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Utilizing waste from the aluminum chloride industry for carriers of platinum in the oxidation of sulfur dioxide to sulfur trioxide. I. E. Adadurov, P. P. Budnikov and A. I. Ryabchenkov. *J. Applied Chem.* (U. S. S. R.) 7, 1147-52(1934).—Waste products obtained in the manuf. of $AlCl_3$ from kaolin contain SiO_2 88-96, Al_2O_3 12-14%, Fe_2O_3 traces and CaO traces, while the active SiO_2 amounts to 12.5%. A Pt catalyst pptd. on this substance by the Budnikov method (*C. A.* **27**, 4789) consumed only 0.2% of Pt calcd. on the carrier. The conversion of SO_2 to SO_3 in a gas contg. 6-7.5% SO_2 yielded a 96-7% conversion at 350-475° at a vol. velocity of 54, while at temps. exceeding 475° the vol. velocity can be raised to 73. The catalyst is suitable for a 2-stage conversion by Gereshof-Bayer app. having a throughput (lab.) of 5.2 tons H_2SO_4 per kg. It is stable to steam, is easily reconditioned by blowing with air at 600° and is easily poisoned by As.

A. A. Boehtlingk

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Preparing "semi-acidic" high-grade refractory bricks. P. P. Budnikov. *J. Applied Chem.* (U. S. S. R.) 7, 1153-61(1934).—Quartz-chamotte bricks were prepd. from Ukrainian clay of various origins, and kaolin contg. 40% quartz up to 3 mm., quartz sand and residual mud from Prosyanov kaolin. Refractories were prepd. from mixts. of 20% quartzite (3 mm.), chamotte from briquets (contg. 15-40% quartz) and 30-50% plastic refractory clay and fired at Seger cone 11-12. The products contained: SiO_2 65.98-72.80, Al_2O_3 23.40-29.06, Fe_2O_3 0.87-2.07, TiO_2 0.26-1.02, CaO 0.33-1.40, MgO and residues 1.40%; their refractoriness was cone 31-33; under a load of 2 kg./sq. cm., they began to deform at 1200-1370°, deformation was 4% at 1345-1455°, 10% at 1430-1530°, 40% at 1510-1600°; total pore space was 16.1-28.7%, shrinkage 0.1-0.5%, compressive strength 134-380 kg./sq. cm. The bricks are resistant to the therm. action of coal slag (up to 1400-1450° for one hr., slag compn.: CaO 8.62, Fe_2O_3 17.19, SiO_2 44.85, Al_2O_3 25.99, MgO 1.62 and SO_3 1.18%). Bricks prepared from Chasovaii Yar clay, chamotte from the above clay and quartz breeze are resistant toward the slag in steel molds (standing up to 25 castings). Specifications for the "semi-acidic" quartz-chamotte bricks, and the method for their manuf. are submitted. A. A. Boehtlingk

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Budnikov, P. P., Zhikharevich, S. A., and Lukova, S. D. CHEMICALLY INERT HEAT-REFRACTORY MATERIALS FOR OVENS FOR SODIUM SULFIDE PRODUCTION. *J. Applied Chem.* (U.S.S.R.), 7, 1363-73 (1934).—The brick should contain < 40% Al_2O_3, and should conform with the following specifications: crushing load < 140 kg./sq. cm., heat-refractoriness (1) < cone 32, commencement of deformation under a load of 2 kg./sq. cm. at 1320°, shrinkage on refiring for 1 hr. at 1400° > 0.5%, absorptive capacity for H_2O > 8%. Magnesite and chromite-magnesite brick exhibit unsatisfactory (1).

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BUDNIKOV, P.P.

R

Budnikov, P. P., and Lukova, S. D. CHEMICALLY INERT HEAT REFRACTORY MATERIALS FOR OVENS FOR SODIUM SULPHIDE PRODUCTION. *J. Applied Chem.* (U.S.S.R.), 7, 1564–73 (1934); *J. Soc. Chem. Ind.* (London), 54, 406 (1935).—The brick should contain not < 40% alumina and should conform with the following specification: crushing load not < 140 kg./sq. cm., heat refractoriness not < cone 32, commencement of deformation under a load of 2 kg./sq. cm. at 1230°, shrinkage on refiring for one hour at 1400° not > 0.5%, and absorptive capacity for water not > 8%. Magnesite and chromite-magnesite brick exhibit unsatisfactory heat refractoriness.

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A comparison of fire bricks for rotating furnaces in the production of sulfuric acid and portland cement. P. P. Rudnikov, S. A. Zhikharevich and S. D. Lukova. *J. Chem. Ind.* (Moscow) 1934, No. 8, 30-40.—See *C. A.* 28, 5020[4].
H. M. Leicester

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Chamotte brick from Polagy lime. P. P. Budnikov.
Domes 1934, No. 9, 50 1. S. L. Madorsky

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C

BUDNIKOV, P. P. Refractory clays from the Pologi district. Ukrain. Khem. Zhur., 9, 116-24 (1934).--The chemical composition of many samples are tabulated and the following classification made: (1) highly refractory, containing SiO_2 45 to 50, Al_2O_3 35 to 40%; (2) intermediately refractory, containing SiO_2 50 to 55, Al_2O_3 30 to 35%; (3) refractory, containing SiO_2 55 to 60, Al_2O_3 25 to 30%; (4) low-quality refractory, containing SiO_2 60 to 70, Al_2O_3 18 to 25%; and (5) non-refractory, containing SiO_2 70 to 80, Al_2O_3 14 to 18%.

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PROCESSES AND PROPERTIES

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Slags of blast-furnaces and their investigation with respect to their applicability in the cement industry. P. P. Budnikov and L. Gulinova. *Ukrain. Khim. Zhur.* 9, Wiss.-Tech. Teil 125-42(1934)(in Russian); cf. C. A. 27, 4051.—Different kinds of slags are discussed with respect to their chem. compn. and phys. properties. Since slags are similar in compn. to portland cement, expts. are made in regard to their applicability in the cement industry.

V. D. Karpenko

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Budnikov, P. P. RAZDOROV CLAYS. *Ukrain. Khem Zhur.* 9, 475-78 (1934). -Analytical and technical data are recorded.

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Blast-furnace slags and their applicability in the cement industry. III. P. P. Budnikov and I. Gulimova. *Ukrain. Khem. Zhur.* 9, 479-97(1934)(in Russian); cf. *C. A.* 28, 7400[illegible].—Lab. expts. with slags of different origins, dried at 100-1000° for 30 min., in the production of portland and non-clinker cements showed that the mech. properties of the cements are little affected by the thermal treatment of slags. Chas. Blanc

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Effect of preliminary grinding of quartz sand on the quality of Dinas brick. P. P. Budnikov and N. S. Kassiyan. *Keram. i Steklo* **10**, No. 7, 29-31(1934).—The brick is uniform in structure, dense and of a pale cream color. The isotropic base(glass) is intensively interlaced by felt-like nettings of anisotropic cryst. needles of tridymite with inclusions of grains of Ca and Fe metasilicates. Fissures between the quartz grains are filled with glass. No cristobalite was found. The SiO_2 content is somewhat lowered in some brick. The CaO content is not higher than 3.92% and has no effect on the refractoriness and on the deformation of the brick. The mech. strength of Dinas brick decreases with increased sand. The water absorption and vol. porosity increase with the quantity of sand used. The refractoriness is cone 32 (1710°). The sp. gr. increases with the amt. of sand. Up to 35% sand can be used without lowering the properties of the brick. An addn. of molasses to the mix is necessary.

M. V. Kondoidy

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Budnikov, P. P., Zhikharevich, S. A., and Lukova, S. D.
COMPARISON OF FIREBRICK FOR ROTATING FURNACES IN THE PRODUCTION OF SULFURIC ACID AND PORTLAND CEMENT. *J. Chem. Ind.* (U.S.S.R.), 10, 36-40 (1934). The ovens should be lined with well-fired fire-clay brick (I) containing < 40% SiO_2, and of a porosity of > 8%; the brick should shrink by > 0.5% after refiring for 2 hr. at 1450°. Black Dinas is suggested as a possible substitute for (I).

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BUDNIKOV, P. P.

Budnikov, P. P., and Lukova, S. D. REFRACTORIES. *J. Chem. Ind.* (U.S.S.R.), 11, 36-38 (1934).—A detailed description is given of the linings of rotary ovens used in the manufacture of cement. The authors suggest that the best results are obtained by using refractory linings consisting of fire-clay brick of 8% porosity and about 40% silica content.

