSSR

TITLE: On the Characteristics of the Regions of Phase-Existence in Polycomponent Systems Below the Solidus Surface. (O kharakteristike oblastey sushchestvovaniya faz v polikomponentnykh sistemakh nizhe poverkhnosti solidusa)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1959, Nr 1, pp 64-66 (USSR)

ABSTRACT: In addition to the thermodynamic characteristics, it is expedient to also employ the numerical characteristics of the phase-existence regions in polycomponent systems, which are deduced by the equation

$$W_A = \frac{\sum V_A}{n V_0}$$

where $\sum V_A$ is the sum of the volumes of elementary polytopes, one of the apices of which is the phase A; n is the number of components, and V_0 the entire volume of the concentration polytope of the n-component

Card 1/2

SOV/131-58-11-6/9

Efforts of the Ukrainian Institute of Refractory Materials Towards the Perfecting of the Technology of Highly Refractory Materials

open-hearth furnace walls. For converters magnesite must be considered the best refractory product, from a chemical point of view, for steel melting by means of oxygen blasts. For the time being, bricks containing periclase spinellide are considered the best for converters in the home industry. In 1959 it will be necessary to create central laboratories in no less than 4 plants of the UkrSSR to serve all neighboring plants as well. Systematic assistance to and training of laboratory workers will be the tasks of the UNIIO. This kind of cooperation has proved successful in carbon-chemical industry. There are 3 tables and 8 references, 5 of which are Soviet.

ASSOCIATION: Ukrainskiy nauchno-issledovatel'skiy institut ogneuporov (Ukrainian Scientific Research Institute of Refractory Materials

Card 2/2

15(6)
AUTHOR: Berezhnoy, A. S.

SOV/131-58-11-6/9

TITLE: Efforts of the Ukrainian Institute of Refractory Products Towards the Perfecting of the Technology of Highly Refractory Materials (Raboty Ukrainskogo instituta ogneuporov po sovershenstvovaniyu tekhnologii vysokoogneuporov)

PERIODICAL: Ogneupory, 1958, Nr 11, pp 517-521 (USSR)

ABSTRACT: The development of metallurgy in the USSR and above all the use of oxygen create new tasks for the industry of refractory material. Refractory materials must be obtained whose stability should conform to the new working conditions. The collective of the Ukrainskiy institut ogneuporov (UNIIO) (Ukrainian Institute of Refractory Materials) is concerned with this question. Under the new conditions of steel melting only basic refractory [illegible] can be used, made of magnesite, chrome magnesite, dolomite, and forsterite. Also the porosity of the chrome magnesite vault bricks must be reduced. Forsterite bricks, made of dunite, are used for the checkers of air regenerators of open-hearth furnaces. The Ukrainskiy Institute of Refractory Materials is studying the possibility of creating monolithic and block linings for the

Card 1/2

SOV/81-59-16-57774

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 16, p 300 (USSR)

AUTHOR: Berezhnoy, A.S.

TITLE: The Preparation of Basic Refractories From Magnesium Oxide Brine

PERIODICAL: V sb.: Kompleksn. ispol'zovaniye solyan. resursov Sivasha i Perekopsk. ozer. Kiyev, AN UkrSSR, 1958, pp 100-108

ABSTRACT: The principal data are given concerning technological investigations, published earlier, of a test sample of $Mg(OH)_2$ prepared from Sivash brine by the Krasno-Perekopsk Chemical Plant.

V. Zlochevskiy.

Card 1/1

AVAILABLE: Library of Congress

Card 5/5

GO/fal
7-17-59

periclase-spinell brick and with bricks made of magnesium and chromite compounds. The application of new refractories, insulating materials, high-temperature mortars, binding media, and cements, combined with advanced techniques in lining furnaces, are said to have more than doubled the time intervals between relining and overhauling furnaces. O. M. Margulis and A. G. Karaulov discuss the use of "tagged atoms" to determine the degree of contamination of steel by refractory-lining particles. N. S. Lesnyak describes the production of refractories by the semidry pressing method employed at the Nizhne-Tagil' plant, and I. S. Kaynarski and V. D. Tsigler cover the use of lightweight Dinas bricks in industrial furnaces. The last paper written by A. R. Makarychev compares and evaluates the physical properties and service life of fireclay bricks, forsterite bricks, Dinas bricks and bricks with high alumina content. Graphs, diagrams, and photographs accompany the papers. For references, see Table of Contents.

TABLE OF CONTENTS:

BEREZHNOY, A. S.

25(1) PHASE I BOOK EXPLOITATION SOV/1788

Ogneupory dlya chernoy metallurgii; sbornik statey (Refractories in Ferrous Metallurgy; Collection of Articles) Moscow, Metallurgizdat, 1958. Errata slip inserted. 4,000 copies printed.

Ed.: D. I. Gavrish, Engineer; Ed. of Publishing House: I. P. Kirsanov; Tech. Ed.: A. I. Karasev.

PURPOSE: This book is intended for engineers and technicians working in ferrous metallurgy.

COVERAGE: The book consists of 20 articles on the development and use of refractories in the Soviet metallurgical industry. D. I. Gavrish, in the first paper, presents the prospects for development and research projects for the period 1959-1965. He emphasizes development of refractory plants in the eastern part of the USSR. In general the articles deal with recent developments in basic and acidic refractories for blast and open hearth furnaces, and for the lining of ladles and special equipment used in continuous casting and in vacuum treatment of steel. A. S. Berezhnoy discusses the technology of manufacturing magnesite and forsterite refractories which frequently replace Dinas brick and fire clay. Several authors state that good results were obtained with

Card 1/5

PHASE I BOOK EXPLOITATION SOV/2014

5(2); 5(4)

Berezhnoy, Anatoliy Semenovich

Kremniy i yego binarnyye sistemy (Silicon and Its Binary Systems) Kiyev, Izd-vo AN Ukr SSR, 1958. 249 p. Errata slip inserted. 3,000 copies printed.

Resp. Ed.: P.P. Budnikov, Academician, Ukrainian SSR Academy of Sciences; Ed. of Publishing House: Z.S. Pokrovskaya; Tech. Ed.: N.P. Rakhlina.

PURPOSE: The book is intended for chemists, silicate technologists, metallurgists, geochemists, petrographers, and mineralogists.

COVERAGE: The book gives a survey of the physical chemistry of silicon and its binary systems. The crystalline structures of silicon and of all known silicon binary compounds, their properties, and uses are described in detail. Special consideration is given to the silicon oxygen system (silica), silicon carbide (carborundum), and to silicides of transition metals. The author claims that this is the first survey on binary silicon compounds in over forty years. There are 716 references: 158 are Soviet, 252 English, 229 German, 62 French, 5 Czech, 1 Polish, 4 Italian, and 5 Japanese.

BEREZHNOY, Anatoliy Semenovich

Silicon and its Binary Systems. New York, Consultants Bureau, 1960. VIII, 275 p. illus., diagrs., graphs, tables
Translated from the original Russian: Kremniy i Yego Binarnyye Sistemy, Kiev, Izd-vo Akademii Nauk Ukrainskoy SSR, 1958.

The Principal Trends in Improving the Production Technology of Magnesite and Forsterite Refractories

high (up to 1,500 - 2,000 kg/cm^2) pressures in the pressing process; to burn magnesite at high temperatures (up to 1,750 - 1,800°C) and forsterite (up to 1,700°C).

V. Zlochevskiy

SOV/81-59-5-16172

Translation from: Referativnyy zhurnal, Khimiya, 1959, Nr 5, p 352 (USSR)

AUTHOR: Berezhnoy, A.S.

TITLE: The Principal Trends in Improving the Production Technology of Magnesite and Forsterite Refractories

PERIODICAL: Tr. Nauchno-tekh. o-va chernoy metallurgii. M-vo chernoy metallurgii USSR, 1957, Nr 12, pp 38 - 45. Discussion, pp 153-169

ABSTRACT: An analysis is made of the effect of various technological factors on achieving for magnesia refractories (MR) a maximum constancy of the volume of their operation zones, sufficient hardness (also at high temperatures) and a high heat resistance. For further improving of the technology it is necessary: to use raw material as pure and concentrated as possible; to burn the loose raw material, containing a considerable amount of volatile components, in rotary furnaces (preferrably by the wet method); to use part of the material with a rational granular composition of the mass; to apply

Card 1/2

The Development of Scientific Research Work in the Industry of Refractories in the USSR

scientific center for ceramics at Leningrad rendered a thorough research of raw material produced in the country possible. The success achieved in this field made it possible, from 1934 onwards, to interrupt imports of refractories from other countries. At that time the following work was developed: 1) Investigation of the chemical and mineralogical composition as well as of the technological properties of the sillimanite series; bauxite; corundum; magnesite; chromite; magnesia silicate; zirconium; clays and kaolins. 2) The development of the production technology of refractories made from fireclay bricks, dinas, magnesite, and chromium-magnesite. 3) The development of the production of new kinds of refractories. 4) The study of refractories while in operation. 5) The development of theoretical research by the utilization of the latest achievements of modern physics: oscillation processes, radioactive isotopes, electron microscopy, vacuum technology, spectrography, etc.

ASSOCIATION: Khar'kov Institute for Refractories (Khar'kovskiy institut ogneuporov)

AVAILABLE: Library of Congress

BEREZHNOY, A.S.

AUTHOR: Berezhnoy, A.S.

131-10-3/6

TITLE: The Development of Scientific Research Work in the Industry of Refractories in the USSR (Razvitiye nauchno-issledovatel'skikh rabot v ogneupornoy promyshlennosti SSSR)

PERIODICAL: Ogneupory, 1957, Nr 10, pp. 447-456 (USSR)

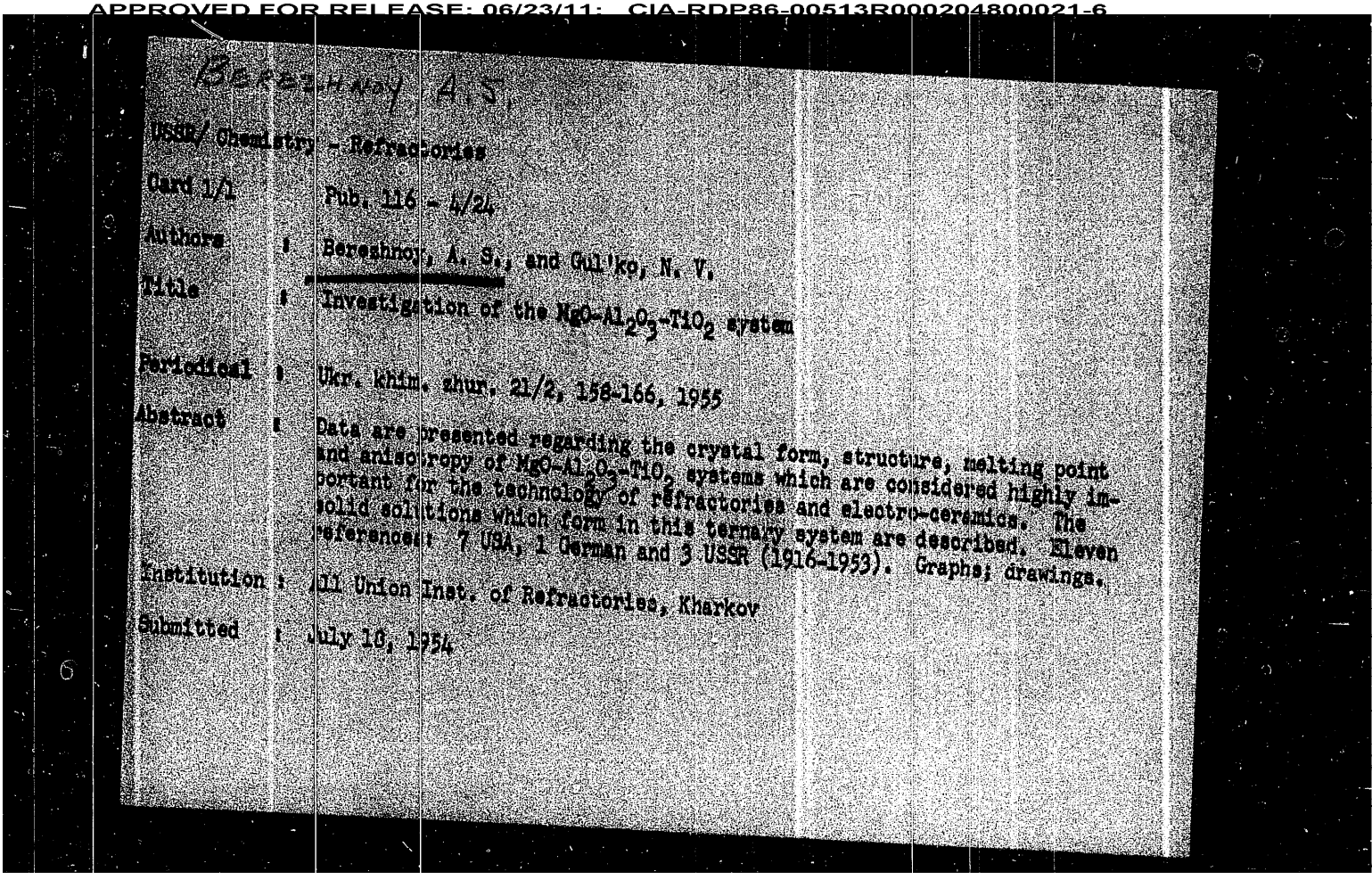
ABSTRACT: In the twenties' the development of the industry of refractories began, in which connection it was necessary to guarantee the demands made by the metallurgical industry to be satisfied by means of raw material produced in the country. (Dinas productions for the lining of the arched roofs of industrial furnaces). At that time the chair for the technology of refractories was established at the Khar'kov Technological Institute, which exists still today. At the end of 1927 the Institute for Silicates was founded at Khar'kov, which was later transformed into a scientific research institute for refractories. Nearly at the same time departments for refractories were established at the institutes for building material in Moscow, Leningrad, and later also at Sverdlovsk, by which some work in this field was carried out and introduced in practice. (Production of blast furnace fireclay bricks by a half-dry method, etc.). It was at that time that also the periodicals "Ukrainskiye silikaty" and "Stroitel'nyye materialy" were founded. The creation of a large and well-equipped

Card 1/2

BEREZHNOY, A.S.

BEREZHNOY, A.S.; KARYAKIN, L.I.

System: Cu_2O - SiO_2 and CuO_2. TSvet.met. 28 no.2:26-33 Mr-Ap '55.
(Copper oxides) (Silicon oxides)



BEREZHNOY, A. S.

USSR/ Chemistry - Refractories

Card 1/1 Pub. 116 - 4/24

Authors : Bereshnoy, A. S., and Gul'ko, N. V.

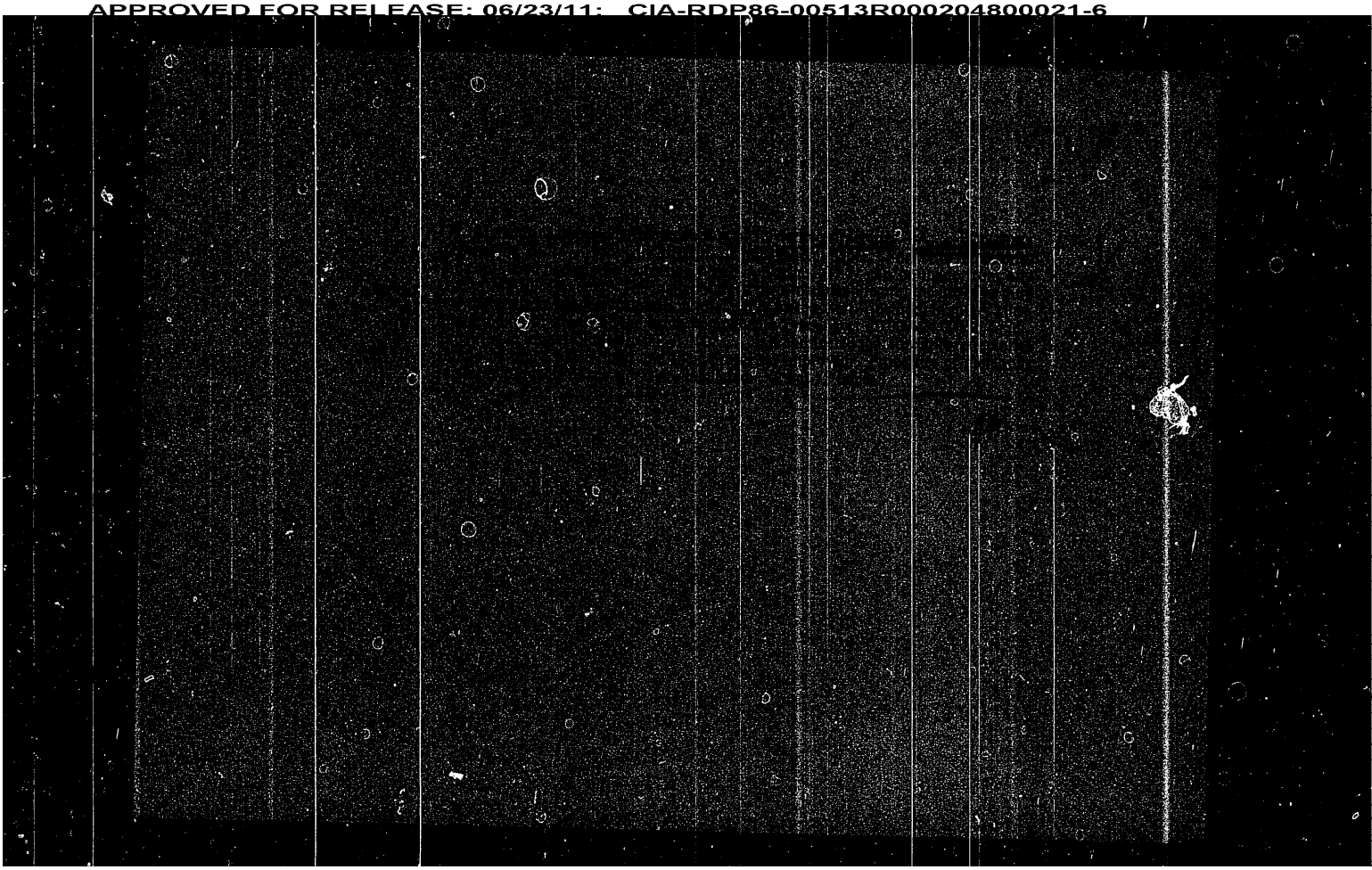
Title : Investigation of the $MgO-Al_2O_3-TiO_2$ system

