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Foam-Glass Modified By Technological Nano-additive

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Investigations have been conducted to study the effects of man-made nano-additive on basic physical and mechanical properties of foamed glass. As the main raw material used tare and flat glass. It was investigate the effect of nano-additive on structural features of the resulting foam glass at a temperature of 850 °C.

Keywords: Modified foam-glass, Manmade nano-additive, Tare and sheet glass, Structural features.

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1. INTRODUCTION

Today are becoming increasingly important insulation materials that can effectively perform their functions to conserve energy resources required to establish and maintain the desired temperature indoors and Walling. Modification, available today for producing foamed glass compositions will improve the structure of similar products and make good use nanoparticulatetechnogenic waste.

In this paper we studied the effect of man-made nano-additive, which is a main component contains iron oxide, on basic physical and mechanical properties of the samples foamed glass. To determine the chemical composition of individual minerals specimens, as well as for studies of the structure using a scanning electron ion-ion-electron microscope Quanta 200 3D.

2. EXPERIMENTAL

There are prepared cubes size 4.5 × 4.5 × 4.5 cm to determine the physical and mechanical characteristics of foamed glass specimens. Waste container and sheet glass was used as the main component, and used as porogens chalk (2.5 %) and carbon black (0.5–1 %). Preparation of the batch was co-milling all components to a specific surface of 4200 cm^2/g. As the nano-additive used waste meltshopOskol Metallurgical Plant, consisting of spherical particles with a size of 60-600 nm, which contain iron oxide (Fig. 1) [1–2].

Selection of compounds was carried out by varying the content criteria nano-dispersible additives and pore-forming components, as well as the influence of the degree of dispersion of the main components on the physico-mechanical properties of the test material.

Foam glass batch preparation for uniformly loaded into molds, filling 30–50 % of their volume, and the mixture produced seal punch. Firing was performed in an electric muffle furnace. In the furnace chamber forms installed in the zone of constant temperatures. The heat treatment is carried out at a sample temperature of 850 °C, the rate of temperature rise was 5 °C/min. Exposure was carried out at the maximum temperature for 10 minutes. For fixing the volume of the samples was placed in a form with a temperature of 100–150 °C for 5 minutes. Annealing occurred at samples foamed glass muffle spontaneous cooling to ambient temperature.

3. RESULTS

Studies to determine the dependence of the main physical and mechanical properties and peculiarities of structure formation on the amount of injected nano-additive, revealed that with the increase in the density of its content is reduced by 30 %, water absorption will be increased by 10 %, but the thermal conductivity is reduced by 1.5 times. This is due to activation of the pore formation in the presence of iron-containing supplements, which allows you to get thinner interporous partitions with fewer defects (Fig. 2 – 3).

It was analyzed the influence of additional mechanical activation charge of similar composition to the specific surface area of 7000 cm^2/g also. Based on the analysis of the obtained results, it was found that an additional mechanical activation reduces the density 1.25 times and 1.27 times the thermal conductivity of the samples at a substantially identical strength indicators.

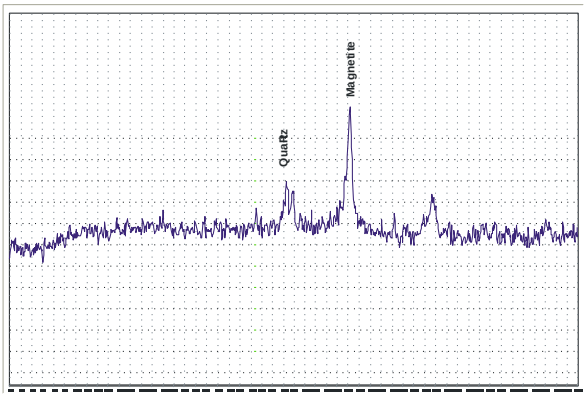

Fig. 1 – Radiographs of technological nano-additive

4. CONCLUSIONS

Available data and conducted by different scientists for many years of research to identify the effect of various additives on the technological properties of the foam glass, and to identify patterns of influence of the mineralogical composition of the waste and simultaneously extracted breeds at different production stages for the main performance indicators, can improve production quality [3].