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BUDNIKOV, P. P.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Budnikov, P. P. MAGNESIA REFRACTORY MATERIALS

Ref. Leaflets Central Council All-Union Inventors' Soc., 12 [224-228] (1933 issued 1934).—The uses of magnesia refractories are described. Chemical and physical characteristics of magnesite deposits in the U.S.S.R., the U.S.A., and other countries are given. Methods of production are described, with a special reference to the Satka plant in the Ural. B. discusses the mining of magnesite rock, firing of magnesite, preparation of the mass, molding, drying, and firing of the brick. The properties of magnesite brick and claims made for it are given. Magnesia materials produced without subsequent firing and magnesite nozzles for casting steel are described.

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CA

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Residue from the ction of aluminum chloride as a pozzuolanic addition to ortland cement. P. P. Budnikov, *Zement* 23, 749-50(1934).—The residue from the chlorination of kaolin contains 88-90% SiO_2. Much of this SiO_2 is quite active and combines with $Ca(OH)_2$ of portland cement to form the practically insol. $CaO \cdot SiO_2 \cdot 5H_2O$. The result is a definite protection for the cement in mortar and concrete against the action of corrosive solns. H. F. K.

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Budnikov, P. P. DESTRUCTION OF GROG BRICK BY CARBON MONOXIDE. *Novosti Tekhniki*, No. 26, 11 (1934); *Referatkartei Silikatliteratur*, No. 613 (1934). It was found that (1) FeS_2 present in the clay changes into oxide when fired. (2) Iron oxide acts as a catalyzer during the reaction $2CO \rightleftarrows CO_2 + C$ and promotes the course of reaction to the right side; Fe_2O_3 is reduced to FeO. The precipitated carbon deposits in the pores of the brick and destroys them. The iron spots show the beginning of the destruction. (3) The oxidation of CO to CO_2 with the precipitation of C lies at 450 to 500°C. At higher temperatures the equilibrium moves to the left side of the equation and C does not precipitate. (4) With a definite iron content and degree of mullitization, the volume porosity of the brick becomes an important factor in the stability of the products. (5) An addition of small amounts of copper sulfate to the mix increases the resistance of grog brick to the effect of carbon monoxide. It is therefore recommended that (*a*) the iron content of the brick be reduced to 1 or 1.3%; (*b*) the remaining iron be uniformly distributed in the brick; (*c*) the porosity be not over 18% in the brick, and (*d*) the brick be fired between 1300 and 1350° in a reducing atmosphere. The ferrous oxide formed in this case makes the body dense and promotes the formation of mullite. A "protective layer" is formed under these conditions which increases the chemical resistance of the brick.

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B-I-9

Choice of chemically resistant refractory materials for sodium sulphide furnaces. P. P. [illegible] and S. A. Jichanevitsch (Trans. Ceram. Soc., 1934, 33, 368–378).—The suitability of various Russian grogged clay, quartz grog, SiO_2, and "Black Dinas" bricks, and MgO, chromite-MgO, and carbonaceous bricks for use in Na_2S furnaces was tested by filling cavities in 75-cu.m. cubes cut from the bricks with a mixture (I) of powdered Na_2SO_4 and coal (3 : 2 pts. by wt.); after being heated for 1 hr. at 1200° the cubes were cut in two and examined microscopically. The refractoriness of the powdered bricks when mixed with 15% of (I) was also determined. The resistance of grogged bricks to attack by (I) increased as the Al_2O_3 content rose, and was influenced by the burning treatment, structure, homogeneity, d, and the quantity of fluxes. Except for the "Black Dinas," which merit further industrial tests, the SiO_2 bricks showed considerable corrosion in the slagging test, and marked lowering of refractoriness when mixed with (I). MgO and chromite-MgO bricks showed the greatest resistance to attack by (I), the carbonaceous brick also being highly resistant. The min. requirements of a satisfactory refractory are suggested as: $Al_2O_3 < 40\%$, H_2O absorption $> 8\%$, crushing strength < 180 kg. per sq. cm., refractoriness $<$ cone 33 (about 1730°), no deformation under load (2 kg. per sq. cm.) below 1320°, and $> 0{\cdot}5\%$ shrinkage on firing for 1 hr. at 1400°.

A. L. R.

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B-I-9

Ceramic utilization of residues in the manufacture of aluminium chloride from kaolin. P. P. Bu[illegible] and M. J. [illegible] (Keram. Rundsch., 1934, 42, [illegible]; Chem. Zentr., 1934, i, 1[illegible]).—The residue after treating kaolin (I) with CO and Cl_2 (approx. 60% of the (I) used) contains SiO_2 [illegible]—[illegible], Al_2O_3 12—4%, CaO traces. It is suitable for manufacturing whiteware of good quality. H. J. E.

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1935-1939

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Lining for rotary cement kilns. P. P. Budnikov and K. F. Mukhin. Russ. 43,566, June 30, 1935. With dead-burned dolomite is incorporated 4-6% Al_2O_3 + Fe_2O_3 and 0-7% SiO_2.

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Replacement of molasses by sulfite-cellulose lye. P. P. Budnikov and N. S. Kassiyan. *Ogneupory* 3, 98-100 (1935).—Quite satisfactory silica brick can be obtained by using concd. sulfite lye, as is evident from a plant investigation; even greater mech. strength than usual was obtained. The sp. gr. decreased. A proportion of 0.5% of lye should be taken, which can be increased to 0.8-1% if sand is used in the charge. B. B. Stefanovsky

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METALLURGICAL LITERATURE CLASSIFICATION

Budnikov, P. P. GROG REFRACTORIES FOR GLASS FURNACES WITH A HIGH IRON CONTENT. *Огнеупоры*, 3 [4] 251-55 (1935).—The possibility of increasing the chemical resistance of glass-furnace grog refractories by the addition of iron compounds was investigated. It was found that the mullitising addition of up to 40% of iron compounds (as it does not noticeably influence the coloring of the glass), if a sufficient amount of aluminum (not under 30%) is present and if the firing is fulfilled properly (at 1350 to 1380°), leads to an increase of chemical stability of the refractories in respect to the influence of fused glass and the components of the charge. The question can be settled definitely by investigation under plant conditions. Suggestions as to the composition of the mass are given. The refractoriness must not be under P.C.E. 30, the volume porosity not over 25%, and the Al_2O_3 content not under 30%.

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Heat of reaction between kaolin burnt at different temperatures and $Ca(OH)_2$. P. P. Budnikov (Compt. rend. Acad. Sci. U.R.S.S., 1935, 3, 358—360).—The heat evolved when burnt kaolin is added to aq. $Ca(OH)_2$ is a max. when the burning temp. is 800° and becomes zero when this is > 1000°. It is suggested that meta-kaolinite formed below 1000° reacts with $Ca(OH)_2$ giving a Ca aluminosilicate.

R. S.

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BUDNIKOV, P. P.

Budnikov, P.P., and Nirenshtein, D.A. Properties of Magnesite Brick. Ognenpory, 3(6) 437-49 (1935.—The authors analyze the universal literature on the effect of iron oxide in magnesite brick and its influence on deformation under load at high temperatures. Investiations demonstrate that fluxes in magnesite lead to a considerable increase in deformation under load at high temperatures. On account of its catalytic action on the formation of periclase by forming magnesioferrite ($MgO\ Fo_2O_3$), Fe_2O_3 is desirable in small quantities (not more than 2 to 3.5%); the increase of the iron oxide content in mangesites containing natural admixtures, together with an increased content of other fluxes, leads to the formation of a series of compounds ($2MgO\ SiO_2$, $FeO\ SiO_2$, $2FeO\ SiO$, etc.), resulting in considerable increase in deformation. The composition of Satka magnesite (Ural) is MgO 46.2, CaO P.9, Fe_2O_3 1.4, Al_2O_3 0.75, SiO_2 1.P, and CO_2 49.88%. This assures the obtaining of high-grade magnesite brick, possessing a high temperature of deformation (not under 1500 to 1550°, 4% at 1700 to 1710° and higher) and other high characteristics. Its chemical composition varies as follows: MgO)2.) to 93.70, CaO 1.27 to 2.1, SiO_3 1.79 to 2.05 Al_2O_3 0.42 to 0.71, Fe_2O_3 2.16 to 3.09%; refractoriness over 2000° C.[3] Thirteen tables characterizing magnesitic refractories from the most important magnesite deposits are appended.