Periodical : Ukr. khim. zhur. 21/2, 158-166, 1955

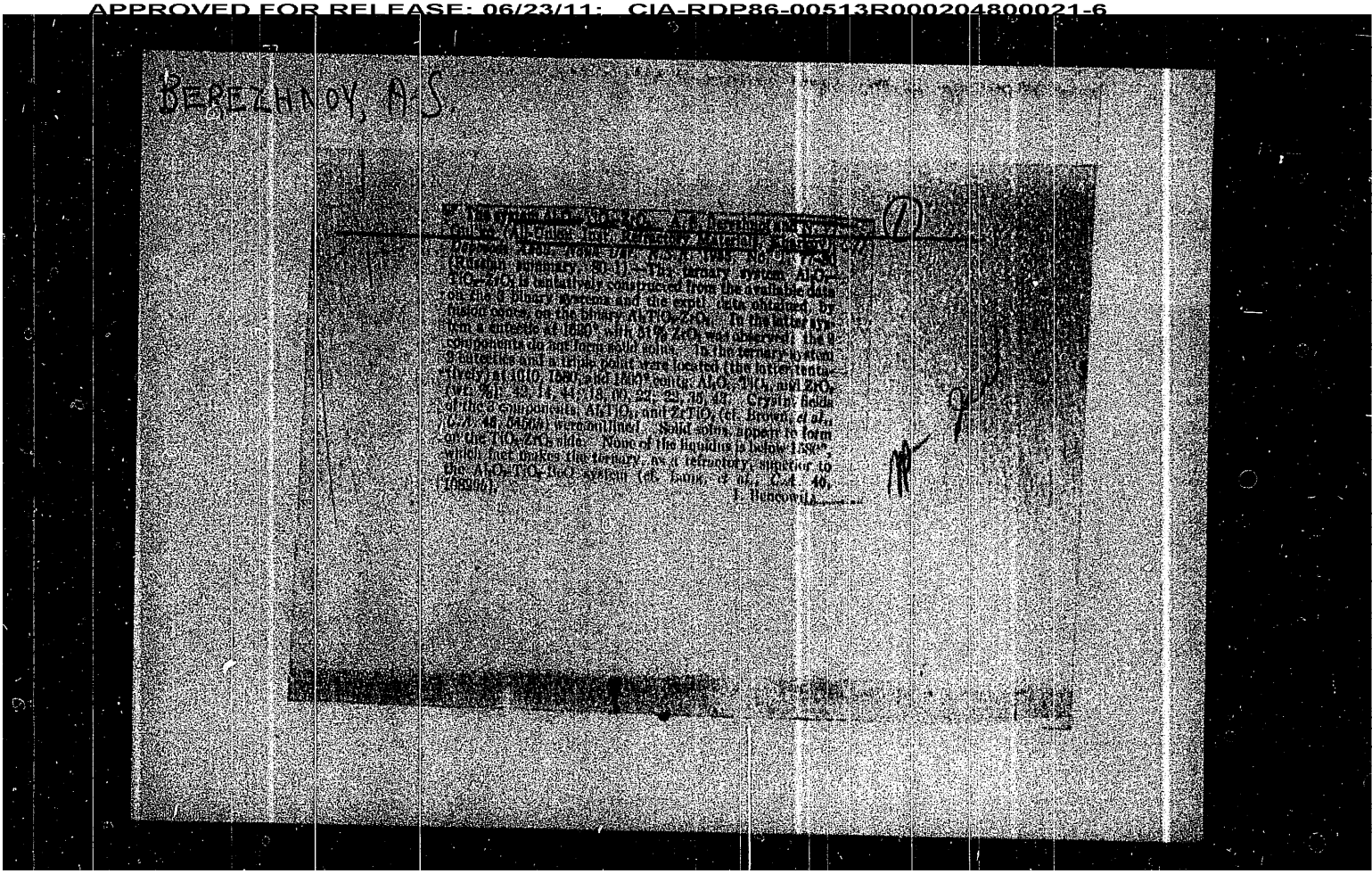
Abstract : Data are presented regarding the crystal form, structure, melting point and anisotropy of $MgO-Al_2O_3-TiO_2$ systems which are considered highly important for the technology of refractories and electro-ceramics. The solid solutions which form in this ternary system are described. Eleven references: 7 USA, 1 German and 3 USSR (1916-1953). Graphs; drawings.

Institution : All Union Inst. of Refractories, Kharkov

Submitted : July 18, 1954



APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204800021-6



BEREZHNOY, A.S.

BUDNIKOV, Petr Petrovich; redaktor; BEREZHNOY, Anatoliy Semenovich; BULAVIN, Ivan Anisimovich; GRISSIK, Boris Mikhaylovich; KUKOLEV, Grigoriy Vladimirovich; POLYBOYARINOV, Dmitriy Nikolayevich; AVGUSTINIK, A.I., doktor tekhnicheskikh nauk, professor, retsenzent; GLEZAROVA, I.L., redaktor; PANOVA, L.Ya., tekhnicheskiy redaktor.

[Technology of ceramics and refractory materials] Tekhnologiia keramiki i ogneuporov. Pod obshchei red. P.P. Budnikova. Izd. 2-e, perer. Moskva, Gos.izd-vo lit-ry po stroit. materialam, 1955. 698 p. (MLRA 8:12)

1. Deystvitel'nyy chlen AN USSR. 2. Chlen korrespondent AN SSSR. (Ceramic industries) (Refractory materials)

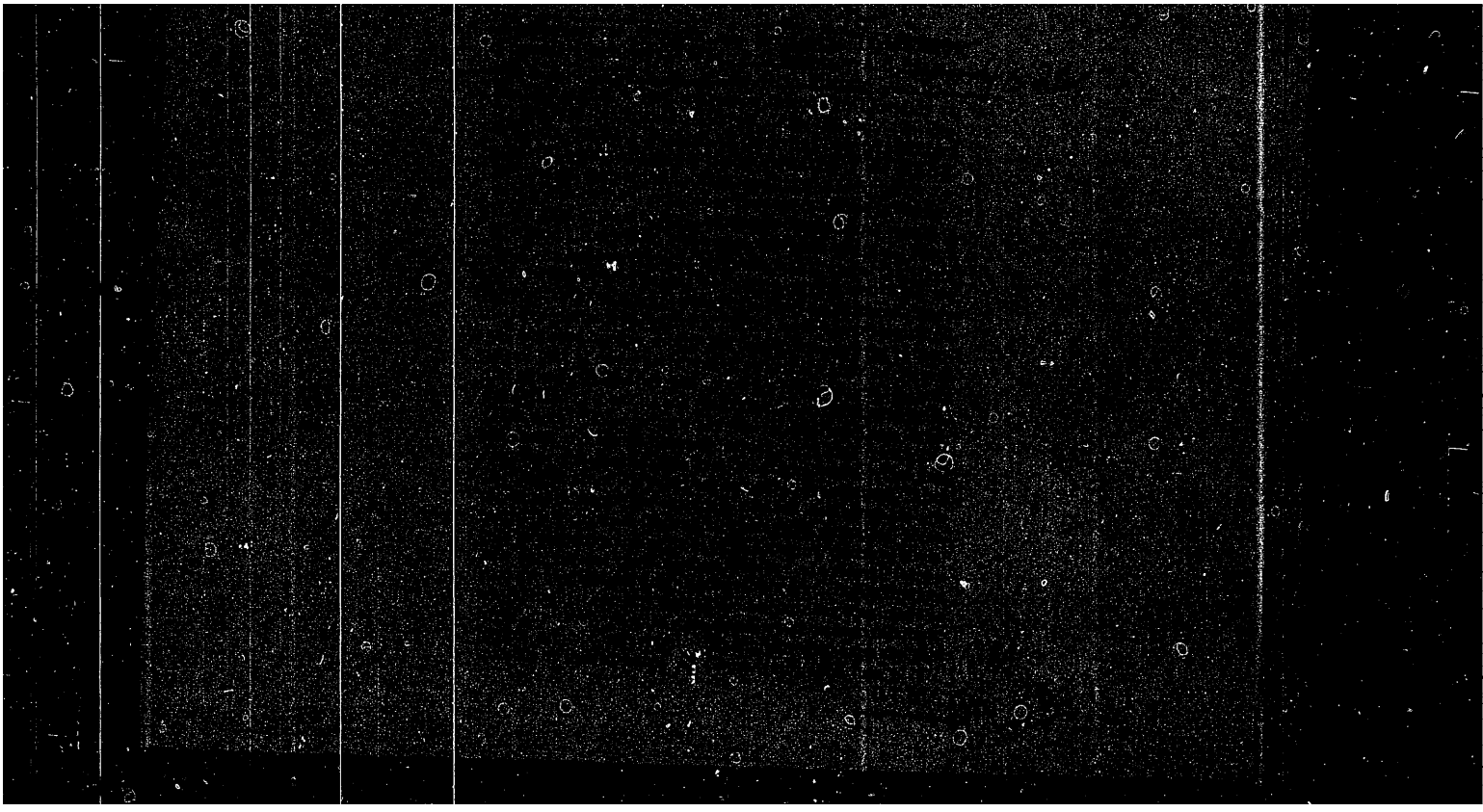
BUDNIKOV, P.P.; BEREZHNOY, A.S.; BOTVINKIN, O.K.; DAVYDOV, S.S.; GEVORKYAN, KH.O.; GORYAYNOV, K.E.; KUPRIANOV, V.P.; KITAYGORODSKIY, I.I.; KYKOLEV, V.G.; LAPIN, V.V.; LITVAKOVSKIY, A.A.; MOSKVIN, V.M.; MIRONOV, S.A.; MCHEDLOV-PETROSYAN, O.P.; PEVZNER, R.L.; SKROMTAYEV, B.G.; YUNG, V.N.; YUSHKEVICH, M.O.

Academician D.S.Beliankin; obituary. Zhur.prikl.khim. 27 no.1: 3-4 Ja '54. (MLRA 7:3)
(Beliankin, Dmitrii Stepanovich, 1876-1953)

BEREZHNOY, A.S.

Effect of pressure on the properties of magnesite refractories.
Ogneupory 19 no.4:213-222 '54. (MIRA 11:9)

1. Vsesoyuznyy institut ogneuporov, g.Khar'kov.
(Magnesite) (Power presses)



APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204800021-6

BEREZHNOY, A.S.

Physical processes occurring upon pressing of the magnesite paste. Ogneupory 18 no.10:452-466 '53. (MIRA 11:10)

1. Vsesoyuznyy institut ogneuporov, Khar'kov.
(Magnesite) (Power presses)

BEREZHNOY, A.S., prof.

Processes in the manufacture of chrome-magnesite refractories and improvement of their quality. Ogneupory 18 no.1:7-13 '53.
(MIRA 11:10)

1.Khar'kovskiy institut ogneuporov.
(Refractory materials)

BEREZHNOY, A.S.

Some data on the structure and properties of the $CaO--MgO--Fe_2O_3--SiO_2$ system. (In: Akademiia nauk SSSR. Voprosy petrografii i mineralogii. Moskva, 1953. Vol. 2, p.281-306) (MLRA 7:4)

1. Chlen-korrespondent Akademii nauk Ukrainskoy SSR.
(Systems (Chemistry))

PA 227T3

BEREZHNOY, A. S.

USSR/Chemistry - Silicon Compounds, Refractories — 21 Mar 52

"The System Cu_2O - SiO_2 and the Existence of Anhydrous Copper Silicates," A. S. Berezhnoy, L. I. Karyakin, I. Ye. Dudavskiy, All-Union Sci Res Inst of Refractories.

"Dok Ak Nauk SSSR" Vol 83, No 3, pp 399 - 401

The system Cu_2O - SiO_2 was studied. The prepns were subjected to microscopic, X-ray and chem exams. It was found that the mix forms 2 types of glass: one contg about 5% Cu_2O and the other 60-65% Cu_2O. A mp curve and a phase diagram were constructed. The mp of the mix (which does not form a solid soln) remains below that of SiO_2. No anhydrons chem compds are formed in the systems CnO-SiO_2 or Cn_2O-SiO_2. The results agree with those obtained in the operation of Cn smelters and in connection with the use of dinas. Presented by Acad D. S. Belyankin 22 Jan 1952.

227T3

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204800021-6

BEREZHNOI, A.S.

Symposium on utilization of Satkinsk magnesite. Ogneupory 17, 494-506 '52.
(CA 47 no.20:10819 '53) (MLRA 5:12)

BEREZHNOY, A. S.

Nov 52

USSR/Engineering - Refractories, Magnesite Technology

"On Rational Production Methods for Magnesite Refractories out of Satka Raw Materials," A. S. Berezhnoy, Corr Mem Acad Sci Ukr SSR, All-Union Inst of Refractories

Ogneupory, No 11, pp 494-506

Reviews entire discussion on technology of magnesite refractories started by A. P. Penarin's article in "Ogneupory" No 1, 1952, giving some additional information of his own and dividing whole subject into two major problems: measures necessary and possible under existing conditions at Soviet plants; the purpose of further improvements in production technology in case of radical changes in process.

266T35

BEREZHNOY, A. S., Prof

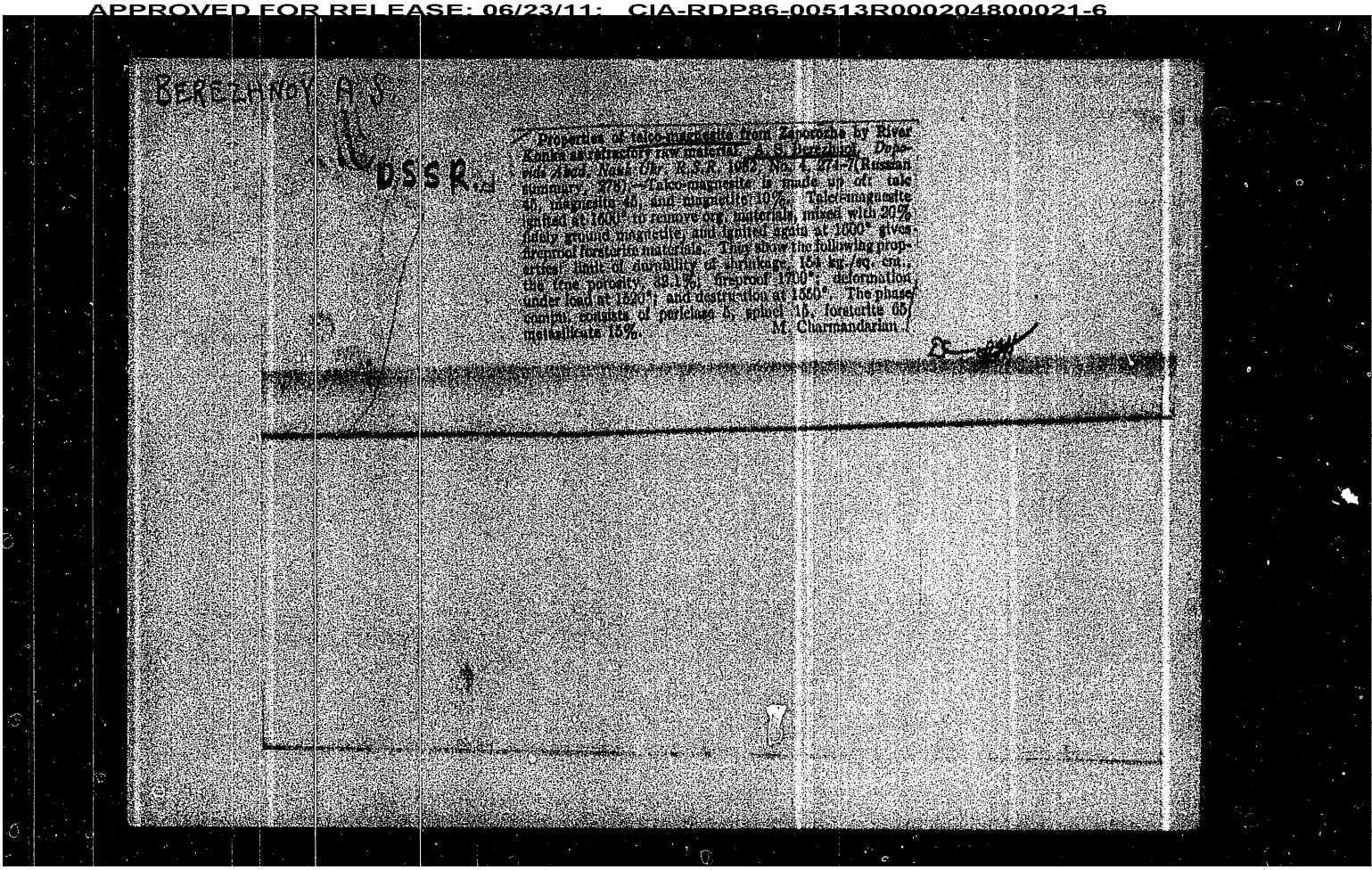
USSR/Engineering - Refractories, Structure — May 52

"On Structure and Properties of $MgO-ZrO_2-SiO_2$ System," Prof A. S. Berezhnoy, Prof L.I. Karyakin, Khar'kov Inst of Refractories

"Ogneupory" No 5, pp 211-221

Presents systematic investigation of solid phase reactions in $MgO-ZrO_2-SiO_2$ system and sintering capacity of materials within this system. Discusses tabulated results in detail.

220T39



BEREZHNOY A.S.

USSR

Properties of talco-magnesite from Zaporozhe by River Konka as refractory raw material. A. S. Berezhnoi. *Doklady Akad. Nauk Ukr. S.S.R.* 1952, No. 4, 274-7 (Russian summary, 278).—Talco-magnesite is made up of talc 45, magnesite 45, and magnetite 10%. Talc-magnesite is ignited at 1600° to remove org. materials, mixed with 20% finely ground magnesite, and ignited again at 1600° gives fireproof forsterite materials. They show the following properties: limit of durability of shrinkage, 154 kg./sq. cm., the free porosity, 33.1%, fireproof 1700°; deformation under load at 1520°; and destruction at 1580°. The phase compn. consists of periclase 5, spinel 15, forsterite 65, monticellite 15%.

M. Charmandarian

BEREZHNOY, A. S.

USSR/Engineering - Refractories, Structure Mar 52

"On the Structure and Properties of the $MgO-ZrO_2-SiO_2$ System," A. S. Berezhnoy, L. I. Karyakin, Professors, Khar'kov Inst of Refractories.

"Ogneupory" No 3, pp 111-124

Clarifies physicochem and some tech features of $MgO-ZrO_2-SiO_2$ system with purpose of finding expedient ways for its practical use. Defines phases of system in equil, constructs diagram of fusibility and outlines possible phase diagram.

