TVER STATE TECHNICAL UNIVERSITY

DEPARTMENT OF PRODUCTION OF CONSTRUCTION PRODUCTS AND DESIGNS

Use of glass granules to produce effective gypsum composites

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Relevance

- In the case of the use of finished products based on gypsum, there is also no danger to people, animals and plants, which compares them favorably with modern synthetic materials.
- The combination of high strength and low density of materials can allow creating a new generation of building materials.
- In order to reduce the weight of gypsum products, various methods are used, such as the plastering of gypsum stone through the use of gas and foaming agents of various nature, the introduction of various porous natural and man-made lightweight fillers, as well as by using a synergistic effect when combining the first and second method
- For example, the plastic strength of building mixtures with hollow microspheres is 4 ... 8 times higher than the density for compositions with added perlite or vermiculite, which affects the technological properties of solutions.
- Mixtures with hollow microspheres retain vitality longer. They have a water retention capacity of 90% more. In this case, the mixtures do not lose their shape in the period before crystallization and have high adhesion to the base after it

Materials and methods

Studies to evaluate the effect of the addition of glass micro granules on the properties of a self-reinforced composite were carried out on the basis of a low-grade gypsum binder - G-5 BII gypsum production in the Moscow region.
The GR microspheres of the Tver Plant were used as filler
Three compositions were studied in the work

Table 1. Gypsum G-5 B II. Properties.

Name of indicator	Value
Degree of grinding, the residue on a sieve with a mesh size of 0.2 mm,%, not more than	14
Bulkdensity, kg / m3	750-850
The tensile strength of beam samples at the age of 2 hours, MPa, not less than compressive strength: bendingstrength	 5 2.5

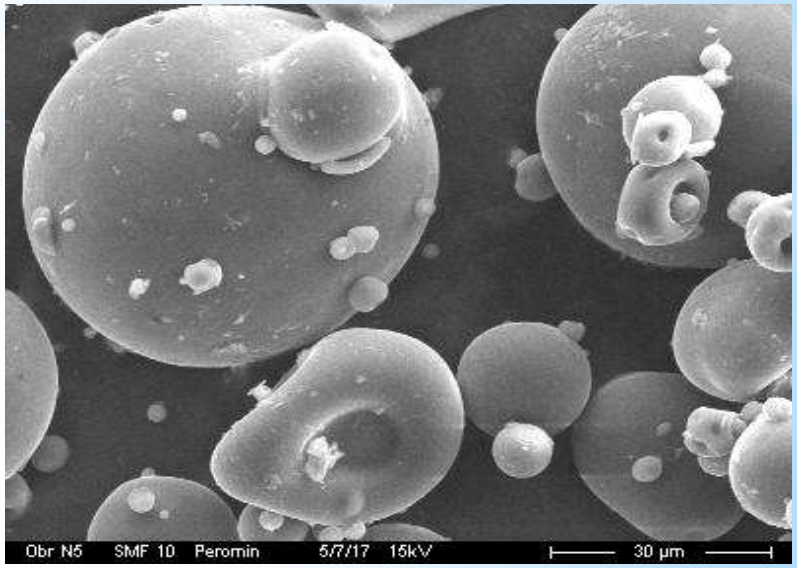
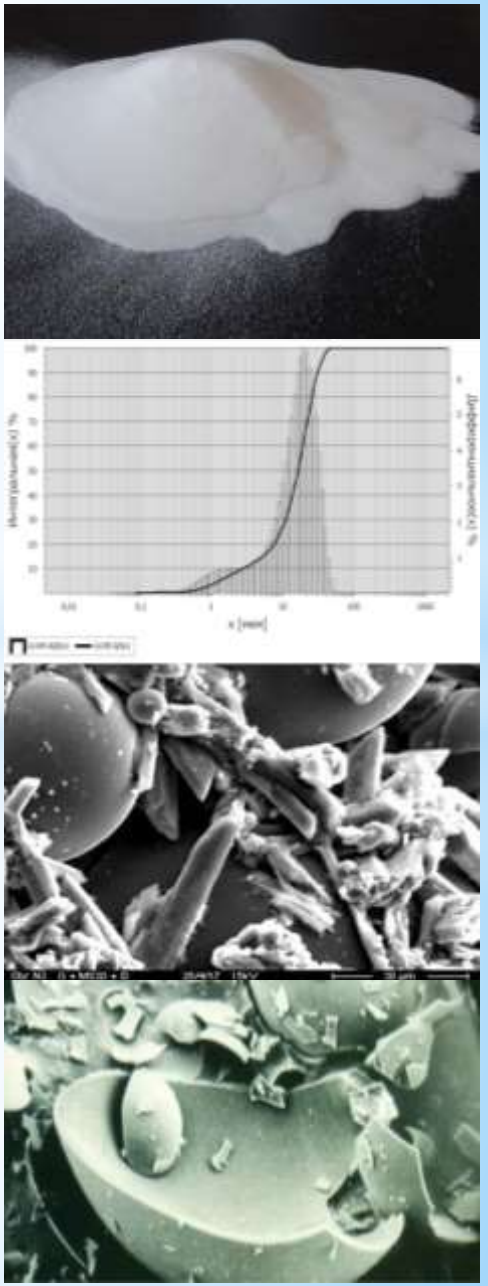


Fig. 1. Hollow microspheres MSO – «0» of the Novgorod production.