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Increase of the heat of hydration of cement in concrete. P. P. Budnikov and L. G. Gulinova. *Tsement* 3, No. 11, 36-9(1935).—The heat of hydration of portland cement mixed with water and of unhydrated and hydrated cement in soln. in a mixt. of HCl and HF was detd. with a diphenylmethane calorimeter (Hunwn type). The high accuracy of the method was proved. The heat evolved in 2 days was 22 cal./g. = about 26%; and in 7 days it was 36 cal./g. = about 42% of the total amt. of heat evolved in 28 days. E. E. Stefanowsky

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CA

Heat of reaction between kaolin burnt at different temperatures and $Ca(OH)_2$. P. P. Budnikov. *Compt. rend. acad. sci. U. R. S. S.* [N. S.] 3, 355-9(1935); cf. C. A. 29, 3486[9].—Kaolin (46.71% SiO_2, 38.97% Al_2O_3, 13.4[illegible]% H_2O) was burnt at a variety of temps from 500° to 1[illegible]50° for an hr., and was quickly cooled from the burning temp. After the kaolin was burnt at 500°, 600° and 700° there remained 7.57, 0.65, and 0.13% H_2O, resp. Higher burning temps. removed all traces of H_2O. After being burned, the kaolin was ground, passed through a 100-mesh sieve and allowed to react with an excess of lime water in a *diphenylmethane calorimeter*. Metakaolinite formed by burning kaolin reacts isothermally with lime water. The greatest amt. of heat is evolved by metakaolinite formed at 800°. At temps. between 800° and 1000° there is a decreasing activity. Kaolin burnt above 1000° does not react with lime water. It is probable that a hydrate of Ca aluminosilicate of the zeolite type is formed by the reaction. H. A. Smith

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CA

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PROCESSES AND PROPERTIES INDEX

Rozdorovsk clays. P. P. Budnikov. *Ukrain. Khem. Zhur.* 9, 475-8(1935) (in Russian). Chem. compn. and the phys. and mech. properties of the clays mined in the region are tabulated and described. Chas. Blanc.

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3RD AND 4TH ORDERS

Manufacture of half-acid refractories of high quality. P. P. Budnikov. *Chem. Obsor* 10, 25-7(in English 28) (1935).—Half-acid refractories possess a sufficient heat and chem. resistance to satisfy the requirements of the iron and steel, coke and petroleum industries. They are divided into: (1) silico-clay (from aerial clay), (2) half-acid fire-clay, made from clay contg. fine quartz, and (3) silico fireclay from clay with both chamotte and sand added. In all cases they contain not over 30% Al_2O_3 and at least 65% SiO_2. In refractories for the highest parts of blast-furnace shafts the mech. strength is increased by the addn. of cryst. quartz sandstone. Suitable binding clay contains at least 32% Al_2O_3 and not over 1.5% Fe_2O_3. The firing temp. is not below cone 13. J. Kučera

COMMON ELEMENTS

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BC

B-I-10

Clay-ostrich gypsum cement. P. P. Budnikov and V. K. Guzev (Ukrain. Chem. J., 1935, 10, 118—132). —The cements may be prepared from clay (fired at 700—900°) 30—70, $CaSO_4$ (fired at 600—700°) 20—60, and $Ca(OH)_2$ 10%. R. T.

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B-I-10

Utilization of waste products of preparation of aluminium chloride from kaolin, as filler for acid-resistant cements. P. P. Budnikov and A. B. Kvitnitski (Ukrain. Chem. J., 1935, 10, 266—270).—Satisfactory cement is obtained from waste (containing SiO_2 81, Al_2O_3 15%) 92, Na_2SiF_6 3, graphite 4, S 1, and aq. Na silicate (d 1·34) 77 pts. R. T.

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CM

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The determination of active silica in pozzuolanic materials. Peter P. Budnikov and Larissa G. Gulinova. *Kolloid-Z.* 70, 100-35(1935); *Compt. rend. acad. sci. U. R. S. S.* 4, 404-8(in English 409-11)(1934); cf. *C. A.* 28, 3850[1], 7400[6].—Free, amorphous, finely divided silica has an enhanced reactivity with $Ca(OH)_2$ in the presence of water and plays a special role in the beneficial effect imparted by the addn. of pozzuolanic materials to portland cement. Detn. of the content by the soda method (Kind and Korolow, cf. *C. A.* 28, 1495[7]) often gives contradictory results. Detn. of the heat evolved on mixing colloidal silica, kieselguhr, silica from chem. analysis, sand, etc., with $Ca(OH)_2$ in a diphenylmethane calorimeter or detn. of the change of cond. with time gives a measure of the active silica. Arthur Fleischer

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Ca

Sulfur dioxide. P. P. Budnikov and E. I. Krech. Russ. 47,681, July 31, 1936. Alkali and alk. earth sulfates are chlorinated at about 750-950° in the presence of KCl, NaCl, $MnCl_2$, MnO_2, $NiSO_4$, Fe_2O_3, Fe ore, $MgSO_4$ or SiO_2, together or separately.

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Ca

Refractories. P. P. Budnikov. Russ. 47,032, July 31, 1936. $CaCl_2$ or a mixt. of CaO and $CaCl_2$ is added to the material used in the manuf. of refractories to increase the strength of the finished product.

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The interaction of basic granulated blast-furnace slag with water, calcium sulfate and burned dolomite. P. P. Budnikov. *Tsement* 4, 2, 24-7(1936); cf. P. P. Budnikov and L. G. Gulinova, *Ukrain. Khem. Zhur.* 9, 275-302 (1934); *C. A.* 29, 6013[8]. The results are given of microscopical investigations of the reaction of basic granulated blast-furnace slag with anhydrite obtained from gypsum burned at 600°, dolomite burned at 900° and dolomite dust, with natural anhydrite, with dolomite burned at 900° and with dolomite dust. Four microphotographs are appended. E. E. Stefanowsky

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Utilization of waste from the production of alumina. P. P. Budnikov and V. K. Gusev. *Tsement* 4, No. 4, 22-7(1938).—Waste obtained from the production of alumina from bauxite can be used to produce a hydraulic binding material by burning it at 700° with consequent grinding to the standard fineness of portland cement. Its neg. property consists in its early hardening and an elevated hydration temperature. It can be also used as an addn. (2-2.5%) to increase the mech. strength of portland cement; (2%) to increase the hydration heat of portland cement; (10%) to increase the mech. strength of clinkerless cement; to accelerate the binding up of portland, slag portland and clinkerless cement; as a catalyst in the production of anhydrite cement; in the latter case it is to be dried at 120° or, better, burnt at 800°. The chemical analysis of the waste used showed: SiO_2 8.25%; Al_2O_3 10.42%; Fe_2O_3 2.82%; CaO 42.42%; MgO 0.22%; SO_3 1.20%; ignition loss 28.27%; fineness of grind: 0.8% remained on a screen of 900 mesh/sq. cm.; 9.8% on a screen of 4900 mesh/sq. cm. F. F. Stefanowsky

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Heat of reaction of cements. P. P. Budnikov and Larisa G. Gulinova. *Inst. chem. gén. ann. secteur anal. physi.-chim.* (U. S. S. R.) 8, 357-72(1936); cf. *C. A.* 30, 4294[1]. — The heat liberated in the process of setting and hardening of hydraulic and air cements, with and without the addn. of pozzuolanic substances, was detd. in the Bunsen isothermic calorimeter by substituting diphenylmethane, m. 24.6°, for water. The materials tested include portland cement, CaO (from marble at 1200°), dolomite heated at 900°, magnesite heated at 1700°, $CaSO_4$ heated at 100-1200°, etc. The heats of hydration are tabulated and graphed. $CaSO_4$ heated at 200° liberates the max. heat of hydration. Increasing ignition temp. decreases gradually the hydration heat. $CaSO_4$ ignited at 750° is incapable of hydration. When heated above 750° $CaSO_4$ is partially dissocd. into CaO and SO_3 and recovers its capacity for hydration. $CaSO_4$ ignited at 700° gives a cement with the best mech. properties. The addn. of $NaHSO_4$ (0.8%) greatly catalyzes the process of setting and hardening of cements.