204T24

BCS

Refractories

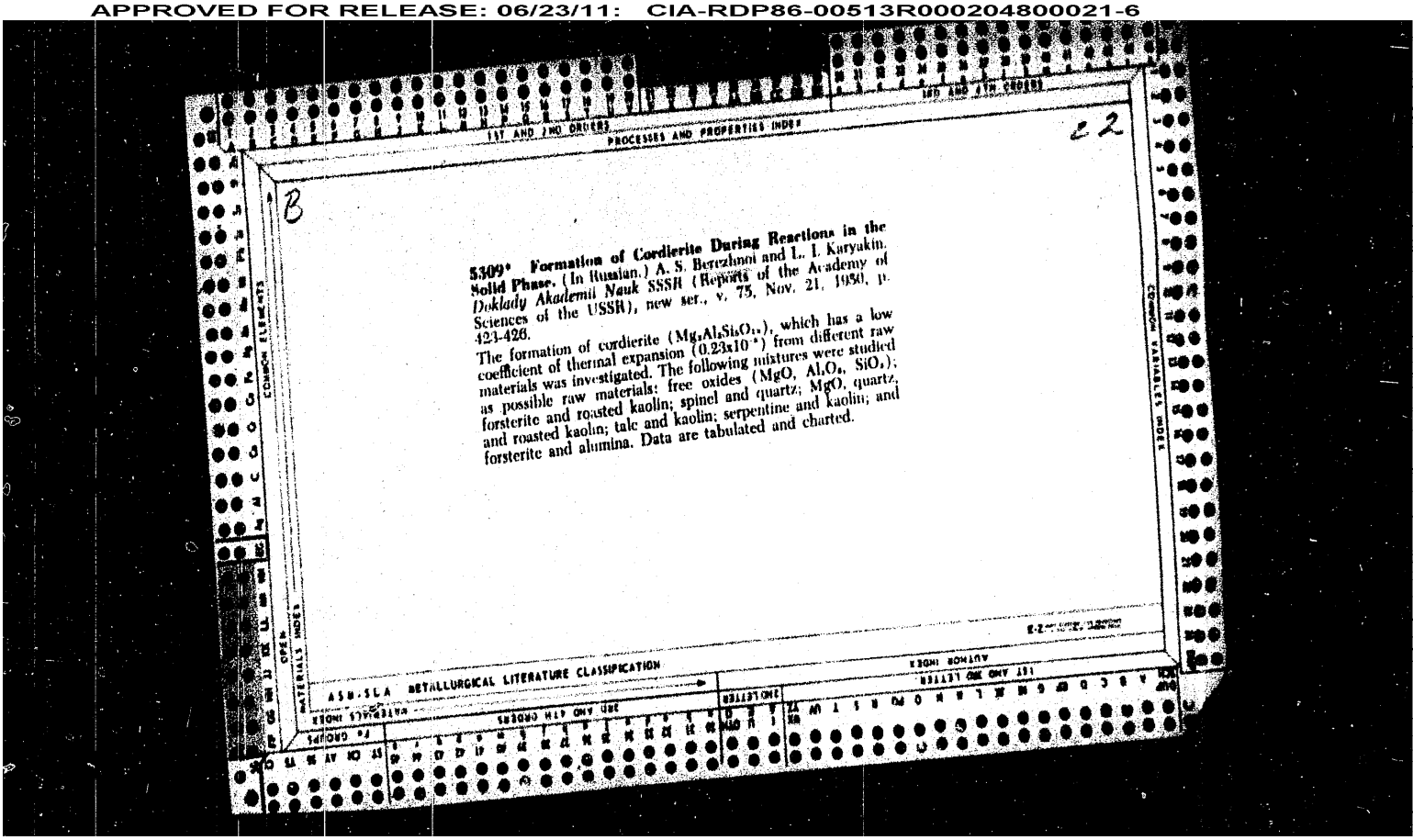
952. The influence of the phase composition on the properties of magnesite refractories.—A. S. Berezhnoi (*Ogneupory*, 16, 344, 1951). The properties of magnesite refractories are determined by the structure and properties of the system CaO–MgO–Fe_2O_3–SiO_2. For magnesite products corresponding to MgO–$MgFe_2O_4$–Mg_2SiO_4–Ca_2SiO_4 the governing factor is the CaO:SiO_2 ratio and, as a secondary factor, the amount of silicates and magnesioferrite (4.5–5%). Monticellite is the constituent chiefly responsible for lowering the refractoriness and Ca_2SiO_4, if not stabilized, may cause magnesite bricks to disintegrate. Therefore both these silicates are highly undesirable in magnesite refractories. If the molecular ratio of CaO:$SiO_2 \approx 2$, a stabilizer, e.g. borates or phosphates, is added; alternatively, the SiO_2 content can be increased (e.g. by adding finely-ground quartz or clay). In general, silicates of any comp. before melting retard the sintering of periclase. This is not true of forsterite during its formation in the solid state; later, forsterite also retards the sintering of products. The best sintering of periclase is produced by ferrites, especially by $Ca_2Fe_2O_5$. The presence of silicates is stated to reduce the influence of ferrites in magnesite products. The ferrite content should be limited if the lining material is meant for use under conditions with a frequent variation of Fe valency. The presence of free CaO in magnesite refractories is undesirable. (16 figs., 2 tables.)

BEREZHNOY, A. S.

USSR.

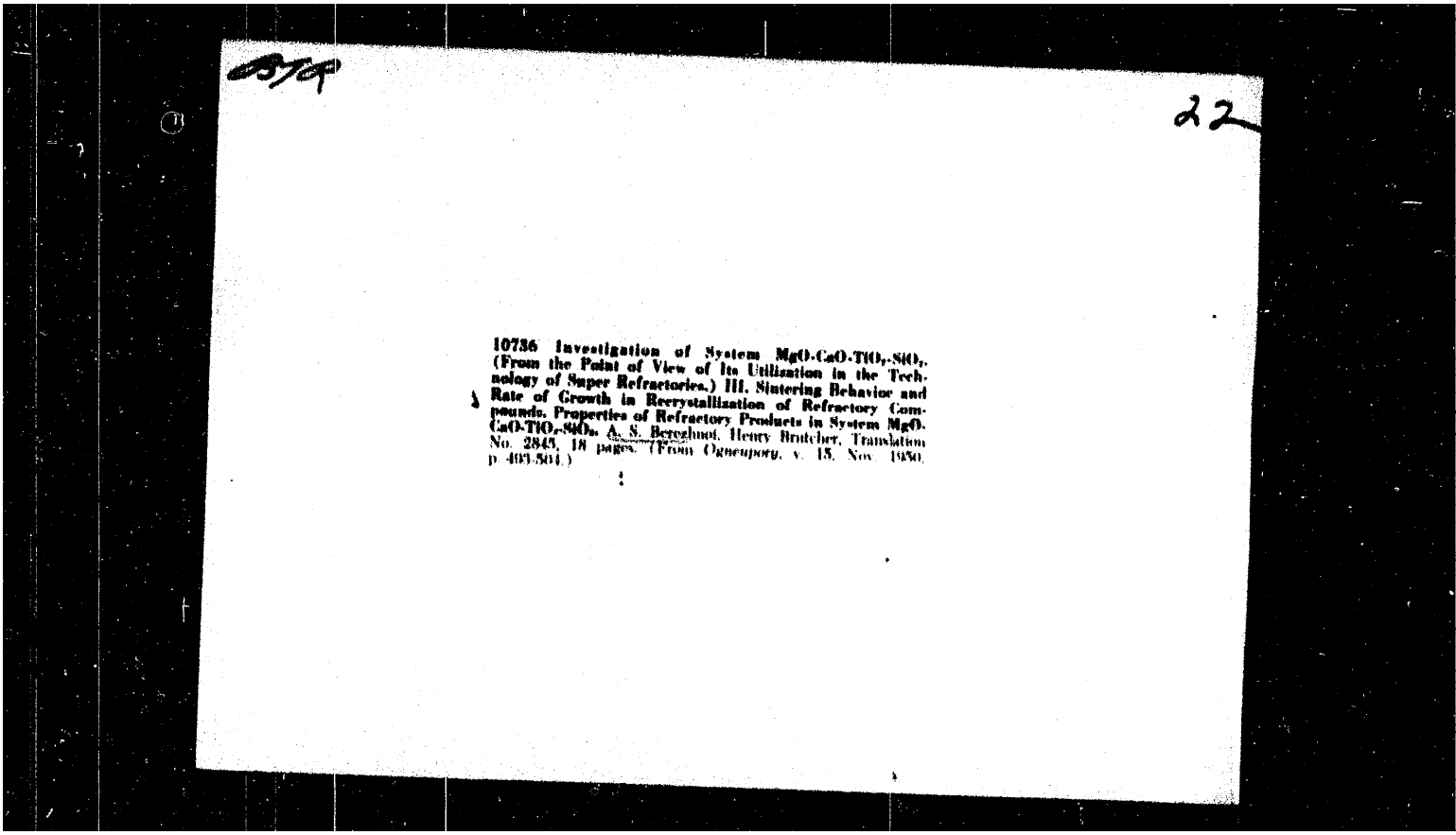
Some data on the system MgO-CaF_2-SiO_2 and their significance in the technology of refractory materials. A. S. Berezhnoi. *Dopovidi Akad. Nauk Ukr. R.S.R.* 1951, 243-8 (Russian summary).—The following are, resp., m. ps. and percentages of MgO in MgO-CaF_2 mixts.: 2800°, 100; 1900°, 80; 1630°, 60; 1430°, 50; 1345°, 40; 1350°, 30; 1360°, 20; 1350°, 10; and 1370°, 0. The eutectic is estd. at 75% CaF_2 and 1340°. For $MgSiO_3$ and CaF_2 the data are (percentages of $MgSiO_3$): 1560°, 100; 1520°, 95; 1490°, 90; 1310°, 80; 1260°, 70; 1180°, 60; 1140°, 50; 1160°, 40; 1150°, 30; 1220°, 20; 1320°, 10; and 1370°, 0. The eutectic is estd. at 50% CaF_2 and 1140°. Microscopic examn. of mixts. MgO-CaF_2 and $MgSiO_3$-CaF_2 did not show any chem. interaction. For SiO_2 and CaF_2 the data are (percentages of SiO_2): 1770°, 100; 1760°, 95; 1700°, 90; 1630°, 80; 1540°, 60; 1470°, 40; 1450°, 30; 1420°, 20; 1410°, 10; 1380°, 5; and 1370°, 0. No eutectic mixt. was observed for SiO_2-CaF_2. A briquet contg. 40% CaF_2-60% SiO_2 showed interaction after 2 hrs. at 1350°. In a three-component system a eutectic was observed at 1120-1130°, contg. SiO_2 17, CaF_2 58, and MgO 25%. Volatile products were formed, presumably from the reaction of CaF_2 with one of the components. CaF_2 holds promise in the formulation of refractories from MgO and $MgSiO_3$.

Murray Senkus



5309* **Formation of Cordierite During Reactions in the Solid Phase.** (In Russian.) A. S. Berezhnoi and L. I. Karyakin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 21, 1950, p. 423-426.

The formation of cordierite ($Mg_2Al_4Si_5O_{18}$), which has a low coefficient of thermal expansion (0.23×10^{-6}) from different raw materials was investigated. The following mixtures were studied as possible raw materials: free oxides (MgO, Al_2O_3, SiO_2); forsterite and roasted kaolin; spinel and quartz; MgO, quartz, and roasted kaolin; talc and kaolin; serpentine and kaolin; and forsterite and alumina. Data are tabulated and charted.

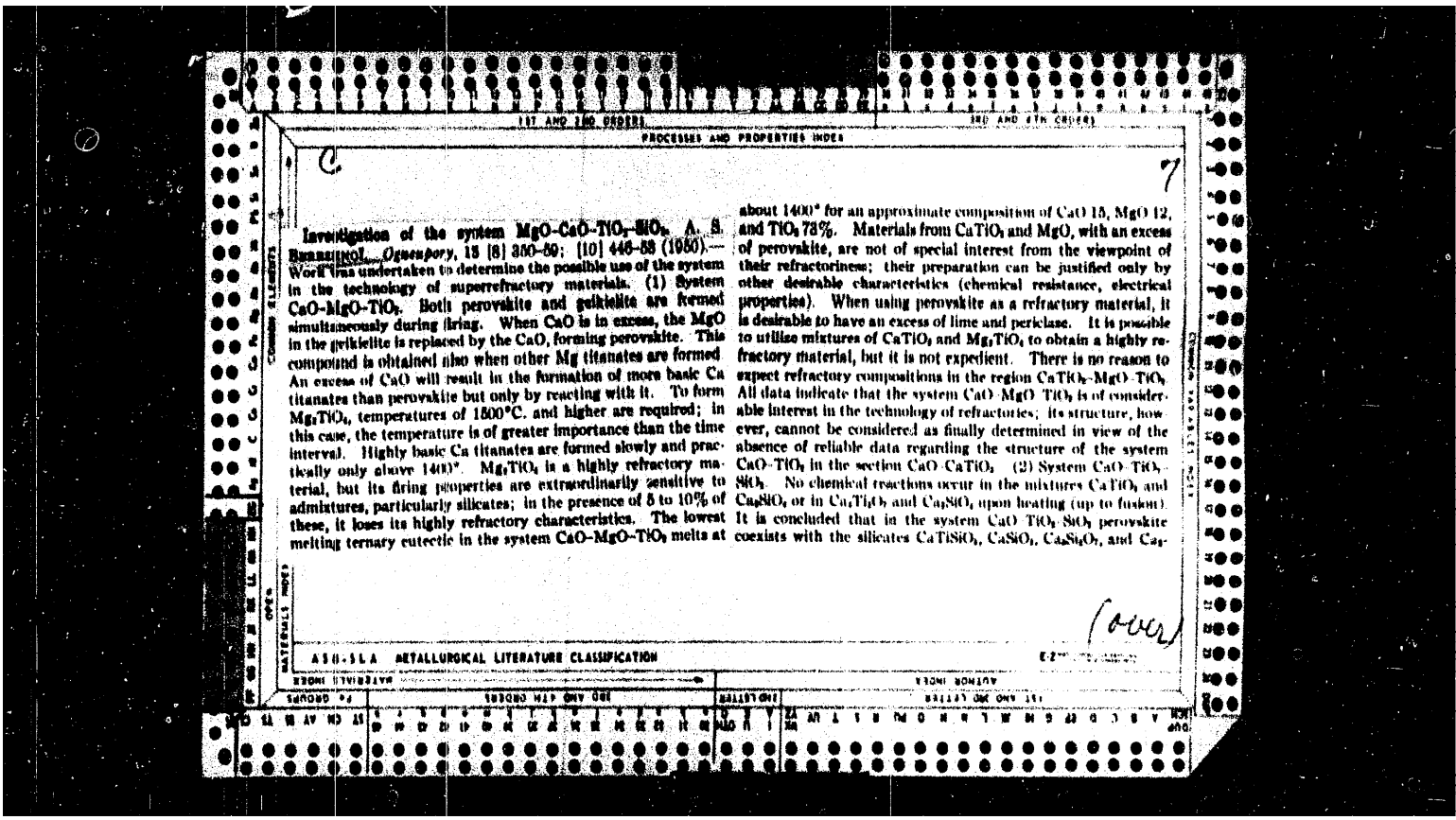


22

10736 Investigation of System MgO-CaO-TiO_2-SiO_2. (From the Point of View of Its Utilization in the Technology of Super Refractories.) III. Sintering Behavior and Rate of Growth in Recrystallization of Refractory Compounds. Properties of Refractory Products in System MgO-CaO-TiO_2-SiO_2. A. S. Berezhnoi, Henry Brutcher, Translation No. 2845, 18 pages. (From Ogneupory, v. 15, Nov. 1950, p. 493-504.)

SiO_4. In this system, unlike in CaO–MgO–TiO_2, there is a large region of nonrefractory compositions. In the technology of refractories, strictly speaking, only the region of compositions $CaTiO_3$–Ca_3SiO_4–CaO can be utilized. In the individual system $CaTiO_3$–Ca_3SiO_4 the eutectic mixture (about 33% Ca_3SiO_4) melts at 1660°C. (3) System MgO–TiO_2–SiO_2. The formation of Mg titanosilicates was not detected. The rate of formation of forsterite in the solid phase was less than of geikielite. The primary product in the solid phase is $MgTiO_3$; then forsterite appears followed by Mg orthotitanate. The area of compositions within the limits of Mg_2SiO_4–$MgTiO_3$–MgO can be utilized in the technology of refractories. This region has a comparatively simple structure; all its compositions are refractory. The eutectic melts at about 1600°. Minimum refractoriness of mixtures in the system is 1415°. (4) System CaO–MgO–SiO_2. The region of compositions suitable for refractories is small. Monticellite has an especially unfavorable effect upon periclase and forsterite refractories. 13 figures, 2 photomicrographs, 12 references.

B.Z.K.



PROCESSES AND PROPERTIES INDEX

C 7

Investigation of the system MgO-CaO-TiO_2-SiO_2. A. S. Ramanujam. *Ogneupory*, 15 [8] 360–69; [10] 446–58 (1950).—Work was undertaken to determine the possible use of the system in the technology of superrefractory materials. (1) System CaO-MgO-TiO_2. Both perovskite and geikielite are formed simultaneously during firing. When CaO is in excess, the MgO in the geikielite is replaced by the CaO, forming perovskite. This compound is obtained also when other Mg titanates are formed. An excess of CaO will result in the formation of more basic Ca titanates than perovskite but only by reacting with it. To form Mg_2TiO_4, temperatures of 1500°C. and higher are required; in this case, the temperature is of greater importance than the time interval. Highly basic Ca titanates are formed slowly and practically only above 1400°. Mg_2TiO_4 is a highly refractory material, but its firing properties are extraordinarily sensitive to admixtures, particularly silicates; in the presence of 5 to 10% of these, it loses its highly refractory characteristics. The lowest melting ternary eutectic in the system CaO–MgO–TiO_2 melts at about 1400° for an approximate composition of CaO 15, MgO 12, and TiO_2 73%. Materials from $CaTiO_3$ and MgO, with an excess of perovskite, are not of special interest from the viewpoint of their refractoriness; their preparation can be justified only by other desirable characteristics (chemical resistance, electrical properties). When using perovskite as a refractory material, it is desirable to have an excess of lime and periclase. It is possible to utilize mixtures of $CaTiO_3$ and Mg_2TiO_4 to obtain a highly refractory material, but it is not expedient. There is no reason to expect refractory compositions in the region $CaTiO_3$–MgO–TiO_2. All data indicate that the system CaO–MgO–TiO_2 is of considerable interest in the technology of refractories; its structure, however, cannot be considered as finally determined in view of the absence of reliable data regarding the structure of the system CaO–TiO_2 in the section CaO–$CaTiO_3$. (2) System CaO–TiO_2–SiO_2. No chemical reactions occur in the mixtures $CaTiO_3$ and Ca_2SiO_4 or in $Ca_3Ti_2O_7$ and Ca_2SiO_4 upon heating (up to fusion). It is concluded that in the system CaO–TiO_2–SiO_2 perovskite coexists with the silicates $CaTiSiO_5$, $CaSiO_3$, $Ca_3Si_2O_7$, and Ca_3-

(over)

A 51-5 L A METALLURGICAL LITERATURE CLASSIFICATION

BEREZHNOY, A.S.

CATALYSTS 2

(3) Chem

Reaction of chromium oxide with forsterite in the solid phase. P. P. Budnikov (D. I. Mendeleev Inst. Chem. Technol., Moscow) and A. S. Bereshnoi. *Doposidi Akad. Nauk Ukr. R.S.R.* 1950, No. 5, 345–8(Russian summary, 348–9).—Mixts. of Cr_2O_3 and Mg_2SiO_4 were pressed at 500 kg./sq. cm. and the specimens kept 0.5–7.0 hrs. at 1200°, as well as in the range 1000–1600° with temp. rise over 2 hrs. After cooling in air, the extent of conversion to $MgSiO_3$ and $MgCr_2O_4$ was detd. by soln. in 15% HCl at 80° for 20 min., under which conditions only forsterite is attacked; both photographic and x-ray methods were used. At 1200° the reaction is intensive for 2 hrs., then almost stops, owing to coating effects with reduced diffusion. At higher temp. the reaction is more rapid; at 1300° partial vitrification occurs. The reaction runs to completion at 1850–1900° with 2.6% vol. increase. The resulting mixt. of 66% $MgCr_2O_4$ and 34% $MgSiO_3$ is refractory above 1900°. G. M. K.

9-2-57 gpp

BEREZHNOY, A. S.

