

ABSTRACTS

UDC 622.336:622.33

Graphite: market, mining, properties, application

Kononov V. A. // New Refractories. — 2021. — No 3. — P. 3–10.

The article deals with the world and domestic graphite market. The main producer and consumer of graphite is China, which produces 65 % of graphite and consumes 35 % of its world production. Deposits of graphite, mining of graphite in Russia, properties of graphite, and its application are presented. The characteristics of graphene and the areas of its application are indicated. Ill. 5. Ref. 8. Tab. 1.

Key words: graphite market, natural graphite, synthetic graphite, flake graphite, spherical graphite, refractory production, foundry industry, lithium-ion batteries, graphene.

UDC 621.879.323:62-82]:658.589

Use of energy of pneumatic hydroaccumulators in the process of moving the excavator-dragline

Suslov N. M., Davydov S. Ya., Suslov D. N., Chernukhin S. A. // New Refractories. — 2021. — No 3. — P. 11–15.

The solution is given for the use of the accumulated energy of the raised leading edge of the machine at the moment of lowering it to the ground for performing manipulations with the support shoes. The parameters of the walking mechanism and released energy at the moment of lowering the leading edge of the excavator base are calculated. The amount of energy stored in hydropneumatic accumulator is calculated. The calculation results showed that the stored energy in the hydropneumatic accumulators is sufficient for carrying out shunting operations with support shoes which increases the overall efficiency of the walking mechanism and the operation of the dragline excavator. Ill. 2. Ref. 15. Tab. 2.

Key words: dragline excavator, thermal energy, walking mechanism, hydraulic drive, working fluid, pneumatic hydraulic accumulator.

UDC 549.521.44-492.2.017:620.187

Boehmite nanoparticles with different functional properties for manufacturing products with specified parameters

Belyakov A. V., Fedotov A. V., Vanchurin V. I. // New Refractories. — 2021. — No 3. — P. 16–23.

The characteristics of boehmite nanopowders prepared by the methods of re-precipitation of aluminum trihydroxide, the sol-gel method by hydrolysis of aluminum alkoxides and hydrothermal synthesis from industrial aluminum powders have been investigated. The method of obtaining boehmite nanopowders has a decisive effect on their structure, dispersion, chemical, phase composition, and technological properties. It is shown that when obtaining products with specified parameters, it is necessary to take into account the difference in the effect of boehmitenanopowders on their functional properties. Examples of the use of boehmite nanopowders of various origins in ceramics and catalyst technologies are given. Ill. 4. Ref. 18. Tab. 7.

Key words: boehmite, pseudoboehmite, nanopowders, hydrothermal synthesis (HTS), sol-gel method, method re-precipitation, catalysts, Hedwall effect.

UDC 666.974.2:691.421.24].001.891

Refractory concrete based on high-alumina cement and clinker aggregate

Krivoborodov Yu. R., Samchenko S. V., Kuznetsova T. V. // New Refractories. — 2021. — No 3. — P. 25–28.

The results of the study of the possibility of using clinker as an aggregate for producing refractory concrete based on high-alumina cement are presented. Clinker is used for cement and aggregate production. The main properties of clinker as an aggregate have been studied. On the basis of high-alumina cement and its clinker, a composition of refractory concrete has been developed that has an compressive strength at normal hardening of 50–55 MPa, a shrinkage of 0,2 %, and a heat resistance of more than 35 thermal cycles (1300 °C – water). Particular attention is paid to the formation of the contact zone between the aggregate and the cement. Refractory concrete belongs to class 16 and is recommended for the lining of thermal units in the chemical industry. Ill. 2. Ref. 16. Tab. 4.

Key words: refractory concrete, high-alumina cement, clinker aggregate, contact zone.

UDC 691.618.93+666.3-492]:678.027.39

Extrusion method for producing microgranular foam-glass ceramic from zeolite rocks

Ivanov K. S. // New Refractories. — 2021. — No 3. — P. 29–33.

A new method for the synthesis of porous glass-ceramic granules less than 1 mm in size from zeolite rocks has been proposed. The method consists in forcing the batch with a screw through a granulating grid, which makes it possible to intensify the reaction of silicate formation. As a result, the optimal extrusion ratio and its effect on the final properties of the material after firing have been established. Such advantages as involvement of local zeolite rocks in production, simplicity of the extrusion method and reduction of the alkaline component in the batch have been achieved. The obtained material has a wide prospect of application in high-strength concrete for special purposes, in the areas of energy saving and fire safety. Ill. 4. Ref. 11. Tab. 2.

Key words: zeolite rock, foam-glass ceramic, extrusion, extrusion ratio, silicate formation reaction, microgranular material, porous structure.

UDC 544.223:666.363.3.046.4].017:548.734

The changes of Pervouralsky quartzite crystal lattice under heating from up 25 to 600 °C

Kukartsev V. A., Abkaryan A. K., Temnykh V. I., Kukartsev V. V., Tynchenko V. S., Kukartsev A. V. // New Refractories. — 2021. — No 3. — P. 34–39.

