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POROUS GLASS-CERAMIC MATERIAL FROM ALKALI ACTIVATION AND SINTERING OF CLAY WITH WASTE GRANITE RUBBLE MIXTURES

Porous glass-ceramics represent a very interesting class of materials due to high surface area and permeability, low density, and specific heat, high thermal and high chemical resistance. In addition, unlike polymeric foams, porous glass-ceramics are nonflammable and flame resistant, chemically inert and not toxic [1,2].

In Europe, about 2.5 million tons of waste is generated per year, of which about a third is construction waste [3]. Waste containing silicate components are widely used in the manufacture of porous ceramic materials. This is achieved by their alkaline activation and firing [4].

The approach, applied in this work for obtaining a porous ceramic material, combined alkali activation and firing clay with the waste of granite rubble (Mikashевичи RUPP "Granit") at a low firing temperature (950 °C) is proposed. After alkaline activation of the mixture, its swelling occurred without the use of foaming additives. The composition of clay from various deposits ("Haidukovka", "Osetki", "Kustiha", "Lukoml") influence the process of expansion. The clay "Kustiha" in its composition is the most optimal, as it contains free quartz (16-22%) and a small amount of aluminum oxide (6-10%).

Using sodium hydroxide when mixing the mixture leads to alkaline activation of its components during drying at 60-80 °C for 1-2 hours. Finally, a sintering treatment was applied at 800-1000 °C, using a heating rate of 10 °C/min and a holding time of 1 h.

To study the composition and properties of the obtained porous glass-ceramic materials used thermogravimetric analysis (DTA/TGA), Fourier transform IR spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM) and other.

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