PHASE X TREASURE ISLAND BIBLIOGRAPHICAL REPORT AID 707 - X

BOOK

Call No.: TP807.B9

Authors: BUDNIKOV, P. P.; BEREZHNOY, A. S.; BULAVIN, I. A.; GRISSIK, B. M.; KUKOLEV, G. V.; POLUBOYARINOV, D. N.

Full Title: MANUFACTURE OF CERAMICS AND REFRACTORY MATERIALS

Transliterated Title: Tekhnologiya keramiki i ogneuporov

PUBLISHING DATA

Originating Agency: None

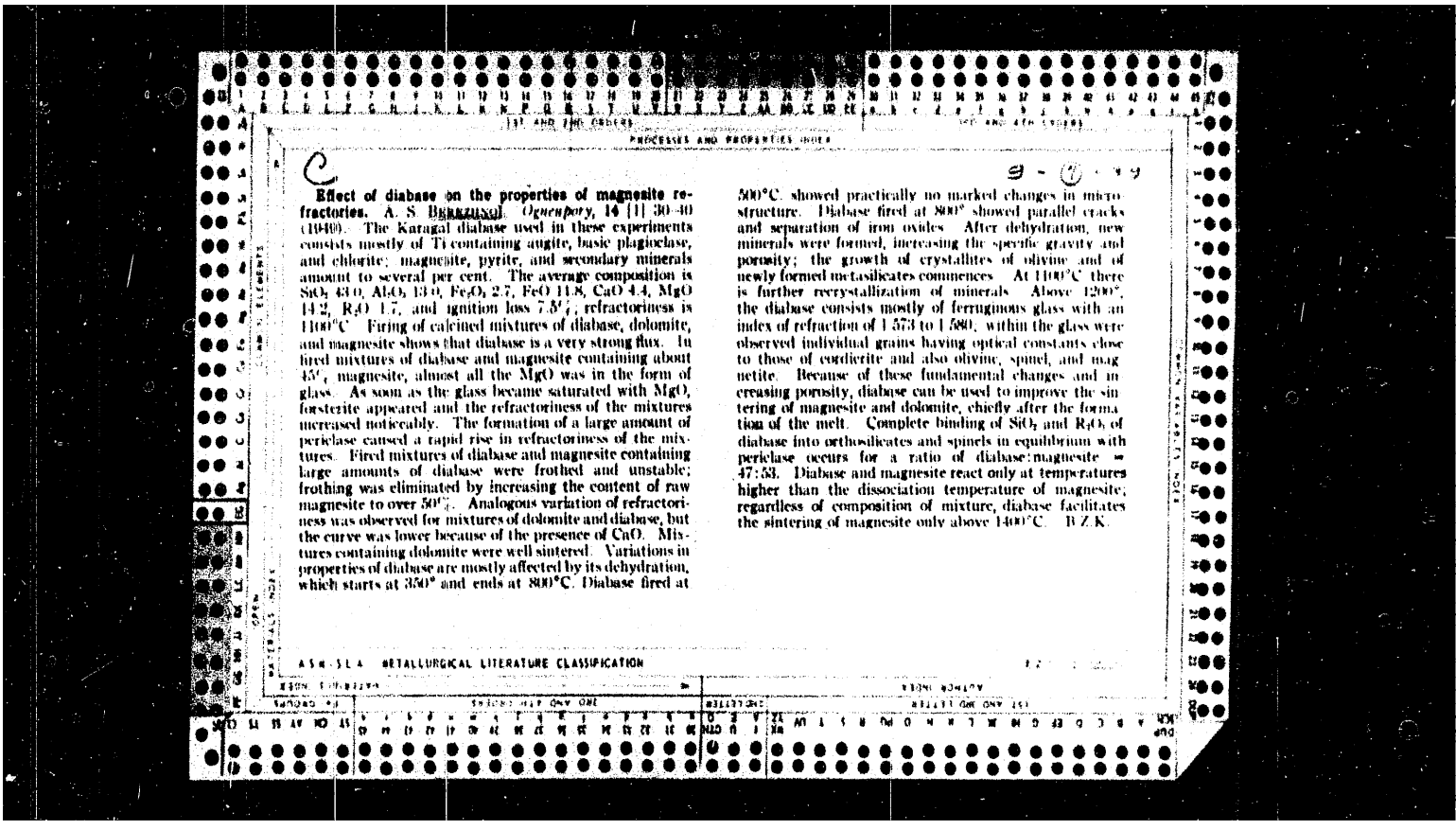
Publishing House: State Publishing House of Literature on Construction Materials

Date: 1950 No. pp.: 575 No. of copies: 4,000

Editorial Staff

Editor: P. P. Budnikov, Member of the Academy of Sciences, Ukrainian SSR

PURPOSE AND EVALUATION: This manual is approved as a textbook for institutes of chemical technology and of construction materials and for students specializing in the technology of silicates. The book compares favorably with its American counterparts, e. g., volume III of Ceramics by Ed. P. McNamara (State College, Pa., 1939) and Factory Design and Equipment and Manufacture of Clay Wares by T. W. Garve (N.Y., 1929). All phases of manufacturing are extensively covered and the book can be used as a reference book.



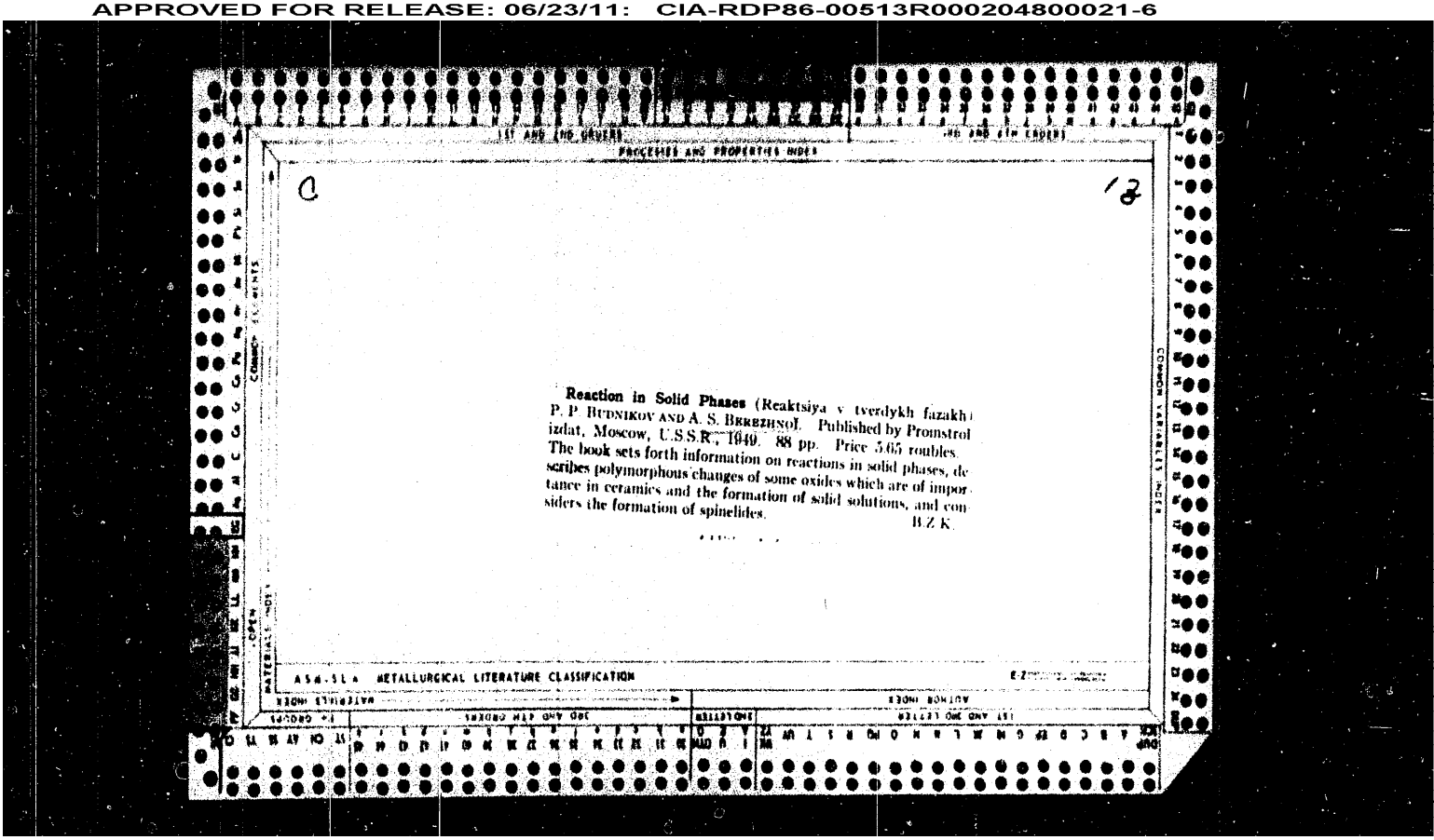
PROCESSES AND PROPERTIES INDEX

C

9 - (1) - 19

Effect of diabase on the properties of magnesite refractories. A. S. Bannikov. *Ogneupory*, 14 [1] 30–40 (1949). The Karagal diabase used in these experiments consists mostly of Ti containing augite, basic plagioclase, and chlorite; magnesite, pyrite, and secondary minerals amount to several per cent. The average composition is SiO_2 43.0, Al_2O_3 13.0, Fe_2O_3 2.7, FeO 11.8, CaO 4.4, MgO 14.2, R_2O 1.7, and ignition loss 7.5%; refractoriness is 1100°C. Firing of calcined mixtures of diabase, dolomite, and magnesite shows that diabase is a very strong flux. In fired mixtures of diabase and magnesite containing about 45% magnesite, almost all the MgO was in the form of glass. As soon as the glass became saturated with MgO, forsterite appeared and the refractoriness of the mixtures increased noticeably. The formation of a large amount of periclase caused a rapid rise in refractoriness of the mixtures. Fired mixtures of diabase and magnesite containing large amounts of diabase were frothed and unstable; frothing was eliminated by increasing the content of raw magnesite to over 50%. Analogous variation of refractoriness was observed for mixtures of dolomite and diabase, but the curve was lower because of the presence of CaO. Mixtures containing dolomite were well sintered. Variations in properties of diabase are mostly affected by its dehydration, which starts at 350° and ends at 800°C. Diabase fired at 500°C. showed practically no marked changes in microstructure. Diabase fired at 800° showed parallel cracks and separation of iron oxides. After dehydration, new minerals were formed, increasing the specific gravity and porosity; the growth of crystallites of olivine and of newly formed metasilicates commences. At 1100°C there is further recrystallization of minerals. Above 1200°, the diabase consists mostly of ferruginous glass with an index of refraction of 1.573 to 1.580, within the glass were observed individual grains having optical constants close to those of cordierite and also olivine, spinel, and magnetite. Because of these fundamental changes and increasing porosity, diabase can be used to improve the sintering of magnesite and dolomite, chiefly after the formation of the melt. Complete binding of SiO_2 and R_2O_3 of diabase into orthosilicates and spinels in equilibrium with periclase occurs for a ratio of diabase:magnesite = 47:53. Diabase and magnesite react only at temperatures higher than the dissociation temperature of magnesite; regardless of composition of mixture, diabase facilitates the sintering of magnesite only above 1400°C. B.Z.K.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



Reaction in Solid Phases (Reaktsiya v tverdykh fazakh) P. P. Budnikov and A. S. Berezhnoi. Published by Promstroi izdat, Moscow, U.S.S.R., 1949. 88 pp. Price 5.65 roubles. The book sets forth information on reactions in solid phases, describes polymorphous changes of some oxides which are of importance in ceramics and the formation of solid solutions, and considers the formation of spinelides.

B Z K

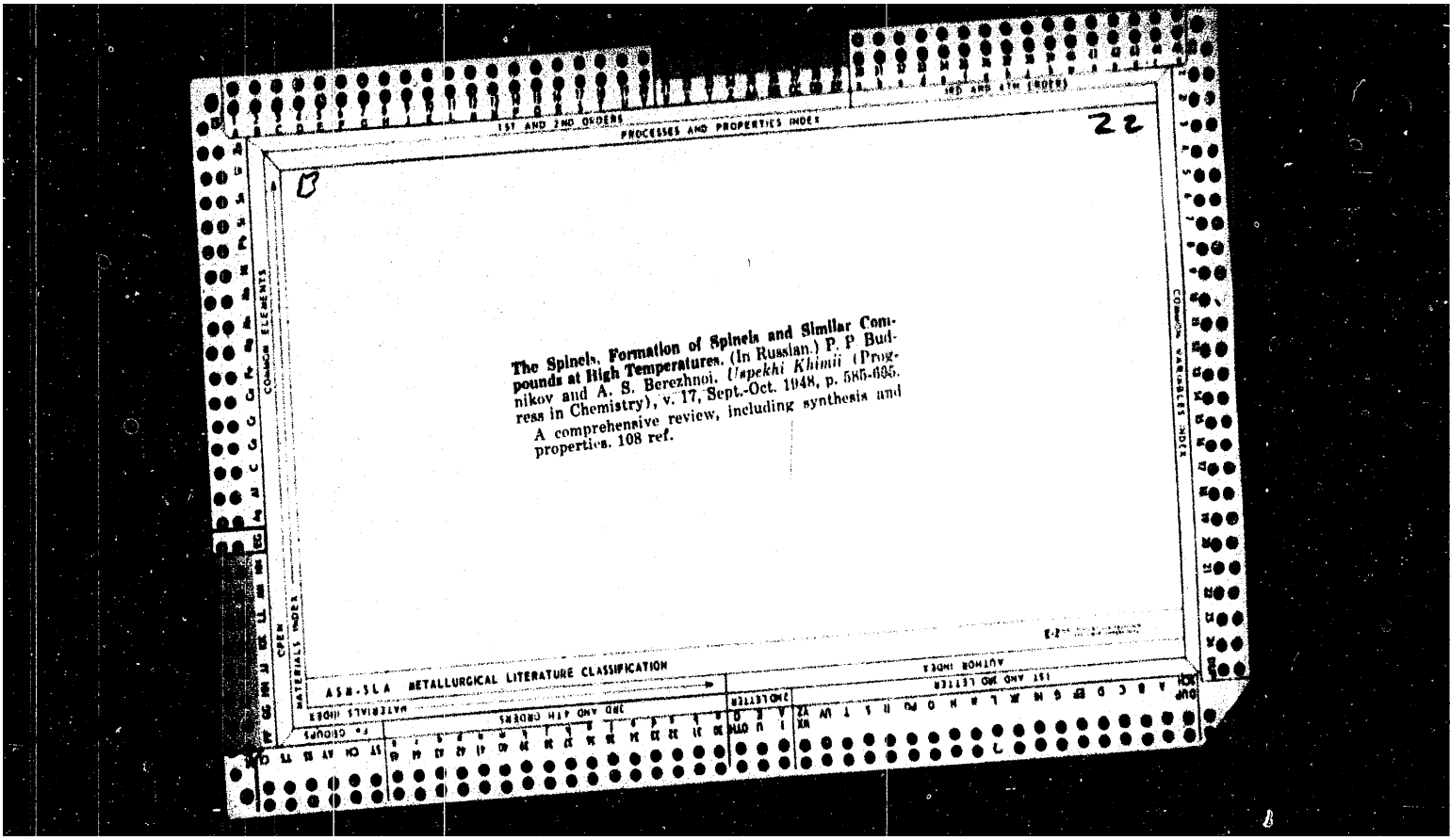
BEREZHNOI, A. S.

Berezhnoi, A. S., "The physico-chemistry of magnesium oxide in the system $CaO-MgO-Al_2O_3-F_2O_3-SiO_2$." p. 717

For clearing up that part of the system $CaO-MgO-Al_2O_3-FeO_2-SiO_2$ which is of interest here, first it was necessary to establish which phases are in equilibrium with magnesium oxide and at the same time with each other. The value of the coefficient of thermal expansion of almost all substances in equilibrium with magnesium oxide are very close to the value of the expansion coefficient of magnesium oxide.

All Union Institute of Fireproofs. July 30, 1947

SO: Journal of Applied Chemistry (USSR) 21, No. 7 (1948)



Bl-9 Ceram. Cer. & Glass

Brit. abs.

Theory of liquid sintering and influence of pressure on sintering (of magnesite). A. E. Rheinhold. (*Ogneupory*, 1948, **13**, 351; *Brit. Ceram. Abstr.*, 1949, **28**(A), —.)—Results of sintering experiments with magnesite of uniform grain size are given. The average distance between centres of grains is always > their diameter; the porosity of the system is ~40% which corresponds to cubic packing. When magnesite particles are moistened with water the total vol. increases with water additions up to ~3%; with further additions the porosity is reduced considerably. The effect of pressure on the degree of sintering of magnesite powder (0—0·2 mm.) was studied. After firing at 1540° the degree of sintering increases regularly with the pressure up to ~ 31,000 lb. per sq. in. At still higher pressures the degree of sintering falls off slightly.

INST. CERAM. RES. ASS. (*Cl*).

BEREZHNOY, A. S. PROF

PA 6/49T38

USSR/Engineering
Refractories
Agglutination

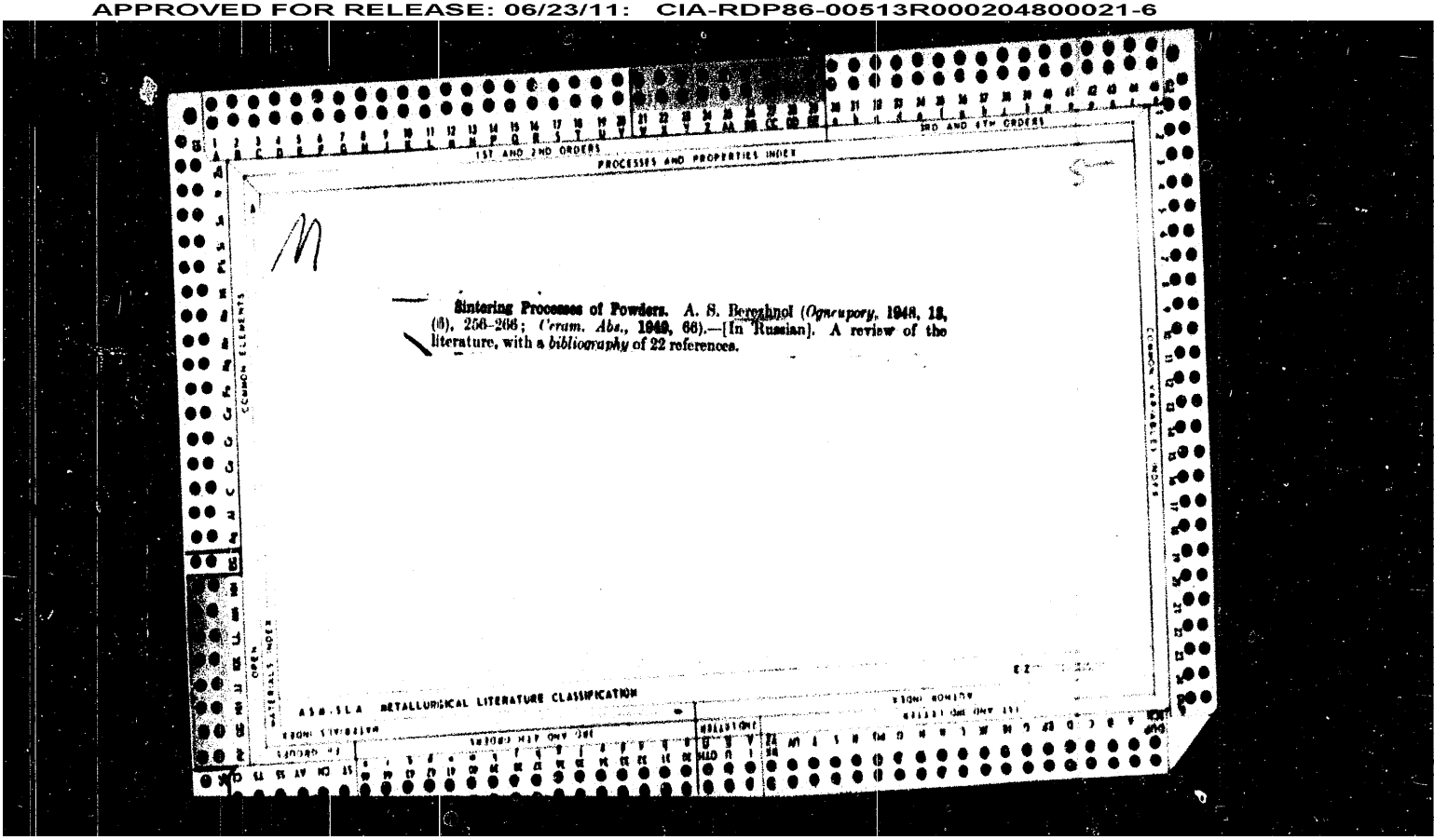
Jun 48

"Agglutination of Powders and Associated Processes," Prof A. S. Berezhnoy, Dr Tech Sci, 11 pp

"Ogneupory" Vol XIII, No 6

Discusses agglutination: (1) in the absence of a liquid phase, (2) with liquid phase, (3) complex processes. Treatment is mainly mathematical but article is illustrated with graphs based on experimental data.