Chas. Blanc

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Influence of phosphoric acid upon clays. P. P. Budnikov, M. I. Nekrich and A. B. Kvitnitskii. *J. Applied Chem.* (U.S.S.R.) 9, 988-93 (in German 993-4) (1936).—The evolution of heat during the mixing of kaolin or clay with H_3PO_4 shows the possibility of a chem. reaction with the formation of complex phosphates with silicates and aluminates, which are more stable in water and acids than clays. The preliminary treatment of clays with hot water (80°) increases their stability in H_3PO_4, H_2SO_4 and HCl. In general, a preliminary heating of clays increases their stability, probably, by increasing the activity of compds. composing kaolin nuclei. Exptl. data are discussed and details of expt. are given. Fourteen references.

A. A. Podgorny

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BC

Evolution of sulphur dioxide and trioxide from calcium sulphate treated with chlorine in presence of a catalyst. P. P. Budnikov and E. I. Kretsch (J. Appl. Chem. Russ., 1935, 9, 995—1009). —Decomp. of $CaSO_4$ in presence of Cl_2 commences at 800—850° in absence, and at 700—750° in presence, of NaCl, Na_2SO_4, or SiO_2. The activity of catalysts at 900—950° falls in the order $NiSO_4 > CuSO_4 > MnCl_2 > MnO_2 > MgSO_4 > Fe_2O_3 > KCl$. Decomp. commences at 400—500° for 4 : 1 C-$CaSO_4$ mixtures, and is completed after 1 hr. at 700°. Addition of steam to the Cl_2 has no effect on the reaction. Max. velocity of decomp. is found for 1 : 4 mol. $CaSO_4$-SiO_2 mixtures, the best effect being given by amorphous SiO_2.

R. T.

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B-I-9

Corrosion by chlorine of different modifications of silica at high temperatures. P. P. Budnikov and E. I. Kretsch (J. Appl. Chem. Russ., 1938, 9, 1225—1229).—The reactivity of different varieties of SiO_2 with Cl_2 in presence of C at 1100—1150° rises in the order: sand < cristobalite < rock crystal < fused quartz < SiO_2 gel < amorphous SiO_2. In absence of C all modifications of SiO_2 begin to react with Cl_2 at 900°. R. T.

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B-I-8

REDUCTION OF CALCIUM SULPHATE SUSPENSIONS.
P. P. Budnikov and I. E. Kretsch (J. Appl. Chem. Russ., 1936, 9, 1929-1936). A mixture of finely-powdered $CaSO_4$ + C is poured in a steady stream down a tube heated at 800 - 1200°; % reduction ∝ temp., relative (C), and xoncn. of mixture in the reaction space, and inversely ∝ the diameter of the particles. R. T.

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Reduction of calcium sulfate in a suspension. P. P. Budnikov and E. I. Krech. *J. Applied Chem.* (U. S. S. R.) 9, 1929-36(in English 1930)(1936).—The existing methods of prepg. CaS are reviewed. To avoid a decrease of the output of CaS, due to a prolonged contact with $CaSO_4$, reduction in suspension is suggested. A rise of a temp., an increase of the amt. of reducing agent and of the concn. of pptg. particles in the reduction zone, and a decrease of size of the pptg. particles increases output of CaS. Thirty literature and four patent references. A. A. P.

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Influence of grain size and of various salts upon portland cement. V. P. Budnikov and L. O. Gulinova. *J. Applied Chem.* (U. S. S. R.) 9, 1037–50(in English 1050) (1936).—Addn. of $CaCl_2$, $AlCl_3$, dolomite burned at 700°, and waste obtained in the production of alumina from bauxite up to 1 2% increases the mechanical strength and the heat of hydration, and reduces the setting period. These addns. are recommended for winter construction work because of their higher heat of hydration. Na_4SiF_6 has little effect upon the mechanical strength but reduces the setting period and the heat of hydration of the cement. $BaCl_2$, Na_2CO_3, $Ca(OH)_2$ and NaOH are not recommended as addns. to cement because they decrease its mechanical strength. Fifty references. A. A. P.

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Determination of alumina by means of 8-hydroxyquinoline. P. F. Rusanov and S. S. Shukovskaja (J. Appl. Chem. Russ., 1936, 9, 2079—2087).—Methods for determination of Al in bauxite, clay, and earthenware are discussed. R. T.

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Budnikov, P. P., and Bobrovnik, D. P. DEHYDRATION OF KAOLINE AND CHASOV-YAR CLAY. *Ukrain. Khem. Zhur.*, 11 [1] 41-55 (1936).—Prosyanaya and Turbovo kaolins and Chasov-Yar clay are anchimonomineral formations. The kaolins do not give up chemically bound water until about 500°C.; Chasov-Yar clay begins to give it up in the interval 400 to 500°. The dehydration process at 500° approximates $d\,C_o/dt = CK$, where C_o = weight of the sample, C = residue after the reaction in the given interval of time, t, and K = the constant of dehydration. The constants of different kaolins are not equal on account of their different mechanical constitution and the presence of admixtures. Constants for temperatures over 500° were not found, because the chemically bound water evolves in the first 10 min. It can be said that both water molecules bound in kaolin are similar as to their chemical bond and that the dehydration process proceeds as a monomolecular reaction.

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B-I-10

Influence of different modifications of gypsum on slag Portland cement. P. P. Budnikov and V. K. Gusev (Ukrain. Chem. J., 1936, 11, 195—208).—Addition of $CaSO_4$, and to a smaller degree of gypsum, to slag Portland cement improves its mechanical strength and resistance to corrosion, and accelerates hardening. In cement mixes low in Al_2O_3 setting is retarded by addition of gypsum, whilst in Al_2O_3-rich cements it is hastened. R. T.

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ca

Effect of burning temperature and various admixtures upon the rate of slacking of lime. P. P. Budnikov and L. G. Gulimova. *Ukrain. Khem. Zhur.* 11, 275-82(1936); cf. *C.A.* 31, 2341.—Expts. carried out with the aid of a diphenylmethane calorimeter and summarized in 7 tables and 2 graphs show that heat is evolved at the highest rate in slacking of lime, made from marble or chalk burnt at 1100°. Addn. of 1% Al, alkali or alk. earth salts markedly accelerates the slacking of lime; the addn. of $CaCl_2$ is regarded as of practical importance in the manuf. of silicate or lime-clay brick. J. G. Tolpin

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Effect of heating hydraulic cements on their mechanical properties and linear dimensions. P. P. Budnikov and D. Z. Il'in. *Tsement* 5, No. 7, 18-24(1937).—The crushing strength of portland, slag portland and clinkerless cements begins to decrease after heating to 200-300°, but at 500° it still remains higher than the initial strength. The tensile strength of all cements investigated decreases considerably after heating to 500°. Alumina cements obtained by the method of sintering undergo a greater decrease in crushing and tensile strength than do other cements investigated. The cements increase in vol. up to 100-200° and decrease beyond this. Greatest vol. decrease is shown by alumina cements, lowest by clinkerless cements. E. E. S.

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Frothed slag from the blast furnace of the South metallurgical plants. P. P. Budnikov and D. Z. Il'in. *Stroitel. Material.* 1937, No. 7, 40-42.—A slag contg. SiO_2 34.4, FeO 1.22, Al_2O_3 11.8, MnO 1.12, CaO 42.9, S 2.60 and MgO 3.45% was poured at 1350-1400° into a pit in a layer 40 cm. thick. Water was added and the thickness increased 30-40 cm. The lower layer, 40 cm. thick, was dense and well crystallized. The middle layer was semivitrified, semicrystalline and highly porous. The upper layer of 30 cm. had a well-frothed, spongy, vitrified structure with big pores. E. E. Stefanowsky

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17-1

Crystals of $CaSO_4.5D_2O$ and $CaSO_4.2D_2O$. P. P. BUDNIKOV and L. B. PALATNIK (J. Phys. Chem. Russ., 1937, 10, 719—724).—The X-ray patterns of $CaSO_4.5D_2O$ and $CaSO_4.5H_2O$, and of $CaSO_4.2D_2O$ and $CaSO_4.2H_2O$, are identical. $CaSO_4.2D_2O$ loses water at 107° more rapidly than $CaSO_4.2H_2O$.

J. J. B.

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(1)

Connexion between temperature of ignition of dolomite and amount of heat evolved when water is added to the product. P. P. Bubnikov and L. G. Gulinova (J. Appl. Chem. Russ., 1937, 10, 797—806).—The heat of reaction of H_2O with burnt dolomite rises abruptly when the temp. of ignition rises from 700° to 850°, corresponding with conversion of $MgCO_3$ into MgO; a second rise occurs at 1000°, due to production of CaO. An abrupt fall in heat of reaction takes place at 1300°, and a practically non-reactive product is obtained at 1500°. R. T.