Quartzite is mountain igneous sedimentary rock formed by fusing quartz sand with other minerals. The volume of its consumption is constantly growing. For this reason, the solving a problem of the feasibility of developing a new field or a new site (lode) the existence of a quartzite deposit directly depends on its properties. This is especially true for the use of quartzite in the metal industry, where it is exposed to high temperature. As a rule, the study of the properties of quartzite for water absorption, open porosity and apparent density is carried out at room temperature. The macro and microstructure are studied before and after calcining at a temperature of 1450 °C using optical microscopes that allow using X-ray phase analysis. Ill. 5. Ref. 9. Tab. 2.

Key words: quartzite, lattice cell, interplanar spacing, refractory material, cell volume.

UDC 621.793/795:621.793.74

Influence of part surface preparation on the coating adhesion strength of during plasma spraying

Kravchenko I. N., Kartsev S. V., Velichko S. A., Kuznetsov Yu. A., Pastukhov A. G. // *New Refractories*. — 2021. — No 3. — P. 40–47.

The results of studies of the effect of part surface preparation on the adhesion strength of the coating with the substrate are presented. A new method of surface preparation for plasma spraying is proposed, which allows to reduce the specific costs and labor intensity of worn parts reclamation, as well as to improve the quality of coatings. A distinctive feature of the proposed method is the effect on the treated surface of the thermal-abrasive jet with simultaneous heating of this surface, which provides a high adhesion strength of the coating with the part surface. Ill. 10. Ref. 32. Tab. 5.

Key words: plasma spraying, adhesion strength, coating quality, abrasive jet machining, thermal-abrasive tool.

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Formation of cubic modification oxides with BCC-lattice type C in polycrystalline dioxides of hafnium, zirconium and cerium upon heating

Solovyeva A. E. // *New Refractories*. — 2021. — No 3. — P. 48–58.

In the study of the structural properties of samples of HfO_2 and ZrO_2 with the addition of 5 mol. % In_2O_3 when heated in the range of 25–1600 °C in vacuum, phase transformations $M \rightarrow T \rightarrow F^1 \rightarrow (F + C)$ were detected. Phase transformations in CeO_2 samples without additive and with the addition of 1 mol. % SrO flow in the sequence $F \rightarrow F^1 \rightarrow (F + C)$. The comparison of these phase transformations with the phase transformations of structural analogues: CeO_2 and from TbO_2 to ThO_2 is carried out. For dioxides from HfO_2 to ThO_2 , the ionic radius is determined and their linear dependence on the crystal lattice parameters was found. A linear dependence of the parameters of unit cells on the ionic radius of the cations of Me_2O_3 compounds with a type C structure (from Sc_2O_3 to Th_2O_3) is constructed. The C-*Ia3* type Hf_2O_3 , Zr_2O_3 , and Ce_2O_3 compounds found fall into this linear dependence in terms of unit cell parameters and ionic radius of cations. The interplanar distances of the structure and the parameters of the unit cell both dioxides and oxides of hafnium, zirconium, and cerium are given. The obtained results confirm the existence of oxides of Ce_2O_3 , $(\text{Hf},\text{In})_2\text{O}_3$, $(\text{Zr},\text{In})_2\text{O}_3$ with the BCC-structure of the crystal lattice of the C-*Ia3* type. Ill. 8. Ref. 27. Tab. 3.

Key words: HfO_2 , ZrO_2 , CeO_2 , In_2O_3 additive, structural properties, phase transformations, crystal lattice, BCC-lattice, HCC-lattice, solid solution.

UDC 666.3:678.019.3(470+571)

Relationship of phase and chemical compositions with the durability of ceramic bricks aged more than 170 years (Nativity church, Samara region)

Abdrakhimova E. S., Abdrakhimov V. Z. // *New Refractories*. — 2021. — No 3. — P. 59–63.

The object of research is a ceramic brick taken from the wall of the Nativity church (Rozhdestvenskoe village, Samara region). The oxide chemical composition showed an increased content of Fe_2O_3 (3,45 %) and alkalis (4,59 %), which will contribute to the formation of the liquid phase at 950 °C. Element-by-element chemical composition showed a higher content of CaO (3,75 %) for samples that will contribute to the formation of anorthite, which increases the products strength and high carbon content (15,2 %) indicates introduction of fuel to the raw. The increased fuel content in the raw material contributes to uniform sintering inside the ceramic sample. X-ray phase and IR-spectroscopic analyses confirmed the chemical compositions that increased calcium content contributes to the formation of anorthite. Ill. 4. Ref. 20. Tab. 1.

Key words: ceramic brick, Nativity church, durability, chemical composition, phase composition, anorthite, liquid phase.

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Systematic analysis of stress-strain state of surface layer of ground Si_3N_4 -TiC ceramics

Kuzin V. V., Grigor'ev S. N., Volosova M. A. // *New Refractories*. — 2021. — No 3. — P. 64–70.

The results of power, thermal and combined analyses of stress-strain state of surface layer of ground Si_3N_4 -TiC ceramic are systematized. The relationships revealed as a result of competent ordering of the data of numerical experiments are recommended for the creation of innovative silicon nitride tools, taking into account the change in the structure of their surface layer during manufacture and adapted to its destruction under the influence of operational loads. Ill. 4. Ref. 19.

Key words: systematic analysis, Si_3N_4 -TiC ceramic, surface layer, stress intensity, statistical characteristic, computational engineering.

НАУЧНО-ТЕХНИЧЕСКАЯ ИНФОРМАЦИЯ