6/49T38



Sintering Processes of Powders. A. S. Bereghnol (*Ogneupory*, **1948**, **13**, (6), 256–266; *Ceram. Abs.*, **1949**, 66).—[In Russian]. A review of the literature, with a *bibliography* of 22 references.

PA 32/49T37

BEREZHNOY, A. S. PROF.

Aug 48

USSR/Engineering
Sintering
Mathematics - Applied

"The Theory of Liquid Sintering and the Effect of Compression Stress on Sintering," Prof A. S. Berezhnoy, Dr Mech Sci, 10½ pp

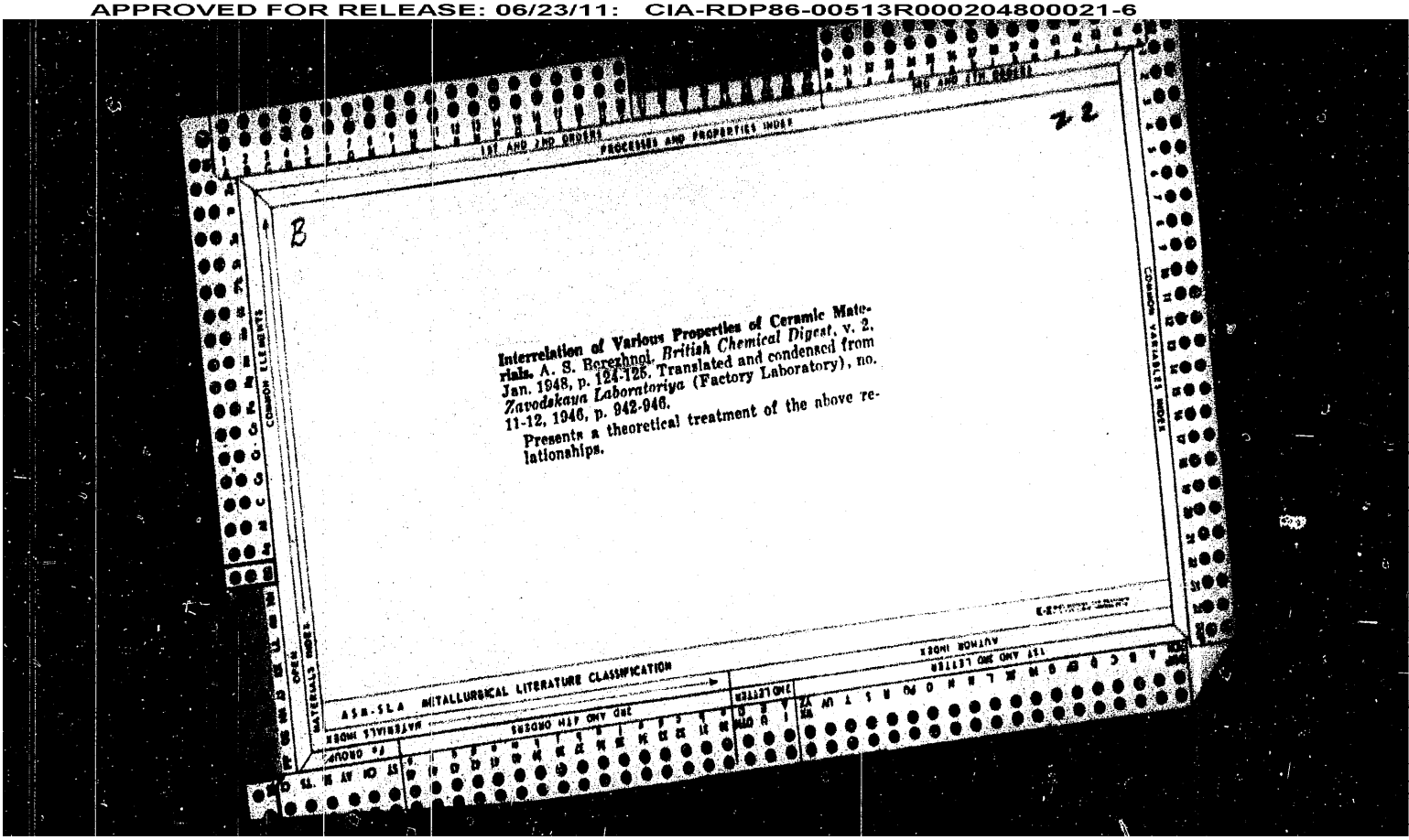
"Ogneupory" No 8

Liquid sintering ("gluing") is of great practical importance. Analyzes processes involved from mathematical standpoint.

32/49T37

[redacted]

APPROVED FOR RELEASE: 06/23/11: CIA-RDP86-00513R000204800021-6



BEREZHNOY, A. S. [redacted]

PA 41T23

USSR/Engineering
Metallurgy
Furnaces, Metallurgical

Jan 1948

"Characteristics of Basic Fettling in Martin Furnaces," A. S. Berezhnoy, Dr Tech Sci, All-Union Inst of Fire Resistant Materials, 9 pp

"Stal'" No 1

Characteristics of basic fettling of Martin furnaces vary widely because of variations in the composition of the mixtures, and conditions under which fettling takes place. Where there is a high magnesium oxide content, magnesium welds have high degree of stability in comparison with magnesium-dolomites, but have a

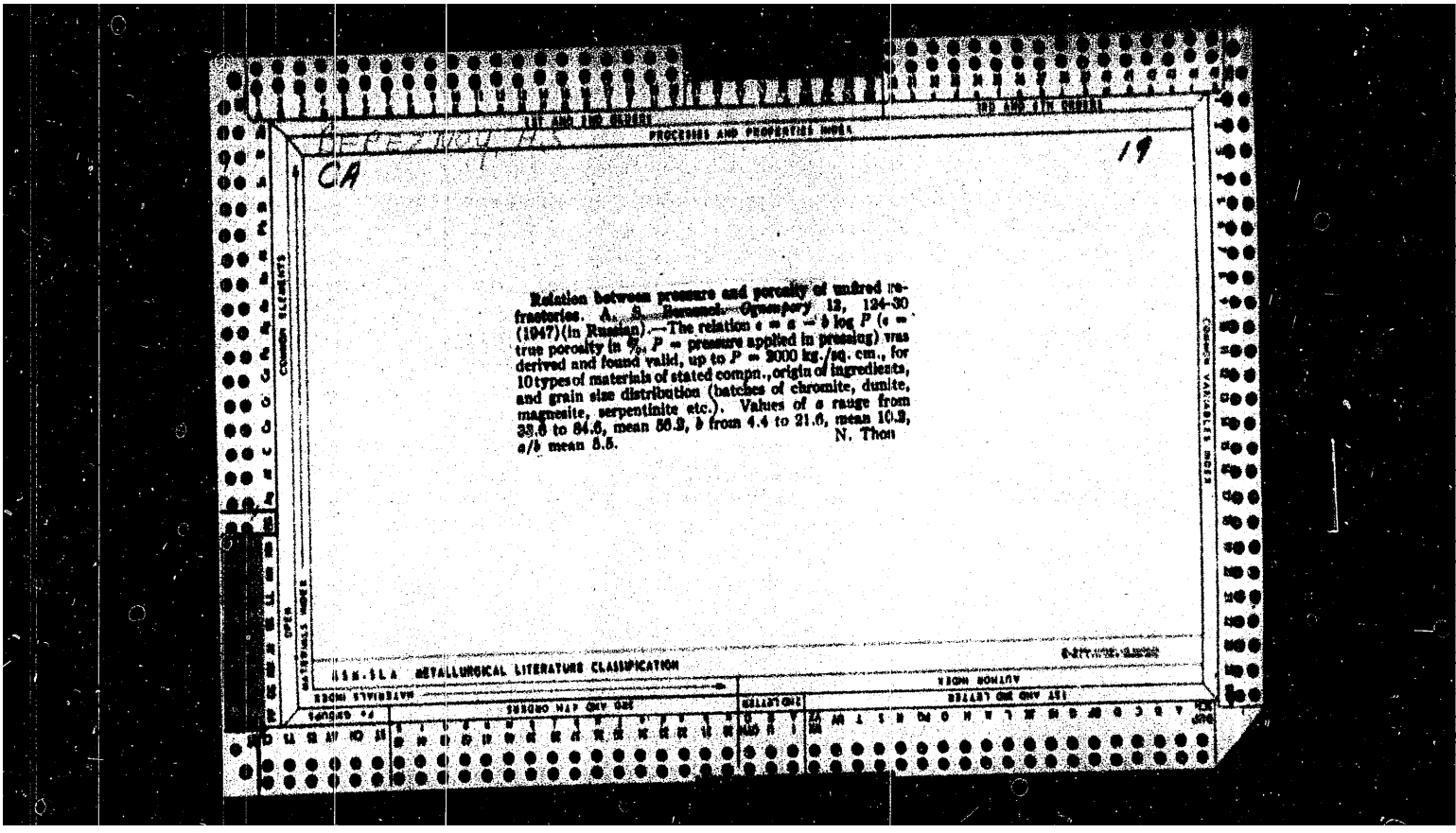
[redacted] 41T23

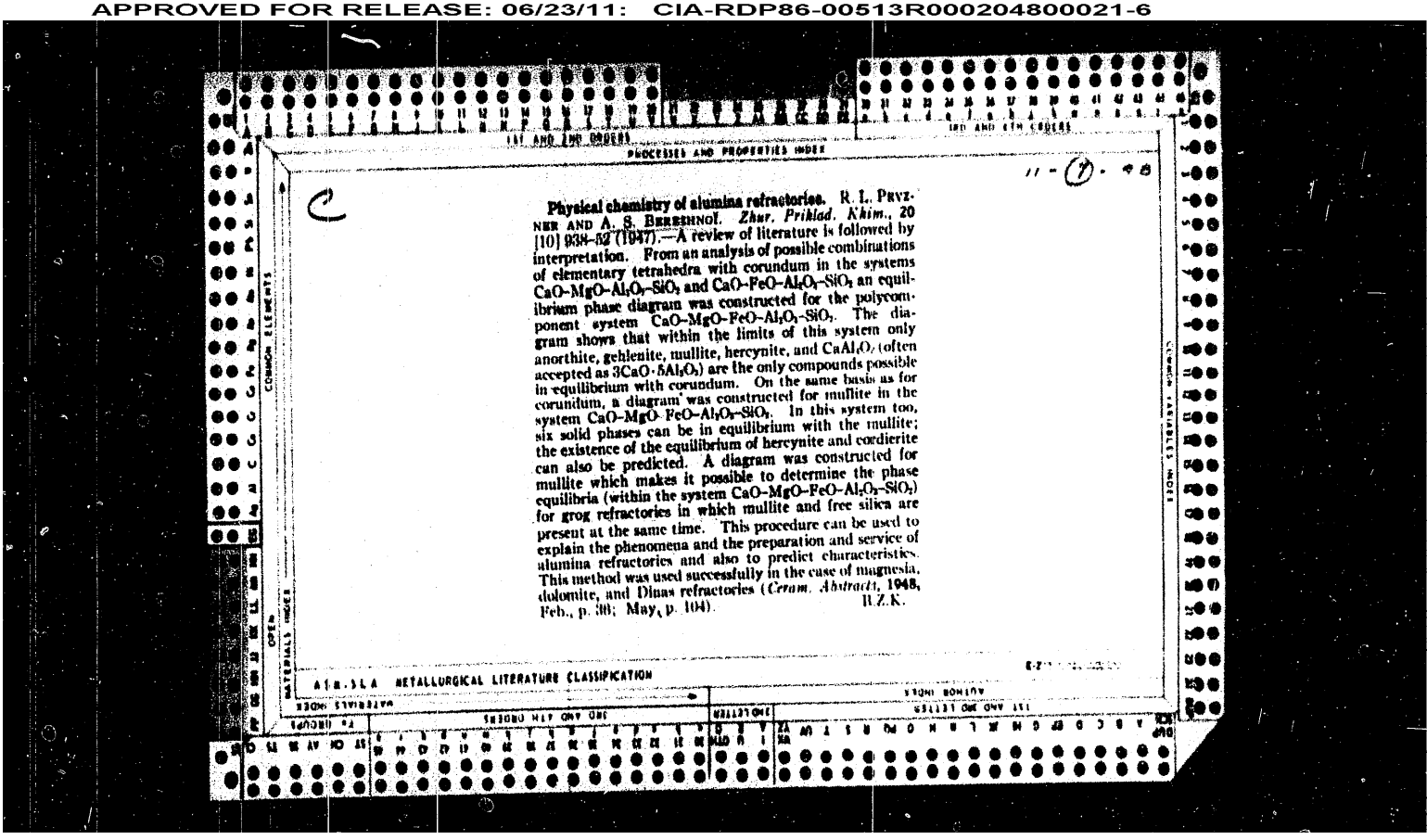
USSR/Engineering (Contd)

Jan 1948

slightly lower clinkering factor. During operation of the furnaces, it must be noted that it is possible to oxidize the basic fettling.

41T23



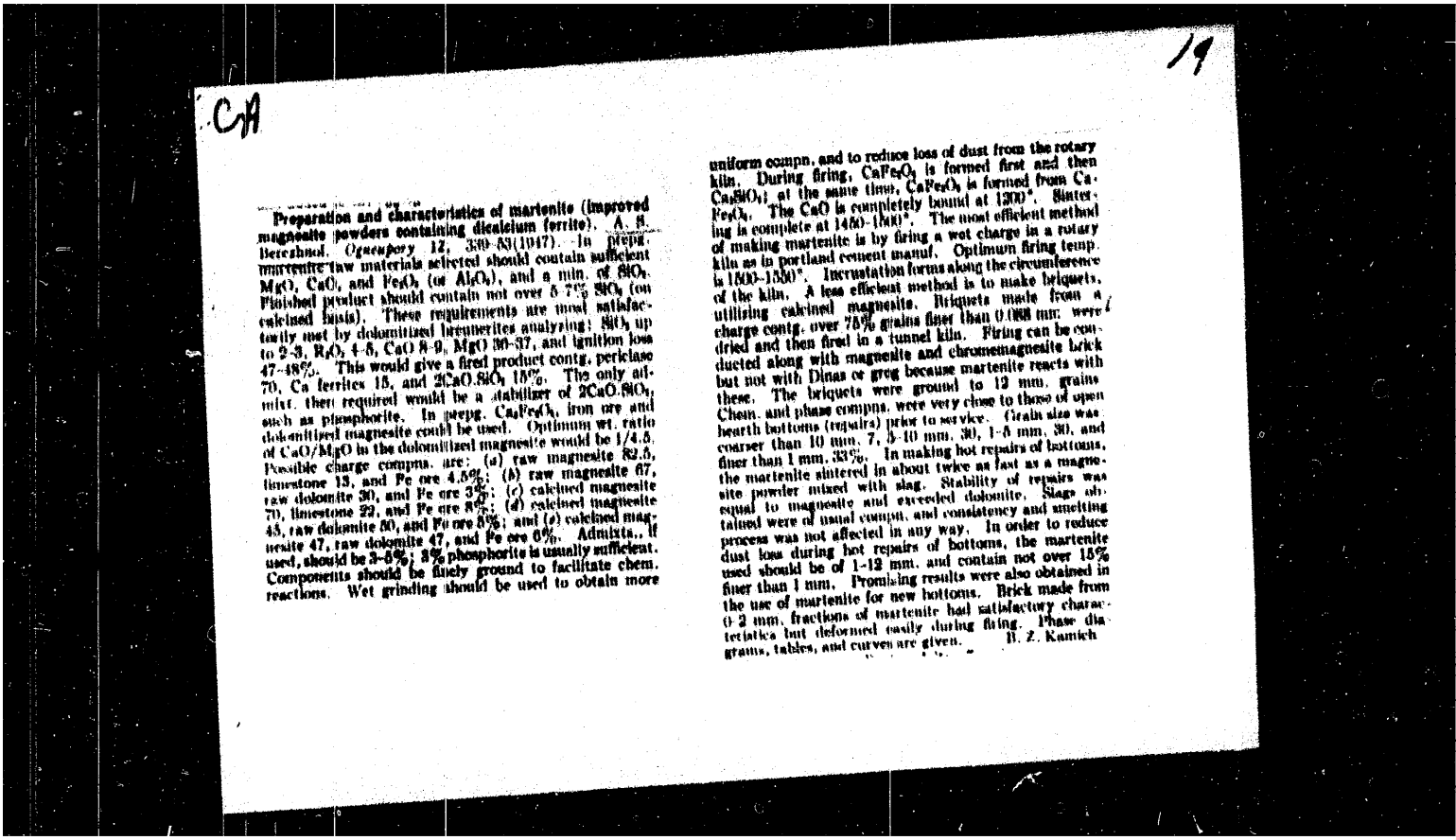


PROCESSES AND PROPERTIES INDEX

Physical chemistry of alumina refractories. R. L. Pryz-ner and A. S. Berezhnoi. *Zhur. Prikład. Khim.*, 20 [10] 938–52 (1947).—A review of literature is followed by interpretation. From an analysis of possible combinations of elementary tetrahedra with corundum in the systems $CaO–MgO–Al_2O_3–SiO_2$ and $CaO–FeO–Al_2O_3–SiO_2$ an equilibrium phase diagram was constructed for the polycomponent system $CaO–MgO–FeO–Al_2O_3–SiO_2$. The diagram shows that within the limits of this system only anorthite, gehlenite, mullite, hercynite, and $CaAl_2O_4$ (often accepted as $3CaO·5Al_2O_3$) are the only compounds possible in equilibrium with corundum. On the same basis as for corundum, a diagram was constructed for mullite in the system $CaO–MgO–FeO–Al_2O_3–SiO_2$. In this system too, six solid phases can be in equilibrium with the mullite; the existence of the equilibrium of hercynite and cordierite can also be predicted. A diagram was constructed for mullite which makes it possible to determine the phase equilibria (within the system $CaO–MgO–FeO–Al_2O_3–SiO_2$) for grog refractories in which mullite and free silica are present at the same time. This procedure can be used to explain the phenomena and the preparation and service of alumina refractories and also to predict characteristics. This method was used successfully in the case of magnesia, dolomite, and Dinas refractories (*Ceram. Abstracts*, 1948, Feb., p. 38; May, p. 104). B.Z.K.