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A rapid method for the determination of silica in blast furnace slags by means of ammonium chloride. P. P. Budnikov and S. S. Zhukovskaya. *J. Applied Chem.* (U. S. S. R.) 10, 1509-5(in German 1565) (1937).—Mix 0.5 g. sample of slag, portland cement or clinker with cryst. 0.5 g. NH_4Cl and treat with 5 cc. of HCl (d. 1.19), warm on the water bath for 20 min., keeping the beaker always covered with a watch glass, and filter, taking care to transfer it completely to a filter paper and to drain all HCl without diluting with water. Transfer the ppt. remaining on the walls of the beaker to the filter paper by washing with hot water and wash the total ppt. with small portions of hot water until the wash water is free from Cl. Dry the ppt. and filter, ash in a Pt or a porcelain crucible, ignite at 1000° to const. wt., cool in a desiccator and weigh. Calc. the percentage of SiO_2 from $(a - b)$ × 100/0.5, where a is the crucible wt. with the ppt., b that of the crucible only and 0.5 is the wt. of sample. Three references. A. A. Podgornyi

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BUDNIKOV, P. P.

Budnikov, P. P. REFRACTORY MORTARS. *Ukrain. Khim. Zhur.*, 12, 33 (1937).—It proposes the production of a highly refractory mortar by mixing 5% sodium silicate into sodium fluosilicate.

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Preparation of chlorine-resistant and refractory lute. P. P. Budnikov and K. I. Krech. *Ukrain. Khim. Zhur.* 12, 91-4(1937).—Lutes were prepd. from andesite (I), Na_2SiF_6 (II), and 40% Bd. sul. glass. The compn. of I was: SiO_2 60.30, Al_2O_3 18.60, Fe_2O_3 2.95, CaO 5.25, MgO 4.10, MnO 0.08 and alkalies 5.90%. The lutes were tested in the system: fused mixt. and vapor of KCl-$MgCl_2$ (20%) gaseous HCl—Cl_2—H_2O—air. Best results were obtained with a lute contg. 30% of I, 5% of II, and sul. glass (60–70% by wt. of dry mixt. of I and II). The lute is to be tried under plant conditions. B. Z. Kamich

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Budnikov, P. P. REFRACTORY COMPOSITIONS. *Ukrain. Khem. Zhur.*, 12, 95-100 (1937).—Details are given of the preparation of high grade refractory compositions, and brick from quartz and fire clay.

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Budnikov, P. P., and Zhikharevich, S. A. PREPARATION OF HEAT-REFRACTORY MATERIALS ON THE BASIS OF FIRE CLAY AND QUARTZ. *Ukrain. Khem. Zhur.*, 12, 95-103 (1937).—Preparation of grog-quartz refractory brick is described.

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BUDNIKOV, P.P.

BC

Action of chlorine on certain calcium silicates. P. P. BUDNIKOV and E. I. KRETSCH (Ukrain. Chem. J., 1937, 12, 183—189).—Equal amounts of $CaCl_2$ are produced in a given time by chlorination at 18—750° of CaO,SiO_2, $2CaO,SiO_2$ (both prepared from CaO and SiO_2 at 1450°), or CaO, whence it is concluded that CaO is present in the free state in all cases. R. T.

Chem. A-1

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Ca

Reaction in solid state between silica and lime, and between burned or unburned kaolin and lime. P. P. Budnikov and D. P. Bokrovnik. *Ukrain. Khem. Zhur.* 12, 190-6(in English 196) (1937).—A review of the literature and exptl. evidence lead to a conclusion that dicalcium silicate is formed in these reactions. Twenty-one references. J. G. Tolpin

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A-1

Formation and crystallization of colloidal calcium sulphate. P. P. Budnikov and D. F. Bobrovnik (*Kolloid. Zhurn.*, 1938, 4, 449—456).—$CaSO_4$ sol has been prepared by interaction of $CaCl_2$ and H_2SO_4 in MeOH solution. The crystallisation of $CaSO_4,2H_2O$ on addition of H_2O to the sol was followed by η measurements, parallel measurements being made with $CaSO_4,\frac{1}{2}H_2O$ suspensions. The nature of the crystals produced was examined microscopically. Inorg. acids promote crystal growth. An aq. extract of peat accelerates the sol-gel change and the formation of crystal nuclei, but retards the growth of these nuclei, so that the final product consists largely of crystals of sub-microscopic size. R. C.

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Rapid systematic analysis of portland cement and clinker and blast-furnace slags. P. P. Budnikov and S. S. Zhukovskaya. *Zavodskaya Lab.* 7, 1124-33(1938). Two procedures with variations for systematic analysis of cement and slag, involving known volumetric, colorimetric and iodometric methods, are described in detail. Ten references. Chas. Blanc

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CA

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White clay-gypsum cement. P. P. Budnikov and V. K. Guzev. *Kommunalnoe Stroitelstvo* 1938, No. 9, 8-14; *Ceram. Abstracts* (in *J. Am. Ceram. Soc.*) 19, No. 4, 86.—A cheap cement is obtained by joint grinding of clay or kaolin calcined at about 800°, $CaSO_4$ (natural or obtained from $CaSO_4.2H_2O$ by calcining at 600°), and CaO. In the setting of this cement, anhydrite hydrates under the influence of $Ca(OH)_2$; $CaSO_4$ interacts with calcined clay whose Al_2O_3 and SiO_2 are in an active state (the activity was detd. in a diphenylmethane calorimeter) and forms Ca hydrosulfoaluminate and Ca hydroaluminosilicate of the compn. $2SiO_2.Al_2O_3.CaO.10H_2O$. Ca hydrosilicate and hydroaluminate are also formed. The reaction velocity depends on the Al_2O_3 content of the clay, the temp. and time of calcining, the ratio of the different components of the cement, and the gypsum modifications. C. L. B.

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R

Budnikov, P. P., and Nukrich, M. I. SILICATE MATERIALS IN THE CHEMICAL INDUSTRY. J. Applied Chem. (U.S.S.R.) 11, 151-75 (1938). A review with about 200 references is given.

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Vladimir Avgustovich Kind. P. P. Budnikov. *J. Applied Chem.* (U. S. S. R.) 11, 807-10(1938).—Obituary with portrait.
A. A. Podgornv

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Decomposition of gypsum in mixture with carbonaceous pyrite. P. P. Budnikov and I. I. Rivlin. *J. Applied Chem.* (U.S.S.R.) 11, 1129-40 (in English, 1130) (1938). The process of burning of various mixts. of anhyd. $CaSO_4$ and carbonaceous pyrite, with and without admixts. of sand, clay and kaolin, was investigated. Sufficient decompn. can be produced in the mixt. contg. 30% of anhydrite. The sulfide S content in the solid residue is not great. The optimum temp. for decompn. of anhydrite by burning to form SO_2 is 1000-1100°. The addn. of quartz increased the decompn. of $CaSO_4$ and greatly decreased caking and slag formation. The effect of other admixts. was less. The briquetting of the charge decreased $CaSO_4$ decompn. The evolution of elementary S during burning is explained by the great velocity of the thermal decompn. of FeS_2 and by some side reactions. About 35 references.

A. A. Podgorny

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The influence of admixtures on decarbonation of dolomite. P. P. Budnikov and D. P. Bobrovnik. *J. Applied Chem.* (U.S.S.R.) 11, 1151–4 (in English, 1154) (1938).—The effect of the addn. of NaCl and $CaSO_4.2H_2O$ on the decarbonation of dolomite was investigated at 600 and 700°. The greatest amt. of CO_2 was evolved in the first 10 min. Addn. of NaCl or gypsum increased the evolution of CO_2 from Volga dolomite by 4.5 times at 600° and by 2 times at 700°. Addn. of NaCl to Nikitovka dolomite increased evolution of CO_2 by 1.8 times at 600° and about 2 times at 700°; the effect of gypsum was much smaller. Volga dolomite contained SiO_2 0.44, Al_2O_3 traces, Fe_2O_3 0.14 and SO_3 0.5%; Nikitovka dolomite, SiO_2 2.42, Al_2O_3 0.23, Fe_2O_3 0.95% and SO_3 none.

