гідрооб'ємно механічна трансмісія має більше переваг, а її недоліки можна нівелювати при подальшій оптимізації її конструкції.

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REFRACTORY CEMENTs BASED ON CALCIUM ALUMINATES AND TITANATES

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Calcium titanate is used in a variety of scientific research, including bioceramics, fuel cells, electrochemical capacitors, and catalytic converters. In bioceramics, calcium titanate is used as a scaffold material for tissue engineering. In fuel cells, calcium titanate is used as an electrode material, while in electrochemical capacitors it is used as an active material. In catalytic converters, calcium titanate was used as a catalyst support material.

In recent years, in various industries that use high-temperature units, there has been a trend of increasing production volumes and use of unshaped materials based on refractory cements, which provides significant savings in raw materials, energy and labor resources.

Unshaped materials operated under conditions of simultaneous exposure to high temperatures and aggressive environments must have high fire resistance, heat resistance, slag and corrosion resistance. From this point of view, the creation of new effective refractory unshaped special-purpose materials based on modified cements that have a set of specified operational properties is promising.

An integral part of unformed refractories is a binder material, which provides strength after hardening and forms a wear-resistant structure. Most often, cements are used as binders in refractory unshaped materials, which have lower cost and improved technological properties compared to organic or other inorganic binders. The possibility of varying the phase composition of the binder material allows achieving matrix affinity with the aggregate, giving the finished material increased strength, low porosity, fire resistance, reduced softening at high temperatures, heat resistance, and resistance to aggressive environments. One of the main directions of creating new types of refractory binders is the partial or complete replacement of the components of alumina cement with other types of oxides. This type of modification can include partial replacement of aluminum oxide with titanium oxide, which will provide astringent materials with increased corrosion resistance to the effects of slag and metal melts.

The aim of the research is to develop and obtain refractory cements based on calcium aluminates and titanates with high strength and corrosion resistance for the creation of refractory composite materials.

The basis of such binders is the three-component system $CaO – Al_2O_3 – TiO_2$, which has been studied in detail. From the point of view of obtaining refractory, corrosion-resistant binding materials, it is rational to develop compositions based on compositions of the $CaAl_2O_4 – CaAl_4O_7 – CaTiO_3$ cross-section, containing hydraulically active phases of alumina cement and calcium titanate to increase corrosion resistance.

To predict the compositions of cements with increased strength, fire resistance, and corrosion resistance, the temperatures and compositions of eutectics in binary and ternary sections of the selected rational region were calculated. Based on the calculations performed, it was established that double and triple sections of the $CaAl_2O_4 – CaAl_4O_7 – CaTiO_3$ region can be used as heat-resistant materials with an operating temperature of 1470 – 1660 °C. The ternary eutectic is shifted to the angle corresponding to CaAl2O4, and is 1479 °C. The highest temperature is the eutectic located on the edge $CaAl_4O_7 – CaTiO_3$ (1665 °C). Thus, to obtain a refractory unformed material based on calcium alumino-titanate cement, it is necessary to adjust the phase composition of the cement towards a higher content of CaTiO3 as the most refractory phase, and the total composition of the composition should contain no more than 60 wt. % of hydraulically active compounds.

The microstructure of calcium aluminate – calcium titanate compositions was investigated and it was found that an increase in the number and size of irregularly shaped pores was observed, and phase formation processes occur around these concentrators. The formation of $CaTiO_3$ along with calcium aluminates affects the microstructure, density, porosity, and hardness of the composition. At the same time, the density decreases, and the porosity and hardness increase compared to calcium aluminates without $CaTiO_3$.

Thus, the possibility of obtaining refractory cements through the targeted synthesis of hydraulically active aluminates and refractory corrosion-resistant calcium titanate in their composition has been theoretically substantiated and experimentally proven.