11-(7)-48

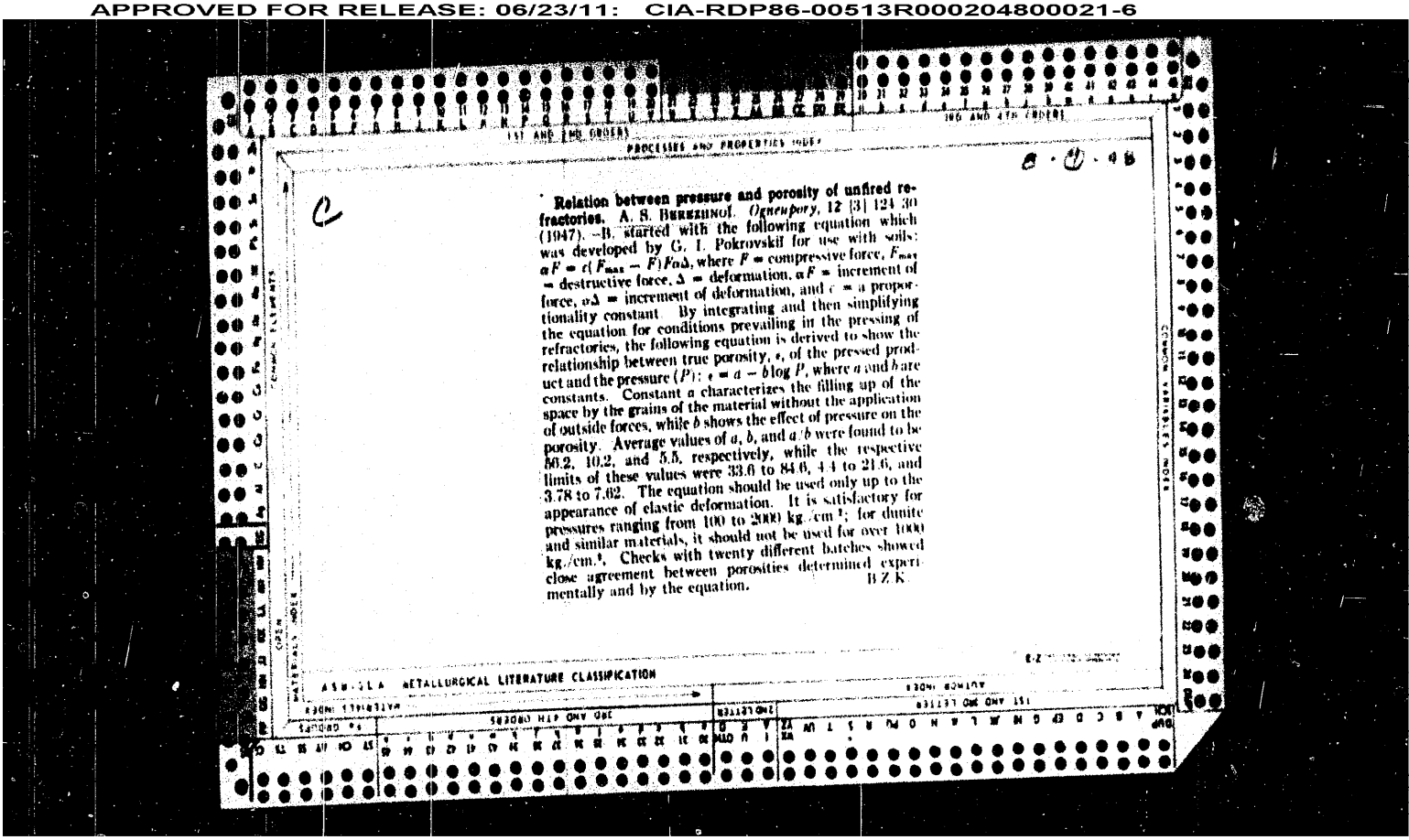
ASTM-SLA METALLURGICAL LITERATURE CLASSIFICATION



CA

19

Preparation and characteristics of martenite (improved magnesite powders containing dicalcium ferrite). A. S. Berezhnoi. *Ogneupory* 12, 330-53(1947). In prepg. martenite raw materials selected should contain sufficient MgO, CaO, and Fe_2O_3 (or Al_2O_3), and a min. of SiO_2. Finished product should contain not over 5.7% SiO_2 (on calcined basis). These requirements are most satisfactorily met by dolomitized briquettes analyzing: SiO_2 up to 2-3, R_2O_3 4-5, CaO 8-9, MgO 30-37, and ignition loss 47-48%. This would give a fired product contg. periclase 70, Ca ferrites 15, and $2CaO.SiO_2$ 15%. The only admixt. then required would be a stabilizer of $2CaO.SiO_2$, such as phosphorite. In prepg. $CaFe_2O_4$, iron ore and dolomitized magnesite could be used. Optimum wt. ratio of CaO/MgO in the dolomitized magnesite would be 1/4.5. Possible charge compns. are: (a) raw magnesite 82.5, limestone 13, and Fe ore 4.5%; (b) raw magnesite 67, raw dolomite 30, and Fe ore 3%; (c) calcined magnesite 70, limestone 22, and Fe ore 8%; (d) calcined magnesite 45, raw dolomite 50, and Fe ore 5%; and (e) calcined magnesite 47, raw dolomite 47, and Fe ore 6%. Admixts., if used, should be 3-5%; 3% phosphorite is usually sufficient. Components should be finely ground to facilitate chem. reactions. Wet grinding should be used to obtain more uniform compn. and to reduce loss of dust from the rotary kiln. During firing, $CaFe_2O_4$ is formed first and then Ca_2SiO_4; at the same time, $CaFe_2O_4$ is formed from CaO, Fe_2O_3. The CaO is completely bound at 1300°. Slaking is complete at 1450-1500°. The most efficient method of making martenite is by firing a wet charge in a rotary kiln as in portland cement manuf. Optimum firing temp. is 1500-1550°. Incrustation forms along the circumference of the kiln. A less efficient method is to make briquets, utilizing calcined magnesite. Briquets made from a charge contg. over 75% grains finer than 0.088 mm. were dried and then fired in a tunnel kiln. Firing can be conducted along with magnesite and chromemagnesite brick but not with Dinas or greg because martenite reacts with these. The briquets were ground to 12 mm. grains. Chem. and phase compns. were very close to those of open hearth bottoms (repairs) prior to service. Grain size was coarser than 10 mm. 7, 5-10 mm. 30, 1-5 mm. 30, and finer than 1 mm. 33%. In making hot repairs of bottoms, the martenite sintered in about twice as fast as a magnesite powder mixed with slag. Stability of repairs was equal to magnesite and exceeded dolomite. Slags obtained were of usual compn. and consistency and smelting process was not affected in any way. In order to reduce dust loss during hot repairs of bottoms, the martenite used should be of 1-12 mm. and contain not over 15% finer than 1 mm. Promising results were also obtained in the use of martenite for new bottoms. Brick made from 0-2 mm. fractions of martenite had satisfactory characteristics but deformed easily during firing. Phase diagrams, tables, and curves are given. B. Z. Kamich



Relation between pressure and porosity of unfired refractories. A. S. BEREZHNOI. *Ogneupory*, 12 [3] 124-30 (1947).—B. started with the following equation which was developed by G. I. Pokrovskii for use with soils: $\alpha F = c(F_{max} - F)F\alpha\Delta$, where F = compressive force, F_{max} = destructive force, Δ = deformation, αF = increment of force, $\alpha\Delta$ = increment of deformation, and c = a proportionality constant. By integrating and then simplifying the equation for conditions prevailing in the pressing of refractories, the following equation is derived to show the relationship between true porosity, ϵ, of the pressed product and the pressure (P): $\epsilon = a - b \log P$, where a and b are constants. Constant a characterizes the filling up of the space by the grains of the material without the application of outside forces, while b shows the effect of pressure on the porosity. Average values of a, b, and a/b were found to be 50.2, 10.2, and 5.5, respectively, while the respective limits of these values were 33.6 to 84.6, 4.4 to 21.6, and 3.78 to 7.62. The equation should be used only up to the appearance of elastic deformation. It is satisfactory for pressures ranging from 100 to 2000 kg./cm.^{2}; for dunite and similar materials, it should not be used for over 1000 kg./cm.^{2}. Checks with twenty different batches showed close agreement between porosities determined experimentally and by the equation. B Z K

BEREZHNOY A. S.

17795

USSR/Refractory Materials
Magnesium Compounds

Aug 1947

"Martinite, its Production and Characteristics," A. S. Berezhnoy

"Ogneupory" No 8

Describes methods of deriving martinite from such ores as Mg_2S,O_4, $MgAl_2O_4$, and others. Fire-resistance of martinite is higher than temperatures of 2000 degrees. Of all magnesium compounds, martinite appears to have the highest fire-resisting qualities. Tables and graphs show relative characteristics of martinite and other magnesium compounds.

17795

BEREZHNOY, A.S.

PA 18T27

USSR/Metallurgy, Powder May 1947
Furnaces, Metallurgical

"Synthetic Metallurgical Powder for Martin Furnaces," A. S. Berezhnoy, V. I. Mitasov, I. G. Fadeyev, Factory imeni Serov and All-Union Institute of Refractory Materials, 2 pp

"Stal'" Vol VII, No 5

It is difficult to use magnesium metallurgical powder in Martin furnaces, even when it is combined with slag. Berezhnoy, at the Institute of Refractory Materials, has discovered a synthetic metallurgical powder (for example, Bazifrite, tomasite and some

USSR/Metallurgy, Powder (Contd) May 1947
Furnaces, Metallurgical

others). Its production is not being made public. However, does describe repair work done to furnaces.

18T27

BEREZHNOY, A. S.

FA 14T73

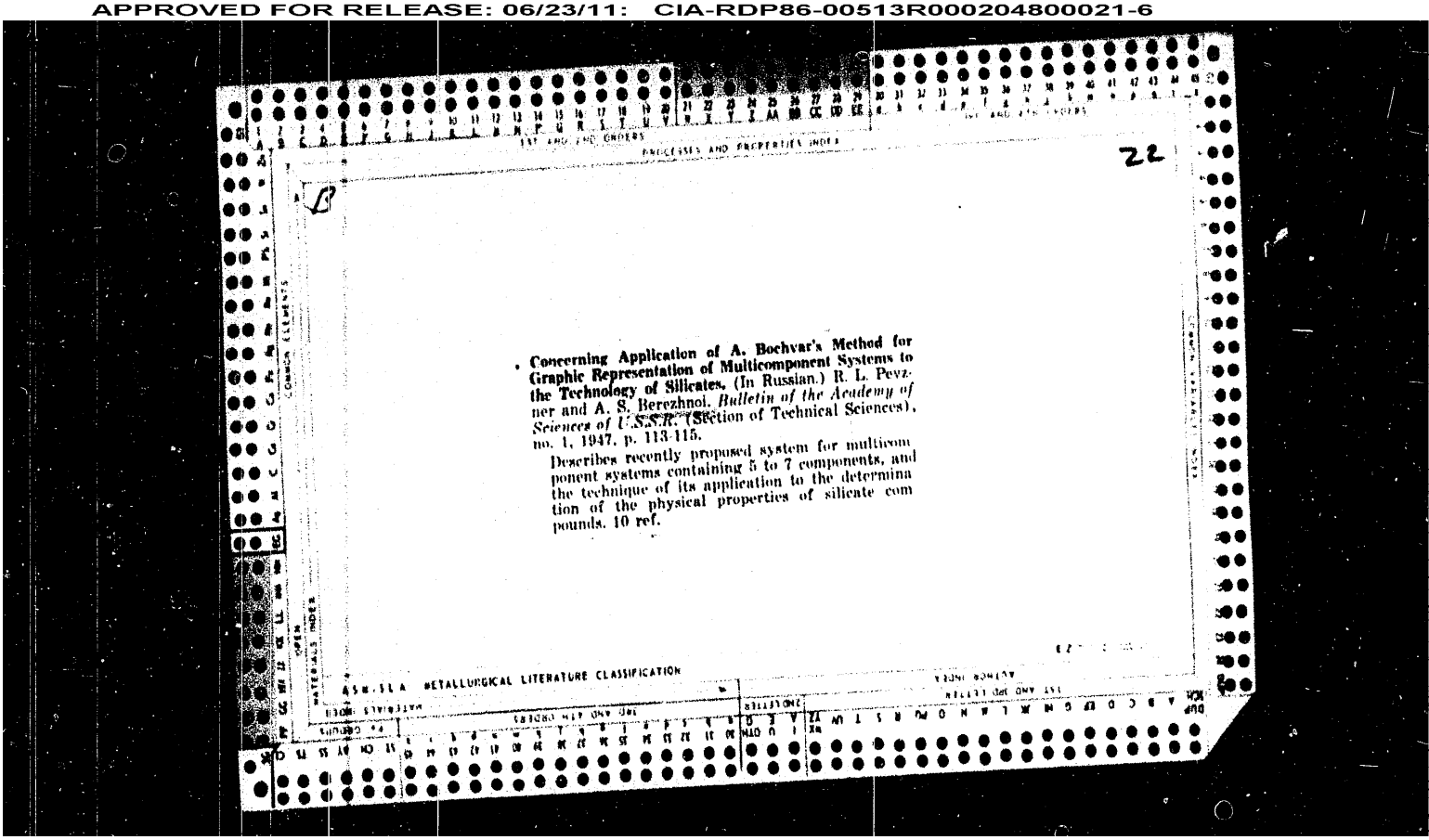
USSR/Fireproofing Jul 1947
Compression

"The Theory of Compressing Fire - resisting Products Out of Nonplastic Matter," A. S. Berezhnoy, 4 pp

"Ogneupory" No 7

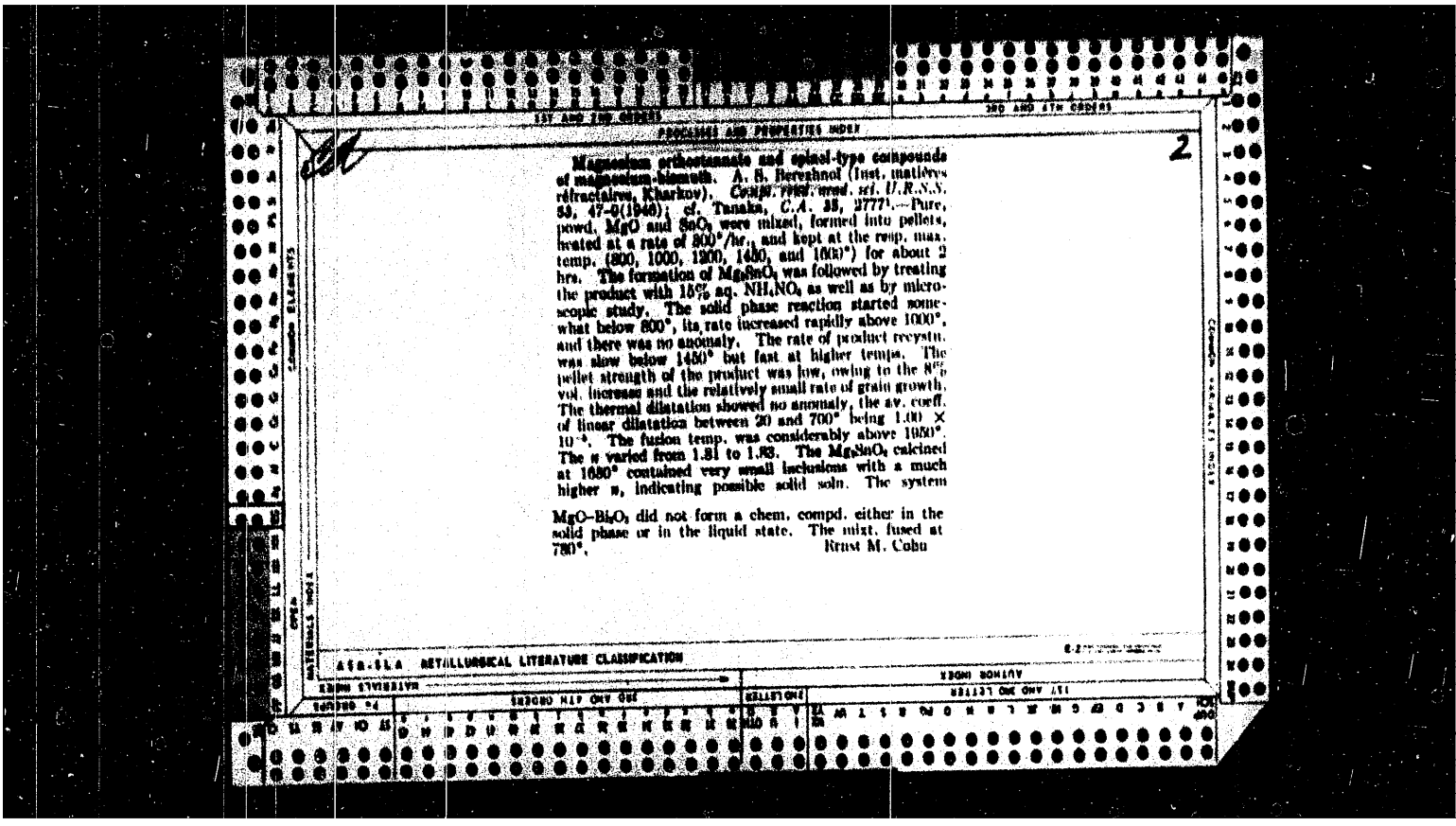
Discusses mathematical formulae to be used in the mechanical and hydraulic exertion of pressure on magnesium bricks. Table and graphs showing relationship of pressure applied to change in thickness of bricks.

14T73



Concerning Application of A. Bochvar's Method for Graphic Representation of Multicomponent Systems to the Technology of Silicates. (In Russian.) R. L. Pevzner and A. S. Berezhnoi. *Bulletin of the Academy of Sciences of U.S.S.R.* (Section of Technical Sciences), no. 1, 1947. p. 113-115.

Describes recently proposed system for multicomponent systems containing 5 to 7 components, and the technique of its application to the determination of the physical properties of silicate compounds. 10 ref.