A. A. Podgorny

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Cement from anhydrite and sulfated kaolin and clays

P. P. Budnikov, K. P. Mukhin and D. Z. Il'in. *Stroitel. Materialy* 1938, No. 12, 30-9. High-grade cement of the type of Keene's cement can be obtained by grinding together anhydrite obtained by burning gypsum at about 600-700° with kaolin or clay contg. not under 15% Al_2O_3 burned at 750° and subsequently treated with H_2SO_4 of 60-70% (about 38 kg. H_2SO_4 to 100 kg. clay). An increase of the content of sulfated kaolin (3-7%) leads to an increase of strength of the cement. The addn. of Na_2SO_4 (0.3-0.7%) does not increase the strength to a considerable extent; if the amt. of this addn. surpasses 0.5%, efflorescences are formed on the surface of samples. The cement obtained is white and dense and is highly resistant to the effect of water. It is concluded that the effect of sulfated kaolin and clay on anhydrite consists in the formation of unstable complex hydrates on the surface of anhydrite grains under the influence of acid, sulfate, aluminum, iron and other salts in presence of water. These hydrates decompose afterward and the liberated surface of $CaSO_4$ acquires the faculty to hydrate. The silica of sulfated clay, being in a finely disperse condition, contributes to the densification of anhydrite cement.

K. K. Stefanowsky

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Dolomite linings of the sintering zone of cement-burning kilns. P. P. Budnikov, K. F. Mukhin and D. O. Nirenshtein. *Ukrain. Khem. Zhur.* 13, 115-29(in English 129-31)(1938).—Natural dolomites contg. 6-8% SiO_2 and not less than 2% $Fe_2O_3 + Al_2O_3$ may be used as a raw material for dolomite linings. The dolomites should be burned with a fuel contg. not more than 10% ash and at a temp. not less than 1500°. The most stable dolomite was of the following compn: SiO_2 0.64, $Al_2O_3 + Fe_2O_3$ 0.08, Mn_3O_4 0.2, CaO 27.98 and MgO 17.5%. Shaft kilns can be lined with rammed dolomite and dolomite brick.

B. Z. Kamich

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Budnikov, P. P., Mukhin, K. F., and Nirenshtein, D. O.
DOLOMITE LINING OF THE SINTERING ZONE OF CEMENT KILNS. *Ukrain Khem. Zhur.*, 13, 115-31 (1938). -Only natural dolomites containing 6 to 9% silica and not less than 2% sesquioxides can be used as raw material; these alone are sufficiently refractory and stable in respect to hydration by moisture from atmospheric air and crumbling when cooled under 700°C. Stable dolomite can be prepared artificially by mixing dolomite waste with an appropriate proportion of admixtures (SiO_2 + Al_2O_3 + Fe_2O_3). With firing temperature of dolomites must not be under 1500°C., this being the lowest temperature insuring a minimum porosity of the dolomite.

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Budnikov, P. P., Feigin, M. S., Susidko, I. L., and Yudin, E. I. PRODUCTION OF HIGHLY REFRACTORY CHROMO-DOLOMITE MATERIAL. *Metallurg*, 1939, 14 30

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Budnikov, P. P. FURNACE REFRACTORIES. J Applied Chem (USSR), 1939, 307.—Details are given of the various types of refractory compositions used in furnaces where sodium sulfite is made. Forsterite brick were much more resistant to corrosion than the fire-clay brick. It suggests that this is probably due to the formation of periclase in the forsterite type of brick.

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Methods of determining slag resistance of refractories. P. P. Budnikov. *Trudy Kharkov. Khim.-Tekhnol. Inst. S. M. Kirova* 1, 34-49(in English, 49-50)(1939).—To det. slag resistance of grog, magnesite and chrome-magnesite brick a hole, made in the sample brick, is filled with basic metallurgical slag. Two C electrodes are introduced into the hole. The slag resistance of different refractories was also detd. by measuring the fusing tempt. of mixts. of refractory and slag, or with other chem. agents. Results are tabulated. M. V. Condoide

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B-I-10

Kutejnikovo and Kamenets-Podolski tripoli for lime-tripoli cement and concrete. P. P. Budnikov and M. G. Shiavskaja (Trudy Charkov Chim. Tech. Inst., 1939, No. 1, 89—97).—The crushing strength of cements and concretes made from these minerals are recorded. R. T.

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Use of tripoli from Kutelnikovo and Kamenets-Podol'sk in the Ukraine for mortar and concrete P. P. Budnikov and M. G. Sanyavskaya. *Trudy Khar'kov. Khim.-Tekhnol. Inst. S. M. Kirova* 1, 89-90(in English, 90-7)(1939).—Kutelnikovo tripoli had 21.70% active silica and the Kamenets-Podol'sk type had 17.04%. Specimens prepd. from lime-tripoli mortars with slag had a higher mech. strength than those prepd. from lime-tripoli mortars with sand. The mech. strength of the specimens acquired after one month may be reached by steaming for 24 hrs. at 70°. The compns. of the tripoli, specimens and slag are listed. B. Z. Kamich

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CA

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Highly refractory chrome-dolomite material and concrete. P. P. Budnikov and M. S. Felgin. *Trudy Khar'kov. Khim.-Tekhnol. Inst. im. S. M. Kirova* No. 2, 91-9 (1939).—A stable dolomite clinker was obtained by firing a mixt. of dolomite, chromite and quartzite for 1 hr. at 1500-1580°. The chromite was added in amts. of 3, 5, 10, 15, 18 and 20% of the decarbonated dolomite and the quartzite was added in amts. of 5-8%. Only those clinkers contg. 18-20% chromite were found to be stable. The clinker had SiO_2 10.98, Al_2O_3 2.31, Fe_2O_3 0.23, CaO 37.07, MgO 35.00, Cr_2O_3 0.62% and melted above 1900°. The clinker formed cements having good hydraulic properties and high mech. strength. Bricks were formed from clinker prepd. from 74% dolomite, 20% chromite and 6% quartzite. In lab. tests the bricks showed: m. p. above 1900°, compression strength of 60, 93, 175 and 270 kg./sq. cm. after 1, 4, 7 and 28 days, resp., start of deformation at 1450° and destruction at 1500° under a load of 2 kg./sq. cm., water absorption 5.5-6.5%, vol. porosity 15-17%. Com. tests showed that these bricks can be used instead of chrome-magnesite bricks in steel plants. B. Z. Kamsch

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Colorimetric method of controlling the quality of metallurgical magnesite. P. P. Budnikov and L. G. Gulinova. *Byull. Vsesoyuz. Khim. Obshchestva* **1939**, No. 7, 14-16; *Ceram. Abstracts* (in *J. Am. Ceram. Soc.*) **19**, No. 4, 92.—The relation between the calcining temp. (up to 1700°) of dolomite and CaO and the amt. of heat evolved when interacting with H_2O and the relation between the calcining temp. of magnesite and the heat evolved during the dissolving of the components was investigated. A diphenylmethane Bunsen type calorimeter was used. The quality (activity) of the product and the temp. to which the material of the given compn. had been calcined can be detd. by this method from the thermal effect of the hydration of CaO and calcined dolomite or that of the dissolving of magnesite in HCl. C. L. B.

