HEAT-INSULATED DECORATIVE SLABS ON THE BASIS OF NATURAL NON-DEFICIT RAW-MATERIALS

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The possibility of obtaining decorative porous slabs of glassy structure of foamglass type has been investigated. Foamglass is modern heat-insulated material of inorganic mix of cellular structure which has broad spectrum of possible application. The main factor limiting broad usage of foamglass is its high production cost. Foamglass production technology includes a stage of glass melting of a particular chemical composition. Aiming at reducing the expenses of foamglass production, many researchers decide to obtain such material passing glass melting stage.

We have conducted laboratory research on obtaining glassy porous material on the basis of loamy and acidic rock widespread in Uzbekistan.

It is known, that loamy rocks have capability to inflation in temperature interval of 900-1000ºC with formation of porous material of 0.8-1.0 g/cm^3 density. Acidic volcanic rocks of glassy structure – pearlites – also inflate with formation of high-porous material of 150 kg/m^3 density and more at the temperature of 900-1150ºC. We have ascertained that acidic volcanic rocks of crystalloid structure – rhyolites – can also inflate. The inflation temperature depends on the chemical composition of the rock (mainly on the content of iron oxide) and lies between 1300-1400ºC.

Micronized mixture, containing loamy rock and rhyolite inflates and gains glassy structure at the temperature interval of 1050-1150ºC. Slabs compacted half-dry or moulded using the plastic method undergo short-term exposure to high-temperature and soaking at that temperature for up to 0.5 hours after drying. The contents and properties of obtained material allow performing relatively quick cooling of the material without negative impact on durability. Later the material undergoes mechanical influence in order to provide necessary dimensions.

In order to stimulate the process of inflation a number of gasifiers were tested. The best results were obtained using mixtures, containing 25-45 % Na_2SO_4, 40-65 % Na_2CO_3, 5-12 NaCl and 1-4 Na_2O. The mixture of such composition appears in removals of caprolactam production process at Chirchik Industrial Complex (Uzbekistan).

Structured water, contained in the minerals of loamy rock as well as gases, adsorbed in the structural interstices of the minerals of volcanic rock is involved in the process of formation of porous structure of slabs along with the gasifier.

Characteristics of the dependence of the density of the material from the composition and durability on compression are shown on Pictures 1 and 2. The size of pores in the obtained material of optimal composition does not exceed 2 mm. Water absorption does not exceed 4% by volume.

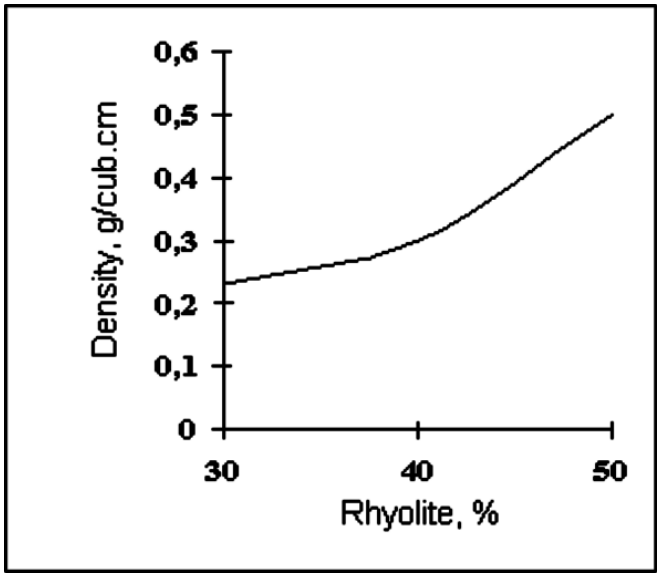

Figure 1. Dependence of density of the material on the contents of rhyolite

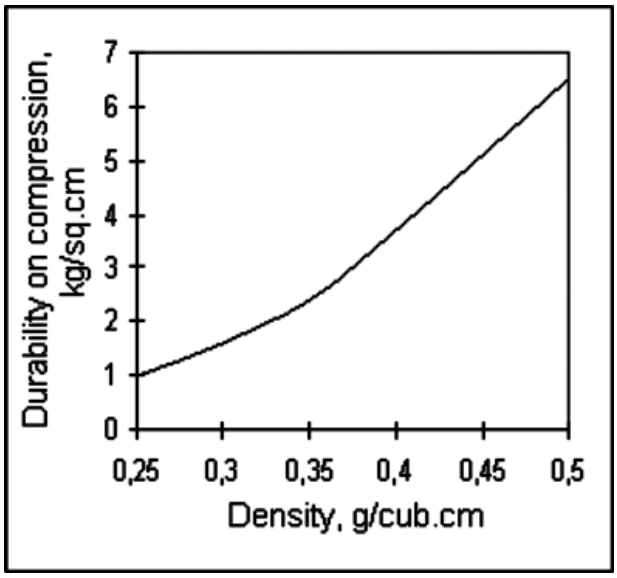

Figure 2. Dependence of durability on compression from porosity of the material

Obtained material possesses all advantages of foamglass and at the same time the stage of special glass melting has been excluded from the technology, which substantially reduced its cost. Glazed solid external surface and chemical-resistant inorganic composition of the material guarantees lasting quality of the slabs under the conditions of adverse external influence. The material has a brown colour, glassy blaze, uneven surface which provides specific ornament and allows application for cladding of walls of lower levels of buildings that are most exposed to atmospheric influence.