INVENTIONS

REVIEW OF RF PATENTS FOR REFRACTORY INVENTIONS

Review prepared by the editorial staff of Novye Ogneupory[1]

Translated from *Novye Ogneupory*, No. 5, pp. 66 – 67, May, 2010.

A METHOD OF MANUFACTURING ARTICLES FROM COMPOSITE HIGH-ALUMINA NANOCERAMIC

B. L. Krasnyi, V. P. Tarasovskii, A. S. En'ko, and A. B. Krasnyi

Patent RU 2351571
IPC C04B35/111, B82B3/00

The invention belongs to the class of ceramic materials based on aluminum oxide with the use of colloidal gel solution methods of obtaining composite materials and may be employed in the process of manufacturing articles that are resistant to the action of dynamic and static loads and with high thermal stability. In accordance with the declared method, GK-1 alumina and CL-370 reaction bimodal alumina are mixed with a water-soluble binary sulphate titanyl and ammonium salt with ratio of the components, scaled on the basis of sintered product, as follows, wt.%: GK-1 alumina, 5 – 83; CL 370 alumina, 5 – 94; TiO_2, 1 – 12. A water-soluble binder with total moisture content from 6 to 24% above 100% with ratio between the binder and water from 1:4 to 1:16 is added to the mixture thus obtained. Roasting of the articles is performed with isothermal hold times, at 200 – 300, 500 – 600, and 700 – 800°C, and the process is completed in the interval of complete transition of the octahedrite form of titanium dioxide into rutile (1500 – 1600°C). The technical result of the invention is that a nanodimensional structure that governs the mechanical strength and thermal stability of articles under nonstationary thermal operational conditions (cf. Table 1) is obtained.

TABLE 1.

Characteristic	Proposed Composition	Prototype
Density, g/cm^3	3.85	3.65; 2.9; 3.6
Mean dimension of crystallites, nm	500	300; 900; 700
Ultimate flexural strength, MPa	900	1200; 700; 700 – 750
Crack resistance, $K_{Ic,}$ MPa·m$^{1/2}$	6.5	7.5; 6.0; 6.3 – 6.9

Inventions Bulletin: Utility Models,[2] *No. 10, 664 (2009).*

A METHOD OF MANUFACTURING ARTICLES FROM A CARBON-CERAMIC COMPOSITE MATERIAL

N. M. Chernenko, I. I. Sidorov, G. A. Kravetskii, A. N. Varenkov, and D. N. Chernenko

Patent RU 2351572
IPC C04B35/532, C04B35/577

The invention belongs to the field of manufacturing of composite materials based on carbon and silicon carbide and articles produced from these materials for thermal insulation and construction that are to function under conditions of complex static and dynamic loads at temperatures up to 2000°C in oxidizing and abrasive-containing media (aerospace instruments, steam-electric equipment in the chemical and petroleum industries, and in metallurgy). Following carbonization, articles made of carbon fibrous filler and polymer binder are impregnated with a solution of polycarbosilane in toluene, dried, and then thermally stabilized and transformed into an expanded-clay aggregate. Holding of the carbonized billet in a 10 – 20% solution is performed for 0.5 – 3.0 h, after which it is dried in a ventilated space for 12 – 24 h at 15 – 60°C. Thermal stabilization is performed with the temperature raised to 800 – 1300°C at a heating rate of 80 – 140 deg/h and rendered into a ceramic (silicification) as the temperature is raised to 1900 – 2100°C at a rate of 150 – 200 deg/h. With the use of the method it becomes possible to increase the efficiency of liquid-phase impregnation

[1] OOO Intermet Inzhiniring, Moscow, Russia.
[2] Subsequently we use the abbreviated name *Bulletin*.

with silicon as well increase the heat resistance and abrasion resistance of a material.

Bulletin, No. 10, 664 (2009).

A BINDER FOR FIBROUS MATERIALS

B. L. Krasnyi, V. P. Tarasovskii, and T. S. Marinina

Patent RU 2352538
IPS C04B28/26, B28B1/52, C04B35/80

The invention belongs to the field of production of fibrous materials based on refractory fibers used for the manufacture of heat-insulation, sound-insulation, and filtering articles. The binder for the fibrous material contains, wt.%: Kz-TM silica sol, 10 – 90 and Ruzin 14 GM styrene-acryl emulsion; 10 – 90, with ratio of the density of the silicon-sol to the styrene-acryl emulsion of 0.9 – 1.1. The technical result is seen in an increase in the quality and an expansion of the range of application of the binder and in a set of starter materials for its manufacture.

Bulletin, No. 11, 664 (2009).

A CARBON-CONTAINING COMPOUND

S. A. Suvorov and V. A. Musevich

Patent RU 2352541
IPC C04B35/035, C04B35/626

The invention belongs to the class of compositions of carbon-containing compounds for use in the production of refractories and may be applied in the production of carbon-containing articles. The technical result of the invention is the production of a carbon-continuing compound for use in the manufacture of articles with improved physico-technical and service properties, a reduction in the cost of producing these articles, and an increase in trouble-free operation of the furnace lining. The carbon-containing compound incorporates a refractory granular filler, graphite, carbon-containing solid and liquid components with high coke residue, and anti-oxidizing addition agents. According to the invention, the refractory compounds contains aluminum and a multi-phase ingredient of the following composition (wt.%) as the anti-oxidizing addition agents: Al_2OC, 37.0 – 45.0; $Al_8B_4C_7$, 20.0 – 28.0; Al_4O_4C, 15.0 – 22.0; Al_2O_3, 4.0 – 12.0; and Al_4C_3, 1.0 – 11.0, with the following ratio between the components of the refractory compound, wt.%: multi-phase ingredient, 0.25 – 5.0; graphite, 4.0 – 20.0; anti-oxidizing addition agent of Al, 1.0 – 3.0; solid carbon-containing component, 1.0 – 4.7; liquid carbon-containing component, 0.8 – 1.5; refractory granular filler, remainder to 100. The multi-phase ingredient is added in the form of a finely dispersed powder with particle size not greater than 60 μm obtained by crushing and grinding a mixture of boron oxide B_2O_3, graphite C, and aluminum Al, in a ratio B_2O_3:C:Al equal to 1:(2.0 – 3.5):(5.0 – 6.0).

Bulletin, No. 11, 645 (2009).