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Mineral resources of the Crimea. P. P. Budnikov and A. A. Alent'ev. *Priroda* 1939, No. 9, 81-5; *Referat. Zhur.* 1940, No. 4, 72.—Sivash lake water, by a complex treatment, can give Br, MgO, HCl, $MgCl_2$, etc. W. R. Henn

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S 5

The Production of Highly Refractory Chrome-Dolomite Material and Tests Made on it under Service Conditions. P. P. Budnikov, M. S. Feygin, I. I. Susidko and E. I. Yudin. (Metallurg, 1939, No. 10–11, pp. 54–59). (In Russian). Following some remarks regarding the difficulties attaching to the production of stable dolomite-base refractories, the authors describe the production of a refractory dolomite clinker stabilised by additions of quartzite and chrome ore. The analyses of the raw material used were :

	Dolomite.	Chrome Ore.	Quartzite.
Silica %	3·41	5·89	96·32
Alumina %	0·73	16·79	0·59
Ferric oxide %	1·05	...	1·17
Ferrous oxide %	...	20·29	...
Lime %	29·48	1·92	0·38
Magnesia %	20·22	14·84	0·29
Chromic oxide %	...	40·32	...
Alkalis %	...	...	0·36
Sulphur trioxide %	...	...	0·43
Loss on ignition %	45·13	0·02	0·31

The amount of chrome ore was varied between 3% and 20% (calculated on the basis of the burnt dolomite) and that of the quartzite was 5% or more. The finely ground mixture was moistened with water (8%) and pressed into cylindrical briquettes which were fired at a maximum temperature of 1560–1580° C. for 1 hr. It was found that an addition of at least 18–20% of chrome ore was necessary to obtain a stable product. A specimen con-

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taining silica 10·98%, ferric oxide 2·31%, lime 37·97%, magnesia 35·96% and chromic oxide 6·62%, could resist temperatures of more than 1900° C. Under a load of 2 kg. per sq. cm. deformation set in at 1520°, and was complete at 1610° C. The finely ground product was found to possess cementing and hydraulic properties. For bricks, the chrome-dolomite clinker was bonded with chromo-dolomite cement and mixed with 8% of water. The air-dried bricks had the following properties: Refractoriness 1900° C.; mechanical strength (resistance to crushing) after one day 60 kg. per sq. cm., after four days 98 kg. per sq. cm., after seven days 175 kg. per sq. cm., and after twenty-eight days 270 kg. per sq. cm.; deformation under a load of 2 kg. per sq. cm. set in at 1450° C. and the brick disintegrated at 1590° C.; absorption of water 5·5–6·5; porosity 15–17% by volume; bulk density 2·64–2·67; 0·8% shrinkage on heating for 1 hr. at 1400° C. A measure of its resistance to spalling was the fact that it could be heated to 850° C. and cooled in air twenty-eight times without failure. Tests under service conditions in an electric furnace and in the side and end walls of an open-hearth furnace are described. These demonstrated the excellent behaviour of the air-dried bricks, which, however, proved unsuitable for lining casting ladles.

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BUDNIKOV, P. P.

Ivan Evgrafovich Adadurov. P. P. Budnikov. J. Applied Chem. (U. S. S. R.) 12, 118-19(1939). Obituary with portrait and bibliography. A. A. Podgorny

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BUDNIKOV, P. P.

USSR/USA METALLURGICAL LITERATURE CLASSIFICATION

Budnikov, P. P., and Shmukler, K. M. CHEMICALLY RESISTANT REFRACTORY MATERIAL FOR KILNS PRODUCING SODIUM SULFIDE. *J. Applied Chem.* (U.S.S.R.), 12, 307-70 (1939).—The authors investigated grog brick prepared in the usual way and a forsterite brick obtained from a batch consisting of dunite calcined at 1450°, caustic magnesite, and molasses, mixed with a 12.5°Bé. solution of $MgCl_2$ and calcined at 1500° to 1600°. Forsterite brick possesses a high resistance to Na_2S melts and should be regarded as the best refractory material for kilns producing this chemical.

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The chemically stable refractory material for the furnaces used in the preparation of sodium sulfite. P. P. Budnikov and K. M. Shmukler. *J. Applied Chem* (U. S. S. R.) 12, 367-70(1939). Fire-clay bricks prepd. from the Chasov-Yar clay No. 6 (SiO_2 58.32, Al_2O_3 35.44, Fe_2O_3 1.37, TiO 0.65, CaO 0.82 and MgO 0.87%) treated with the Na_2SO_4-charcoal (3:2) mixt. at 1200° for 2 hrs. were destroyed. Under the same conditions, the forsterite bricks prepd. from dunite calcined at 1450° (MgO 44.21, SiO_2 33.69, Al_2O_3 0.14, Fe_2O_3 + FeO 7.65, Cr_2O_3 0.58, MnO 0.14, CaO 0.17, alkali 0.28 and H_2O 12.66%) 100, quartzite 2, $Mg(OH)_2$ 12 and molasses 0.8 parts by wt. and burned at 1500-1600° were not affected. This is attributed to the chem. stability of the Mg_2SiO_4 and periclase formed. A. A. Podgorny

	Type	Material	% of production	Raw material	Seger cone	M. P. °C.	Seger cone	Fuing Temp. °C
oxidic	1.	silica	about 30	quartzite	32-34	1700-1750	14-18	1400-1500
	2.	fireclay	about 60	clay	26-35	1600-1770	10-16	1300-1450
	3.	mullite		cyanite	above 36	above 1800	14-18	1400-1500
	4.	high alumina		bauxite-corundum	above 36	above 1800	14-18	1400-1500
	5.	magnesite		magnesite	above 42	above 2000	10-20	1450-1550
	6.	chromite	about 10	chrome ores	above 42	above 2000	14-18	1400-1500
	7.	chrome-magnesite		magnesite and chrome ore	above 42	above 2000	16-26	1450-1600
	8.	spinel		$RO.R_2O_3$	above 36	above 1800	above 16	above 1450
	9.	zirconium		zirconium ore	above 42	above 2000	above 14	above 1400
others	10.	carbon		coke	above 42	above 2000		approx. 1000
	11.	carbides (SiC)		carborundum	above 42	above 2000	12-16	1350-1450
	12	nitrides, etc.			above 42	above 2000		

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Acid-resisting concrete and its use. P. P. Budnikov and M. N. Skiyarov. *J. Chem. Ind.* (U. S. S. R.) 16, No. 1, 23-5(1939). H. M. Leicester

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A.C.S.

Cement

Anhydrous cement. P. P. Budnikov and K. F. Mukhin. Russ. 56,832, April 30, 1940. [illegible] 3.09.—Gypsum calcined at 600° to 700°C. is ground together with a kaolin, clay, or similar material. The kaolin, etc., is previously calcined at a temperature at which its nucleus decomposes, then washed with H_2SO_4, and dried. M.Ho.

Cement manufacture. Mikael Vogel-Jorgensen (F. L. Smith & Co.). Can. 413,107, June 8, 1943 (May 13, 1941). G.M.H.

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2C

Aluminous cement. P. P. Budnikov and I. G. Gol'denberg. Russ. 57,563, July 31, 1940. The heat of hardening is lowered by addn. of a silicic acid sol to aluminous cement prepd. in the usual manner.

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P. P. Budnikov. Russ. 57,850, Aug. 31, 1940. Anhydrite or burned gypsum is ground with shale ashes or shale slag. Cf. *C. A.* 38, 5056[4].

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R

Budnikov, P. P., and Bobrovnik, D. P. REACTION IN THE SOLID STATE BETWEEN SiO_2 AND CaO, KAOLIN, ITS FIRING PRODUCTS, AND CaO. *Trudy Inst. Geol. Nauk, Akad. Nauk S.S.S.R. Mineral.-Geokhim. Ser. Petrograf. ser.*, 1940, 223-29.—The formation of calcium silicates from CaO and SiO_2 at 500°, 600°, and 700° was investigated. With the increase in temperature, the amount of CaO reacting with SiO_2 increases, and with increase of grain size, it decreases. In samples fired at 1000°C, water-soluble and insoluble calcium silicates were formed, the amount of free CaO decreasing compared with that of samples fired at a lower temperature. At 600° more α-calcium orthosilicate (C_2S) and less C_3S_2 and CS form; at 1000° the formation of Cs and C_3S_2 predominates, and only an inconsiderable amount of α C_2S is found. It follows that the reaction in the solid phase proceeds according to the Ostwald law by leaps over intermediary unstable compounds ($2CaO \cdot SiO_2$ and $3CaO \cdot 2SiO_2$) to the final $CaSiO_3$. The rate of reaction increases with the temperature and with increase of activity of SiO_2 and degree of dispersion of CaO. These findings have been applied to the firing of silica brick.

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Budnikov, P. P., and Endovitskii, V. I. LININGS FOR THE SINTERING ZONE OF ROTARY KILNS IN THE CEMENT INDUSTRY. *Repts. Acad. Sci. Ukr. S.S.R.*, 1940 [4] 35-40 (in Russian, 40-41; in German, 42-46). To determine the most appropriate lining materials, the following materials were tested: dolomite brick, grog kaolin of increased density with 41.5% Al_2O_3, high-alumina brick containing 50.73% Al_2O_3, and forsterite brick. The latter was prepared from a batch of Ural dunite fused at 1450° with additions of quartzite, caustic magnesite, and molasses and mixed with a $MgCl_2$ solution. The brick was fired at 1600°. The properties were as follows: refractoriness P.C.E. 37 to 38, mechanical strength 160 to 300 kg./cm.², deformation under load beginning at 1620° to 1660° and ending at 1720° to 1770°, volume weight 2.45 and volume porosity 25.28%. The brick consists of forsterite, a small amount of fayalite and periclase. It reacts slightly with Portland cement clinker at 1500°.