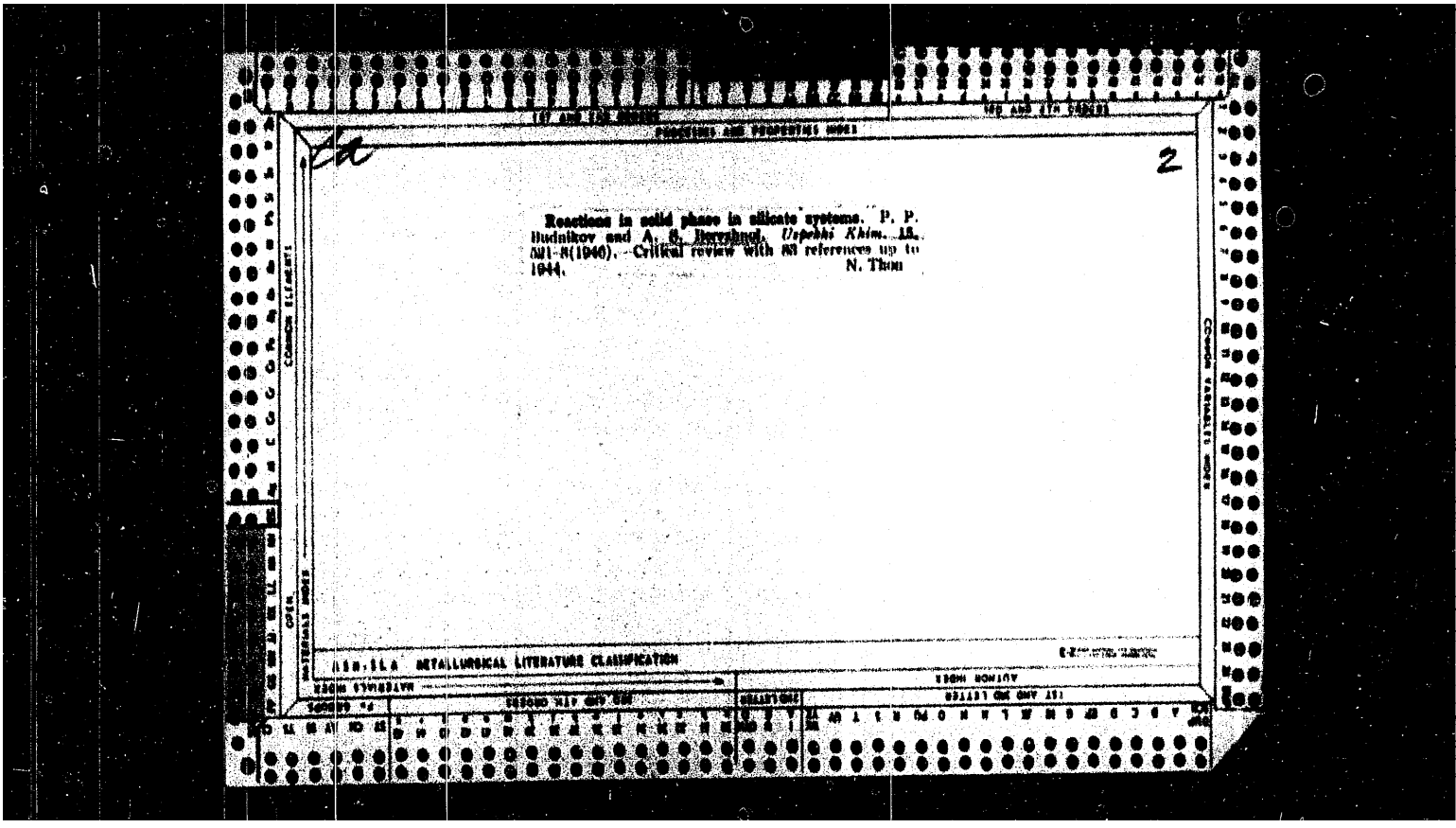
PROCESSES AND PROPERTIES INDEX

2

Magnesium orthostannate and spinel-type compounds of magnesium-bismuth. A. S. Bereshnoi (Inst. matières réfractaires, Kharkov). *Compt. rend. acad. sci. U.R.S.S.* 59, 47–9(1948); cf. Tanaka, *C.A.* 35, 2777⁵.—Pure, powd. MgO and SnO_2 were mixed, formed into pellets, heated at a rate of 300°/hr., and kept at the resp. max. temp. (800, 1000, 1200, 1400, and 1600°) for about 2 hrs. The formation of $MgSnO_3$ was followed by treating the product with 15% aq. NH_4NO_3 as well as by microscopic study. The solid phase reaction started somewhat below 800°, its rate increased rapidly above 1000°, and there was no anomaly. The rate of product recrystn. was slow below 1450° but fast at higher temps. The pellet strength of the product was low, owing to the 8% vol. increase and the relatively small rate of grain growth. The thermal dilatation showed no anomaly, the av. coeff. of linear dilatation between 20 and 700° being 1.00×10^{-6}. The fusion temp. was considerably above 1050°. The n varied from 1.81 to 1.83. The $MgSnO_3$ calcined at 1650° contained very small inclusions with a much higher n, indicating possible solid soln. The system $MgO–Bi_2O_3$ did not form a chem. compd. either in the solid phase or in the liquid state. The mixt. fused at 780°.

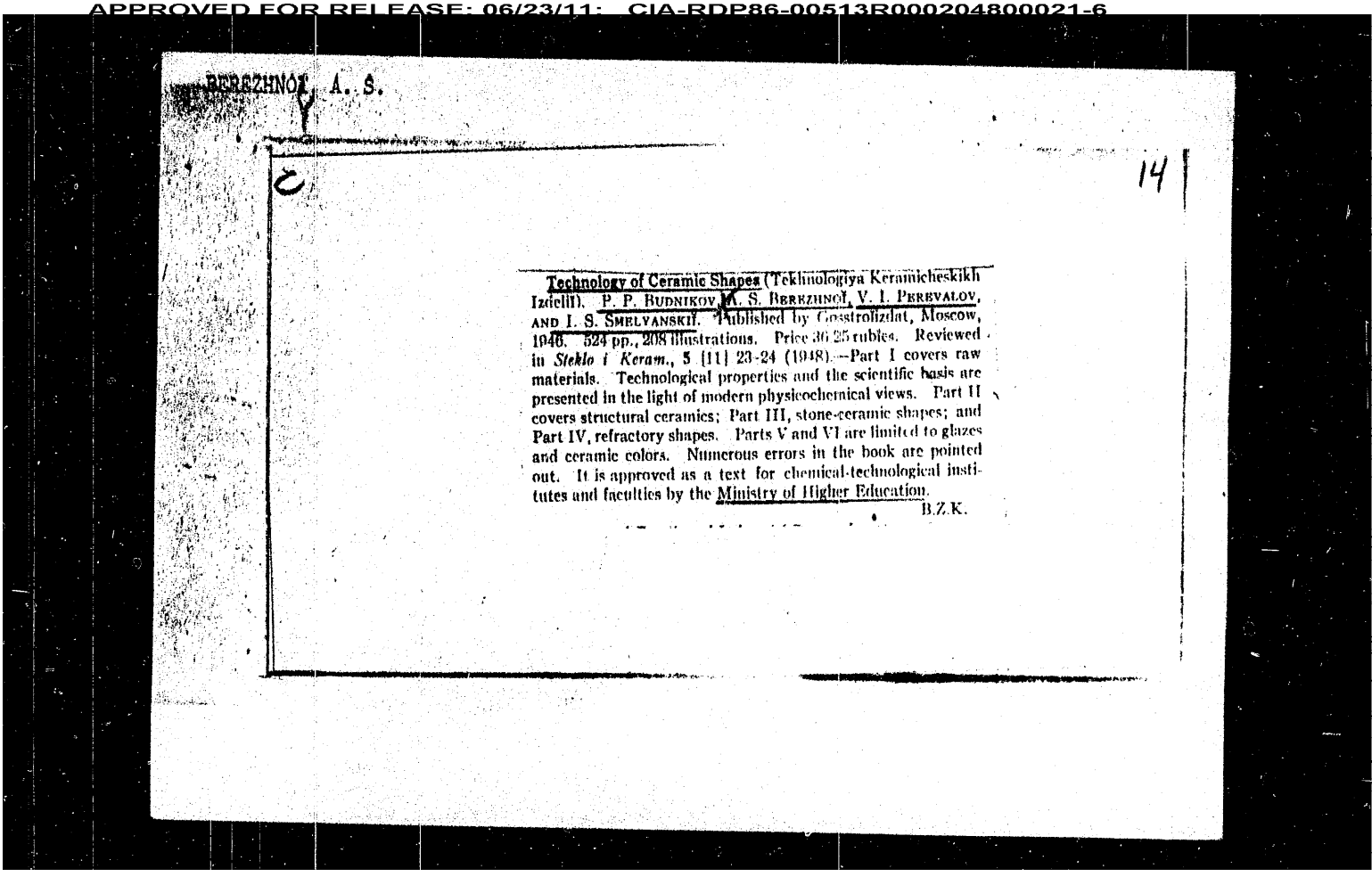
Ernst M. Cohn

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



2

Reactions in solid phase in silicate systems." P. P. Budnikov and A. S. Berezhnoi. *Uspekhi Khim.* 13, 301-8(1944). Critical review with 88 references up to 1944. N. Thon



BEREZHNOI, A. S.

14

Technology of Ceramic Shapes (Tekhnologiya Keramicheskikh Izdelii). P. P. Budnikov, A. S. Berezhnoi, V. I. Perevalov, and I. S. Shelyanskii. Published by Gosstrolizdat, Moscow, 1948. 524 pp., 208 illustrations. Price 36.25 rubles. Reviewed in *Steklo i Keram.*, 5 [11] 23-24 (1948).—Part I covers raw materials. Technological properties and the scientific basis are presented in the light of modern physicochemical views. Part II covers structural ceramics; Part III, stone-ceramic shapes; and Part IV, refractory shapes. Parts V and VI are limited to glazes and ceramic colors. Numerous errors in the book are pointed out. It is approved as a text for chemical-technological institutes and faculties by the Ministry of Higher Education.

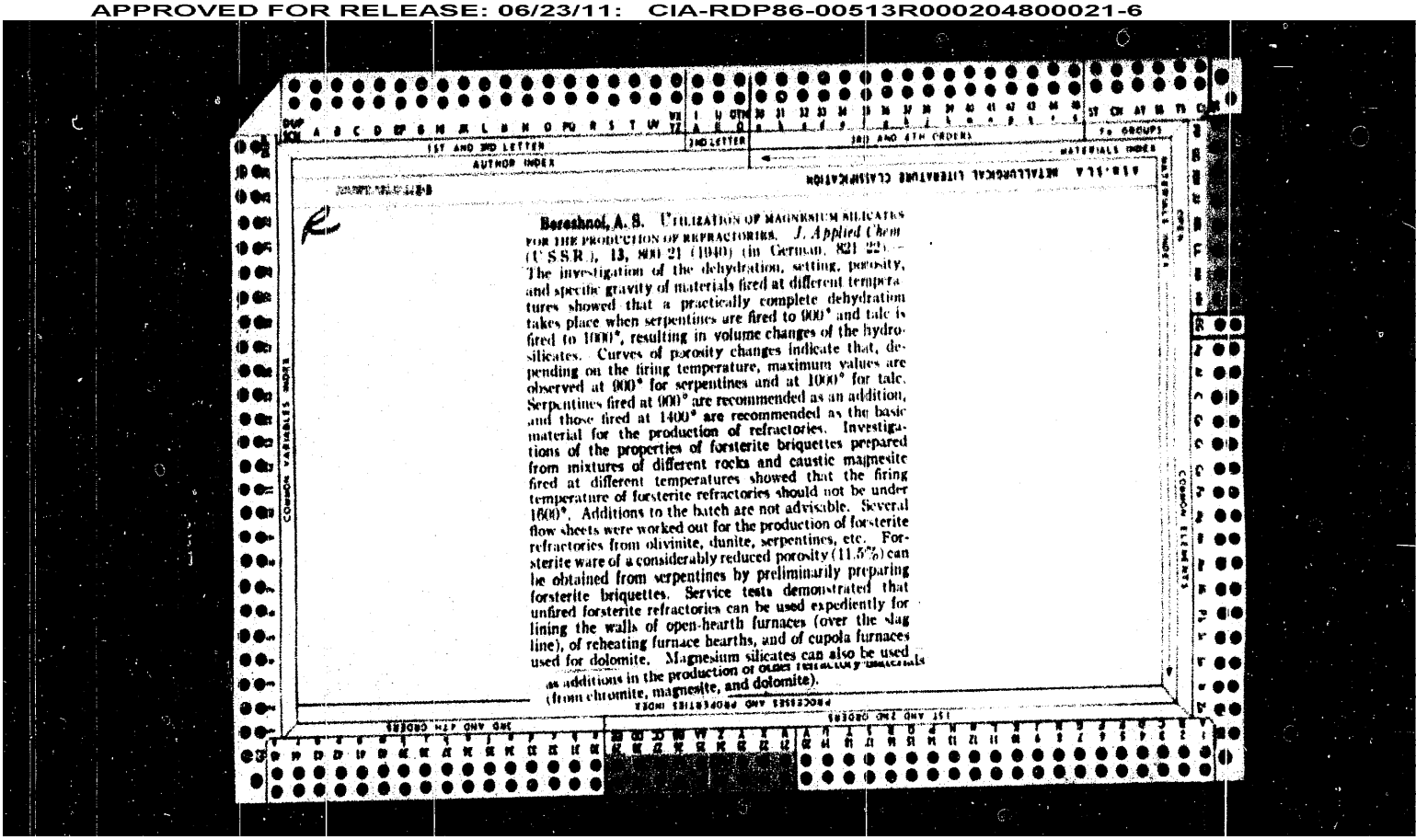
B.Z.K.

A.C.S.

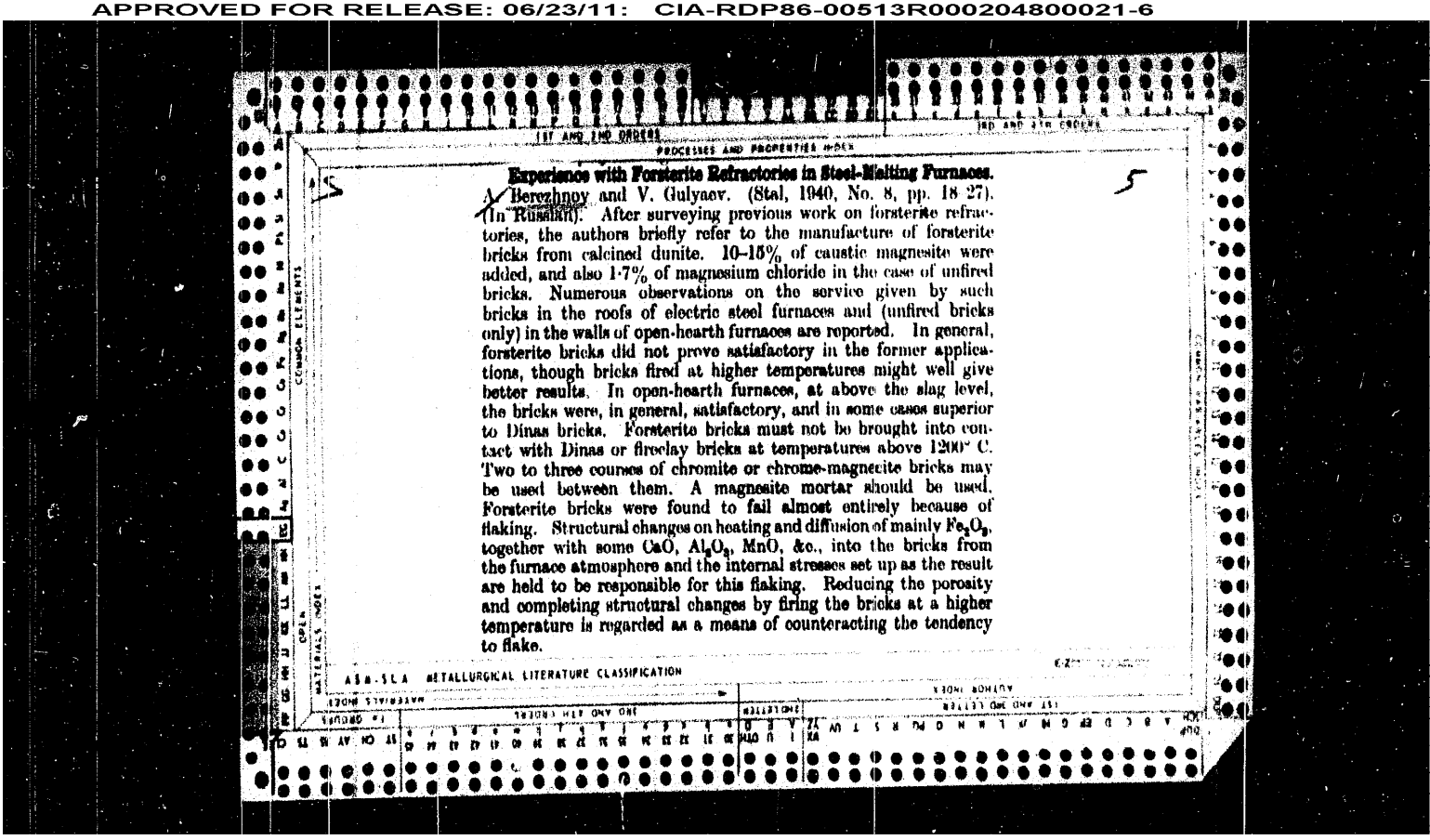
Refractories

Thermostable magnesite refractories with a spinel mortar. A. S. Berezhnoi and V. M. Tsvnkina. *Sbornik Materialov po Voprosu Ogneupornoi Prom.*, **1940**, No. 2, pp. 98-102; *Khim. Referat. Zhur.*, **4** [9] 110-11 (1941). --Results of experiments show the possibility of producing high-quality thermostable refractories from Satkin magnesite. A study of the formation of various spinels at high temperature, primarily through reactions in the solid phase, showed that alumina and chrome spinels are the most suitable. A technological procedure is recommended based on the study of the interdependence between the properties of fired magnesite and the methods of its production. A review of the literature and a description of technological works are included. See "Production. . .," *Ceram. Abs.*, **18** [9] 245 (1939); "Spinel. . ." *ibid.*, **19** [3] 68 (1940). M.Ho

Forsterite refractories. A. S. Ванаимов. *Sbornik Rabot Ukrain. Nauch.-Issledovatel. Inst. Ogneuporov & Kislotouporov*, **1940**, No. 46, pp. 87–116; *Khim. Referat. Zhur.*, **4** [9] 110 (1941).—B gives the results of his experiments on the production of fired and green forsterite refractories from dunite and olivinite. The dunite products were best when fired at 1670° to 1720° for 6 hr. The olivinite were fired at 1600°. Comparing the processes of their preparation and the properties of the products, B. prefers refractories made from olivinite. He also experimented with combined magnesite-forsterite refractories and found them preferable to forsterite refractories, as they fire better and have a higher thermal resistance. Unfired masses are suitable for the walls of open-hearth furnaces. See "Spinel. . .," *Ceram. Abs.*, **19** [3] 68 (1940); "Service. . .," *ibid.*, **20** [6] 147 (1941); "Substitute. . .," *ibid.*, **21** [11] 235 (1942). M.Ho.



