Structure of refractory materials based on local mineral raw

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Abstract
The paper is devoted to the results of microscopic analysis of the structure of fire-resistant materials developed on the basis of local mineral raw materials. The authors point out that in this regard, a special place is occupied by the microscopic analysis of refractory materials, because the use of various radiation and various designs of microscopes from optical to electronic requires various special preparation of objects and special methods for deciphering the observed images. Moreover, the use of these methods in relation to the fire-resistant compositions obtained during the experiments, consisting of kaolin, wollastonite, soda water glass, silica, finely dispersed thermovermiculite, silicon dioxide, dolomite, etc., demonstrates their microrelief morphology, which gives rise to other experiments related to increasing the quality of fire resistance of the objects under study.

1 Introduction

Among the entire range of refractory materials, corundum and mullite-corundum refractories, which have sufficiently high refractoriness and strength, are widely used. On the basis of corundum and mullite, a number of compositions have been developed, intended, mainly, like other classes of refractories, to meet the needs of the metallurgical industry [1-6].

The problem of obtaining effective heat-insulating materials from local mineral raw materials always remains relevant, and in this regard, tile press materials also need thermal protection.

2 Methods of research

In this regard, the plate press materials obtained during the experiments are chemically unrelated components (mineral particles and organic), including binders, which form the structure of a new composite material [7-13]. In this regard, it is very important to establish the nature of their interaction in the main composition [14-20]. Based on this, in order to...
study the structure of the resulting tile materials developed on the basis of the mineral wollastonite, kaolin, nanoparticles of silicon dioxide, silica, dolomite, thermo vermiculite, liquid glass, their electron microscopic analysis was carried out using optical and electron microscopy methods (See electronic images of samples (Figures 1-10)).

Fig. 1. Electronic photographs of particles of a composition consisting of kaolin, the mineral wollastonite and sodium liquid glass.

Fig. 2. Electronic photographs of particles of a composition of finely dispersed wollastonite, silica, sodium liquid glass.
Fig. 3. Electronic photographs of particles of the composition of the tile material, consisting of finely dispersed thermo vermiculite, kaolin, sodium liquid glass.

Fig. 4. Electronic photographs of particles of the composition consisting of the finely dispersed mineral wollastonite, silicon dioxide nanoparticles, and sodium liquid glass.
Fig. 5. Electronic photographs of particles of a composition consisting of finely dispersed thermo vermiculite, dolomite, sodium liquid glass.

Fig. 6. Electronic photographs of particles of a composition consisting of kaolin, dolomite, sodium liquid glass.
Fig. 7. Electronic photographs of particles of a composition consisting of kaolin, a fine mineral wollastonite and sodium liquid glass.

Fig. 8. Electronic photographs of particles of a composition consisting of a finely dispersed mineral wollastonite, thermovermiculite and sodium liquid glass.
Fig. 9. Electronic photographs of wollastonite particles

Fig. 10. Electronic photographs of particles of a composition consisting of a finely dispersed mineral wollastonite and dolomite, sodium liquid glass

3 Results

The study of photographs of the particle surface of the obtained materials and from other analyzes, it can be concluded that the samples of the compositions of Figures 2–4 and 7, having a smoother surface than the other samples, formed a denser structure, which gives the material more strength physical and mechanical characteristics. And also in Figure-9, you can see that these are particles of the wollastonite mineral, separately distributed over the entire surface, do not form a dense structure, a comparison of which with others gives the basis for making some comparative conclusions in favor of other samples with smoother surfaces.
4 Conclusions

Thus, the possibilities of microscopic methods have the following important features:

- Using these methods, it is possible to carry out the calculation of quantitative parameters and fix the results of the object under study. It is currently recommended to equip microscopes used in this field with digital cameras that can be connected to a person's computer;

- The diagnostics of minerals is carried out using the polarization method of microscopy in an immersion medium. The surfaces of mineral grains, layers, filaments, plasma, their relationships are considered;

- When equipping laboratories with microscopes, all of the above factors should be taken into account - the ability to conduct research using a variety of microscopic techniques, including digital processing of the results;

- Modern high-quality optical systems, digital equipment can significantly improve the quality and information content of the optical method used in the creation of thermal insulation and refractory materials.

References


