INNOVATIVE TECHNOLOGY FOR THE PRODUCTION OF PERICLASE-SPINEL MATERIALS

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The main field of application of periclase spinel refractories is the lining of rotary kilns for firing cement clinker, during the operation of which the refractory material is subjected to thermal, mechanical and chemical influence. That is why the following requirements are put forward to the operational characteristics of periclase spinel refractories: high physical and mechanical properties, high indicators of heat resistance, resistance to chemical corrosion, resistance to abrasive wear, resistance to thermomechanical loads, good smearing, environmental friendliness.

The main component of periclase-spinel materials is periclase, to which spinel and various additives are added to increase the heat resistance and flexibility of the refractory structure to thermal shocks, increase the operational characteristics of the refractory lining, which works in extreme conditions.

The authors suggested that, in addition to the main components (periclase and spinel), briquettes of different composition, which are pre-formed, fired and crushed, should be added to the composition of periclase-spinel materials. The composition of the briquettes was chosen in accordance with previously performed thermodynamic calculations of the three-component systems Al_2O_3 – FeO – TiO_2 and MgO – FeO – TiO_2, and the four-component system MgO – Al_2O_3 – FeO – TiO_2.

The mass compositions of periclase spinel refractories were also chosen on the basis of thermodynamic calculations of the MgO – Al_2O_3 – FeO – TiO_2 system [1, 2]. The samples were formed, fired and the limit of compressive strength, density, porosity and heat resistance were determined. All samples, compared to known analogues, have high indicators of physical and mechanical characteristics and meet the technical requirements for these materials

References:

1. Borysenko O. Subsolidus structure of the MgO – Al_2O_3 – FeO – TiO_2 system / O. Borysenko, S. Logvinkov, G. Shabanova, Y. Pitak, A. Ivashura, I. Ostapenko // Chemistry & Chemical Technology. – 2022. – Vol. 16, No 3. – P. 367–376. https://doi.org/10.23939/chcht16.03.367.

3. Borisenko O. Thermodynamics of Solid-Phase Exchange Reactions Limiting the Subsolidus Structure of the System MgO-Al_2O_3-FeO-TiO_2 / O. Borisenko, S. Logvinkov, G. Shabanova, O. Mirgorod // Materials Science Forum Submitted. – 2021. – Vol. 1038. – P. 177–184. https://doi.org/10.4028/www.scientific.net/MSF.1038.177.