Bereshnoi, A. S. UTILIZATION OF MAGNESIUM SILICATES FOR THE PRODUCTION OF REFRACTORIES. *J. Applied Chem* (U.S.S.R.), 13, 800-21 (1940) (in German, 821-22). — The investigation of the dehydration, setting, porosity, and specific gravity of materials fired at different temperatures showed that a practically complete dehydration takes place when serpentines are fired to 900° and talc is fired to 1000°, resulting in volume changes of the hydrosilicates. Curves of porosity changes indicate that, depending on the firing temperature, maximum values are observed at 900° for serpentines and at 1000° for talc. Serpentines fired at 900° are recommended as an addition, and those fired at 1400° are recommended as the basic material for the production of refractories. Investigations of the properties of forsterite briquettes prepared from mixtures of different rocks and caustic magnesite fired at different temperatures showed that the firing temperature of forsterite refractories should not be under 1600°. Additions to the batch are not advisable. Several flow sheets were worked out for the production of forsterite refractories from olivinite, dunite, serpentines, etc. Forsterite ware of a considerably reduced porosity (11.5%) can be obtained from serpentines by preliminarily preparing forsterite briquettes. Service tests demonstrated that unfired forsterite refractories can be used expediently for lining the walls of open-hearth furnaces (over the slag line), of reheating furnace hearths, and of cupola furnaces used for dolomite. Magnesium silicates can also be used as additions in the production of other refractory materials (from chromite, magnesite, and dolomite).

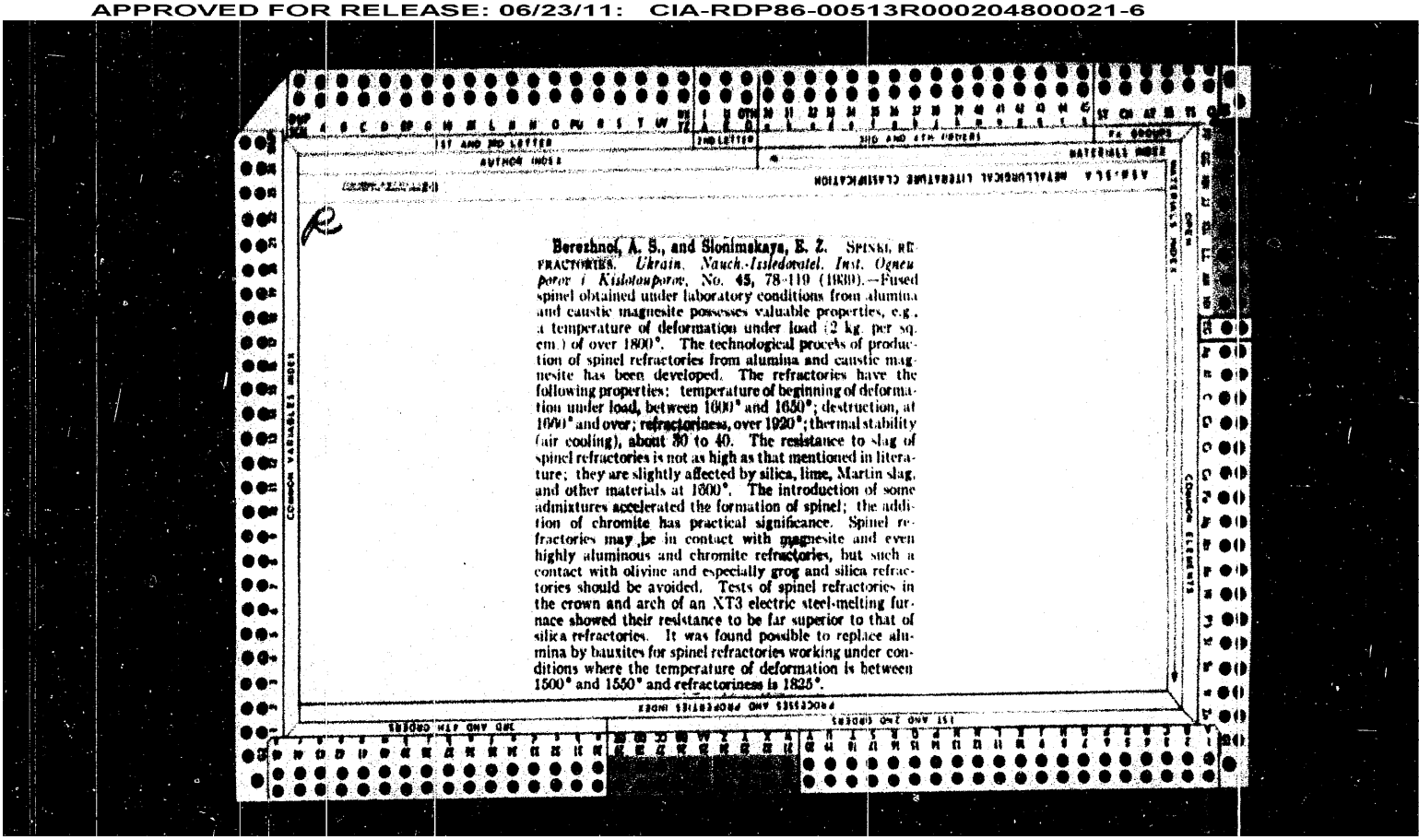


PROCESSES AND PROPERTIES INDEX

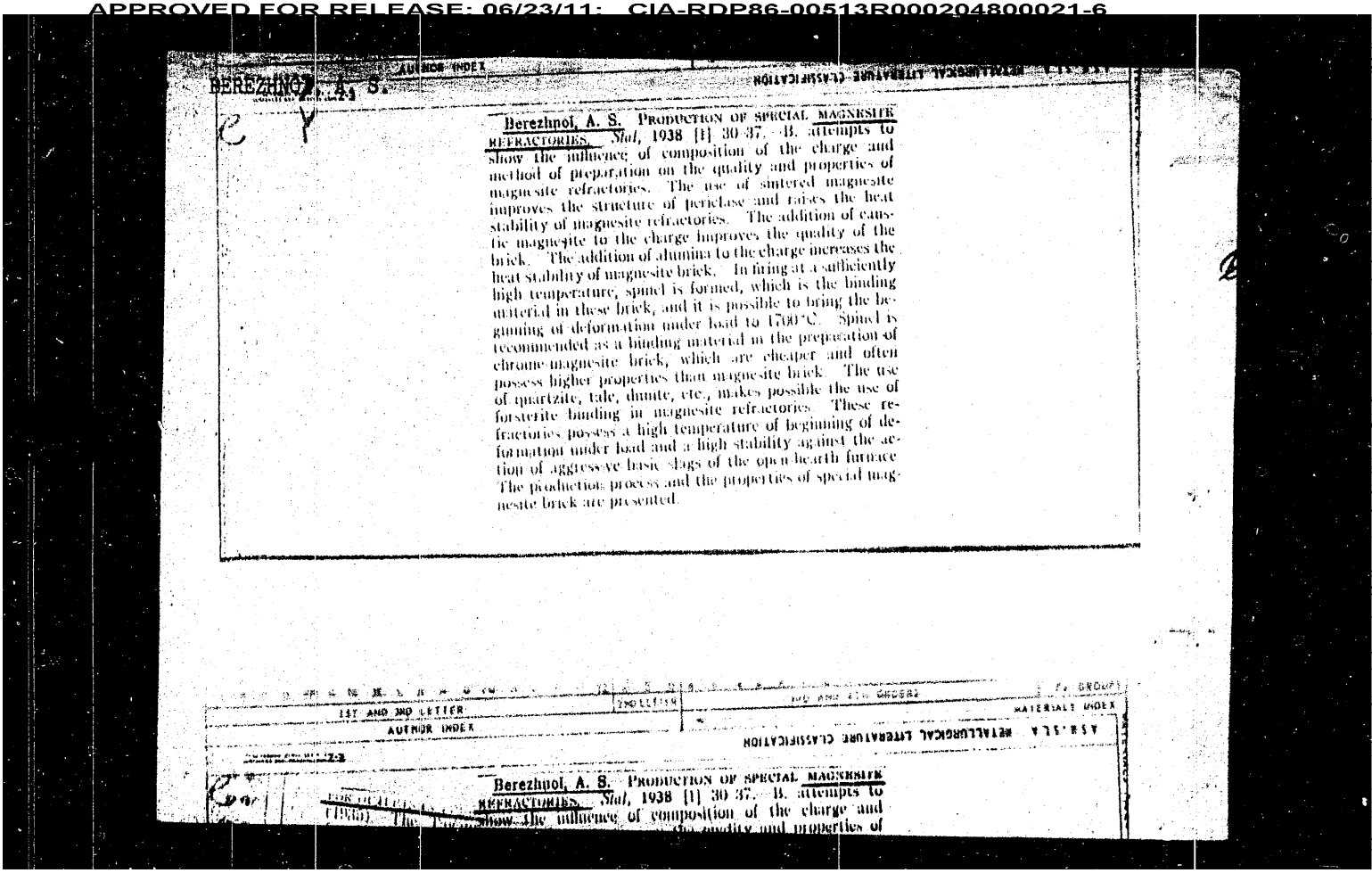
Experience with Forsterite Refractories in Steel-Melting Furnaces.

A. Berezhnoy and V. Gulyaev. (Stal, 1940, No. 8, pp. 18–27). (In Russian). After surveying previous work on forsterite refractories, the authors briefly refer to the manufacture of forsterite bricks from calcined dunite. 10–15% of caustic magnesite were added, and also 1·7% of magnesium chloride in the case of unfired bricks. Numerous observations on the service given by such bricks in the roofs of electric steel furnaces and (unfired bricks only) in the walls of open-hearth furnaces are reported. In general, forsterite bricks did not prove satisfactory in the former applications, though bricks fired at higher temperatures might well give better results. In open-hearth furnaces, at above the slag level, the bricks were, in general, satisfactory, and in some cases superior to Dinas bricks. Forsterite bricks must not be brought into contact with Dinas or fireclay bricks at temperatures above 1200° C. Two to three courses of chromite or chrome-magnesite bricks may be used between them. A magnesite mortar should be used. Forsterite bricks were found to fail almost entirely because of flaking. Structural changes on heating and diffusion of mainly Fe_2O_3, together with some CaO, Al_2O_3, MnO, &c., into the bricks from the furnace atmosphere and the internal stresses set up as the result are held to be responsible for this flaking. Reducing the porosity and completing structural changes by firing the bricks at a higher temperature is regarded as a means of counteracting the tendency to flake.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



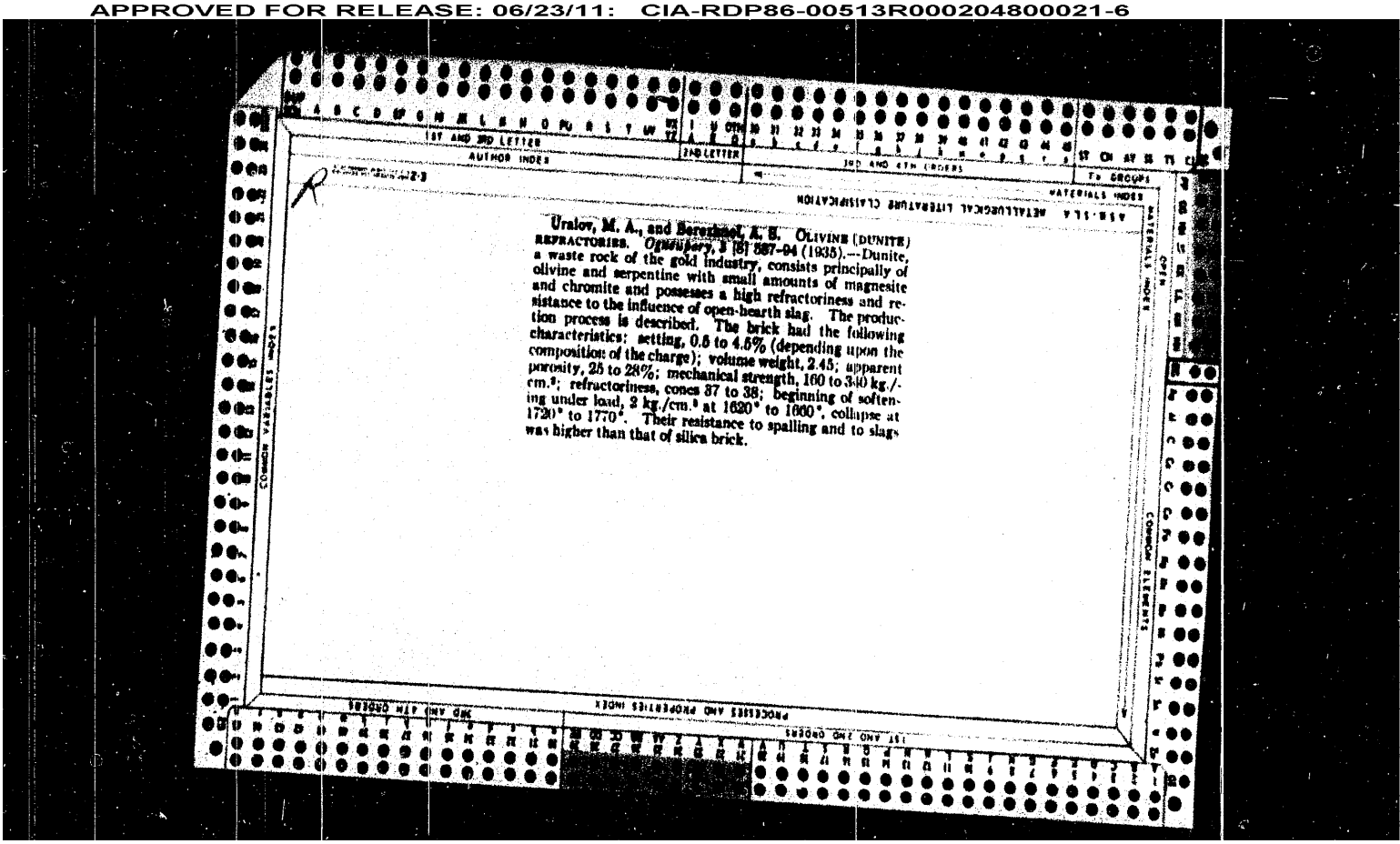
Bereshnoi, A. S., and Slonimskaya, E. Z. SPINEL RE FRACTORIES. *Ukrain. Nauch.-Issledovatel. Inst. Ogneuporov i Kislotauporov*, No. **45**, 78-119 (1939).—Fused spinel obtained under laboratory conditions from alumina and caustic magnesite possesses valuable properties, e.g., a temperature of deformation under load (2 kg. per sq. cm.) of over 1800°. The technological process of production of spinel refractories from alumina and caustic magnesite has been developed. The refractories have the following properties: temperature of beginning of deformation under load, between 1600° and 1650°; destruction, at 1690° and over; refractoriness, over 1920°; thermal stability (air cooling), about 30 to 40. The resistance to slag of spinel refractories is not as high as that mentioned in literature; they are slightly affected by silica, lime, Martin slag, and other materials at 1500°. The introduction of some admixtures accelerated the formation of spinel; the addition of chromite has practical significance. Spinel refractories may be in contact with magnesite and even highly aluminous and chromite refractories, but such a contact with olivine and especially grog and silica refractories should be avoided. Tests of spinel refractories in the crown and arch of an XT3 electric steel-melting furnace showed their resistance to be far superior to that of silica refractories. It was found possible to replace alumina by bauxites for spinel refractories working under conditions where the temperature of deformation is between 1500° and 1550° and refractoriness is 1825°.



BEREZHNOI, A. S.

Berezhnoi, A. S. PRODUCTION OF SPECIAL MAGNESITE REFRACTORIES. *Stal*, 1938 [1] 30-37. B. attempts to show the influence of composition of the charge and method of preparation on the quality and properties of magnesite refractories. The use of sintered magnesite improves the structure of periclase and raises the heat stability of magnesite refractories. The addition of caustic magnesite to the charge improves the quality of the brick. The addition of alumina to the charge increases the heat stability of magnesite brick. In firing at a sufficiently high temperature, spinel is formed, which is the binding material in these brick, and it is possible to bring the beginning of deformation under load to 1700°C. Spinel is recommended as a binding material in the preparation of chrome-magnesite brick, which are cheaper and often possess higher properties than magnesite brick. The use of quartzite, talc, dunite, etc., makes possible the use of forsterite binding in magnesite refractories. These refractories possess a high temperature of beginning of deformation under load and a high stability against the action of aggressive basic slags of the open-hearth furnace. The production process and the properties of special magnesite brick are presented.

Berezhnoi, A. S. PRODUCTION OF SPECIAL MAGNESITE REFRACTORIES. *Stal*, 1938 [1] 30-37. B. attempts to show the influence of composition of the charge and



Uralov, M. A., and Berezhnoi, A. S. OLIVINE (DUNITE) REFRACTORIES. *Ogneupory*, 3 [8] 387–94 (1938).—Dunite, a waste rock of the gold industry, consists principally of olivine and serpentine with small amounts of magnesite and chromite and possesses a high refractoriness and resistance to the influence of open-hearth slag. The production process is described. The brick had the following characteristics: setting, 0.5 to 4.5% (depending upon the composition of the charge); volume weight, 2.45; apparent porosity, 25 to 28%; mechanical strength, 160 to 340 kg./cm.²; refractoriness, cones 37 to 38; beginning of softening under load, 2 kg./cm.² at 1620° to 1660°, collapse at 1720° to 1770°. Their resistance to spalling and to slags was higher than that of silica brick.

BEREZHNOI, A. S.

Frenkel, A. S., and Berezhnoi, A. S. PRODUCTION OF CHROMITE REFRACTORIES. Ognenpory, 3 (6) 449-55 (1935).--Mixtures of chromite with quartzite, clay from different deposits, alumina, soluble glass, soda, lime, magnesite, dolomite, magnesia and quartzite in the proportion of $2MgO:SiO_2$, magnesia and alumina in the proportion of $MgO:Al_2O_3$, natural serpentine, and other materials were investigated as to their refractoriness. Chromite had the following chemical composition: SiO_2 3.40 Al_2O_3 14.75, Cr_2O_3 42.0, FeO 22.92, CaO 0.58, and MgO 14.63%. High-refractory mixtures with quartzite can be obtained with 0 to 15% and 87 to 100% chromite. With 0 to 44% alumina the refractoriness did not fall under cone 37. Soluble glass (20%) and soda lower it to cone 16. With up to 20% CaO, 15% MgO, and 20% dolemite it was over cone 37. With serpentine (over 24%) it falls to cone 18. If clay, kaolin, aluminum oxide and its salts, soluble glass, etc., are used, low-melting glasses and silicates are formed with the magnesia silicates present. A blinding mass of forsterite type was taken, amounting to 20% after firing. The mass had the following granulometric composition: 1 to 2 mm. 6%, 0.5 to 1 mm. 8%, 0.2 to 0.5 mm. 24%, and under 0.2 mm. 62% Samples were pressed at 300 kg./cm.^{2}, fired at 1650° for 6 to 6.3 hr., and cooled for 24 hr. The brick obtained was sintered; the mechanical strength was from 350 to 500 kg./cm.^{2}, water absorption 5.1 to 6.2%, apparent porosity 17.4 to 20.9%, volume porosity 17.4 to 20.9%, volume weight 3.2 to 3.4, specific weight 4.1 to 4.2, refractoriness above cone 39, beginning of deformation under load of 2 kg./cm.^{2} at 1570° to 1595° 2%, and collapse at 1620°.