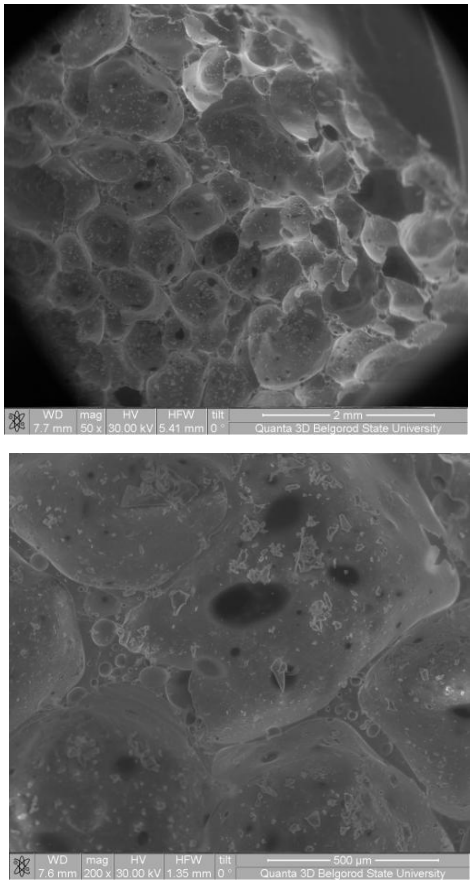

Fig. 2 – Micro-structure of foam-glass in the presence of nano-additive

And also allow taking the solution to the problems of effective use nano-disperse technogenic waste, the volume of which at the moment tends to be a significant annual increase in spite of having a number of areas for its application.

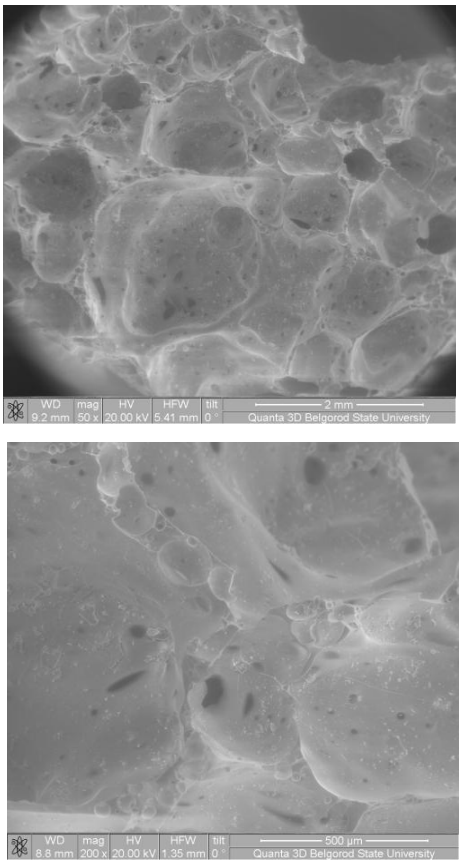

Fig. 3 – Micro-structure foam-glass without nano-additive

Based on the results of research have been developed and produced products formulations, the main characteristics which allow us to recommend them for use as a modified foam glass. To implement the results of research in an industrial setting foam glass production technology [4].

REFERENCES

1. A.V. Shamshurov, V.V. Strokova, *Proceedings of the International Scientific and Technical Conference. – Minsk: Belarusian State Technological University* **29** (2005).
2. N.I. Minko, I.N. Mikhal'chuk, N.V. Sidor, *Proceedings of International Conference. – Belgorod: Part 3, 123* (2002).
3. A.V. Shamshurov, *Technology paving slabs on the basis of quartz rocks baked at low temperatures / Dissertation*, **184** (2004).
4. A.V. Shamshurov, V.V. Strokova, T.I. Tymoshenko, *Proceedings of Int. science-technical Conference. – Penza, Part 2,* **91** (2001).