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Scientific research work in chemical universities. P. P. Budnikov. *Sovet. Nauka* 1949, No. 5, 140-5.—Data on scientific research work at the Chemical-Technological Institute in Kharkov are given. Problems desirable to be worked on are indicated and the application of the completed scientific research works to the industries is discussed.

S. Machelson

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ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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Refractories

Ukrainian kaolins as raw material for the aluminum industry. P. P. Budnikov and A. N. Synorv. *Vestnik Inzhenerov i Tekh.*, 1940, No. 5, pp. 310-11; *Chem. Abs.*, 34, 7547 (1940).—The practical value of the sulfite method for preparing Al_2O_3 from Ukrainian kaolins is described. The kaolin is fired at 800° to 900° and treated with SO_2 at 50° to 60° and 7 atm. At 80° to 100°, most of the Al sulfite (containing 29% Al_2O_3) precipitates out from the solution. Th precipitate is ignited, and the SO_2 is recovered. The Al_2O_3 is then purified by the Bayer method. In another case the kaolin is fired and then treated with 25% HNO_3 in an autoclave at 150°, and the $Al(NO_3)_3$ is crystallized. The latter is decomposed by heating to 400° to 500°, or the $Al(NO_3)_3$ solution is neutralized with NH_3. In the first modification the HNO_3 is recovered, while in the second NH_4NO_3 is obtained. The use of HNO_3, however, involves corrosion problems.

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Investigation of the Maryev siliceous sandstones
P. P. Budnikov and D. P. Bobrovnik. *J. Geol. Acad. Sci. Ukrain. S. S. S. R.* 7, Nos. 1-2, 29-44(1940)(in Ukrainian). Chem. analyses show 95.9% SiO_2, up to 4.1% Al_2O_3 and 0.45% Fe_2O_3. F. H. Rathmann

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1ST AND 3RD LETTER — AUTHOR INDEX — 2ND LETTER — 3RD AND 4TH ORDERS — MATERIALS INDEX — METALLURGICAL LITERATURE CLASSIFICATION

Budnikov, P. P. RESULTS ATTAINED IN FIELD OF BASIC REFRACTORIES FOR METALLURGY. *Vestn. Akad. Nauk Ukr. R.S.R.*, 1940 [10] 44-54.—Refractories made from dolomites, chrome-dolomites, magnesites, chrome-magnesites, chromites, forsterites, spinels, Siemens-st, zircons, and materials with high clay contents are discussed.

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B-I-4

Volumetric determination of silica in basic slag, Portland cement, and clinker, by means of 8-hydroxyquinoline. N. P. Rudnikov and S. S. Shukovskaya (J. Appl. Chem. Russ., 1940, 13, 311—313).—Analytical methods are described.

R. T.

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Improving of refractory properties of kaolin and clay. P. P. Budnikov and A. N. Sysoev. *J. Applied Chem.* (U. S. S. R.) 13, 719-22 (in English, 722) (1940).—Kaolin and clays were mixed with an excess of coal (without addn. of metallic Fe) and heated to 1700°. At 1450°, the reaction $Al_2O_3.2SiO_2 + 6C = Al_2O_3 + 2SiC + 4CO$ took place. The reaction was complete at 1700°. The product was mixed with 10% plastic refractory clay and the mixt. was then calcined. The m. p. of the refractory material obtained was 1880°; it deformed under load near to its m. p.

A. A. Podgorny

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A POSSIBLE METHOD OF INCREASING THE REFRACTORY PROPERTIES OF KAOLIN AND CLAYS.—P. P. Budnikov and A. N. Sysoev (*J. Appl. Chem. Russ.*, **13**, 722, 1940). The authors describe an investigation on the production of a corundum-silicon carbide refractory from fireclay. The clay is mixed with an excess of coal; no metallic iron is included. On firing such a mixture, the silica is reduced and combines with the excess carbon according to the idealised equation: $Al_2O_3.2SiO_2 + 6C \rightarrow Al_2O_3 + 2SiC + 4CO$. It has been found that the reaction begins at 1,450° C., and is complete at about 1,700° C. The product of this reaction was mixed with 10% of a plastic fireclay and fired. Bricks made in this way had a softening point of 1,880° C.; the refractoriness-under-load was not greatly removed from the softening temperature.

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Budnikov, P. P. Utilization of magnesium silicates for the production of refractory brick. *J. Applied Chem.* (U.S.S.R.), 13, 707-09 (1940).—The possibility of using Mg silicates for the manufacture of refractory brick is pointed out

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BUDNIKOV, P. P.

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Reactions in the solid state. P. P. Budnikov and A. S. Bereshnoi (*J. Appl. Chem. Russ.*, 1940, 13, 1277—1287).—A review of recent German publications.

J. J. B.

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Rapidly hardening bauxite-gypsum cement. P. P. Budnikov and V. K. Guzev. *J. Applied Chem.* (U. S. S. R.) 13, 1583-5(in German, 1585)(1940).—Cement prepd. by mixing and calcining bauxite, chalk and gypsum in certain proportions, had a considerable mech. strength, and stability against (aggressive) water. Setting was very rapid. Storage of this cement for one year increased the setting time and slightly decreased the mech. strength.

A. A. Podgorny

COMMON ELEMENTS

OPER.

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Fast-hardening bauxite-gypsum cement. P. P. Budnikov and V. K. Guzev. *Zhur. Priklad. Khim.*, 13 [11] 1582-85 (1940); *Khim. Referat. Zhur.*, 4 [6] 98 (1941). —The authors experimented with a fast-hardening cement composed of bauxite, chalk, and gypsum. The calcination was done at 1280° to 1300°. $CaO \cdot Al_2O_3$, $3CaO \cdot 5Al_2O_3$, $CaSO_4$, and slight amounts of $2CaO \cdot SiO_2$ were found in the product petrographically. This cement has good strength properties and is resistant to corroding waters. The cement was quick setting, but this property diminished after 1 year's storage. See "Activation . . . ," *Ceram. Abs.*, 22 [1] 4 (1943); "White . . . ," *ibid.*, 19 [4] 86 (1940). M Ho.

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Determination of metallic iron and ferrous and ferric oxides in blast-furnace slag and alumina cement. P. P. Budnikov and A. N. Mel'nikova. *J. Applied Chem.* (U. S. S. R.) 13, 1732-8(in German, 1738-9)(1940). Metallic Fe can be detd. by the $CuSO_4$ method (a basic soln. should be neutralized with H_2SO_4). Total Fe can be detd. by the iodometric or the Knop method. The Knop method gave satisfactory results for detg. ferrous Fe in slags from which metallic Fe was removed with a magnet. Bibliography. A. A. Podgorny

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A.F.S. Cement

Activation of acid blast-furnace slags and the production of clinkerless cement. P. P. Budnikov and V. K. Gozzev. *Compt. Rend. Acad. Sci. U.R.S.S.*, 29 [8] 712-14 (1940); *Khim. Referat. Zhur.*, 4 [3] 88 (1941).—Experiments showed that a clinkerless cement with considerable mechanical strength can be produced from acid blast-furnace slags using, as activator, $CaSO_4$ combined with CaO and MgO. Good results can also be obtained by using, as activator, $CaSO_4$ combined with dolomite, decarbonized $MgCO_3$, or decarbonized $CaCO_3$. The decarbonization was effected by heating at a temperature slightly over 1000°; the gypsum was calcined at 600°. In the mix 5% calcined dolomite and 10 to 15% anhydrite were used. The reactions taking place during the hardening of this cement are described. M.Ho.

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Budnikov, P. P., and Rivlin, I. I. MAGNESIUM OXIDE FROM DOLOMITE AND ITS USE IN THE MANUFACTURE OF HIGHLY REFRACTORY PRODUCTS. *Trudy Kharkov. Khim.-Tekhnol. Inst. im. S. M. Kirova*, 3, 154-62 (1941).—Several French patents dealing with the separation of magnesium oxide from dolomite fired at 900° were tested. The optimum temperature for firing dolomite and the temperature of its treatment with ammonium chloride were determined. Samples of refractory forsterite material were obtained from a mixture of concentrated dolomite and serpentine. Petrographic study showed that the samples contained small grains of forsterite and periclase

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