Results

- The best characteristics in the study according to the criterion of ratio and strength were shown by the composition of GR -2, therefore, these results are given in the work - the dependence of strength and density on the content of the additive of glass microspheres GR-2.
- It was found that the average diameter of the microspheres in the GR-2 mixture is 16 μm, the distribution mode corresponds to a grain size of 19.73 μm, and the distribution amplitude is:(d90 – d10) / 50 = 1.75.
- The water-solid ratio has little effect on the average density of the composite. This is due to the shape and surface quality of the granules. Micro granules not only increase water demand, but also increase the workability of the whole mixture. The effect of W/S is manifested for a mixture without filler or with a small amount
- However, the water-solid ratio affects the strength of the composite. Increased W/T reduces strength. For W/S = 0.6 and W/S = 0.62, the curves are closer in character. The lowest density corresponds to the content of microspheres - 30% and amounts to 858 kg/m^3.
- The optimal composition of the mixture according to the criteria of strength and density is characterized by a granule content of 30% at W/S = 0.6.



Results and findings

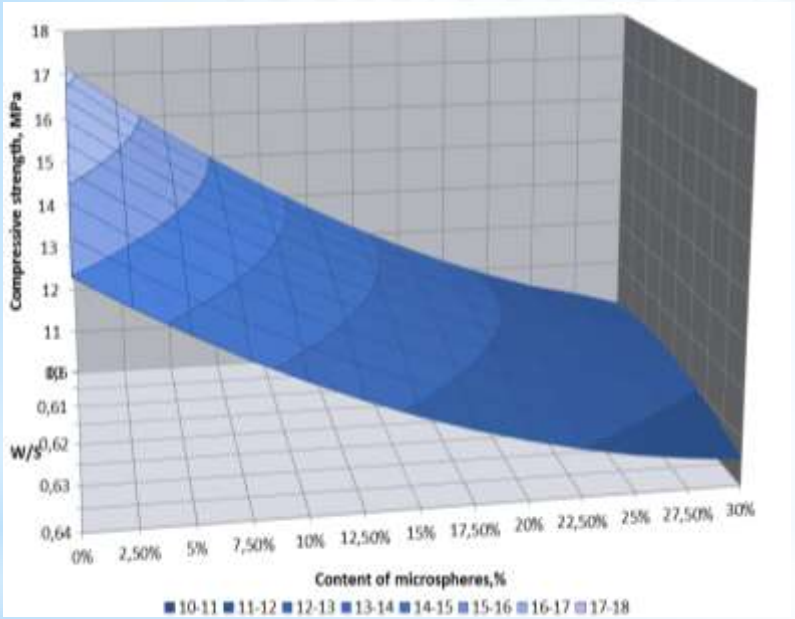


Fig. 2. The effect of the addition of microspheres on the strength of the gypsum self-reinforced composite at various W/T

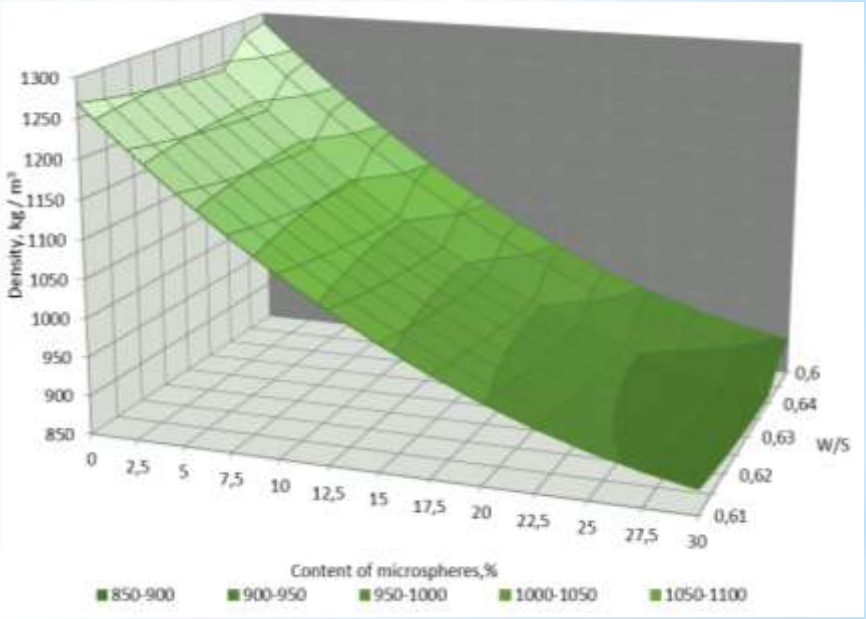


Fig. 3. The effect of the addition of microspheres on the density of the gypsum self-reinforced composite at various W/T

- The gypsum self-reinforced composite with the addition of GR micro granules has an average strength of ~ 11 MPa at a density of 858 kg/m^3. Without adding expensive chemical modifiers.
- Thus, the studies confirmed the possibility of obtaining a lightweight gypsum composite based on glass hollow microspheres. The introduction of glass micro filler allows you to use the material to create a wide range of 3 D gypsum products. The granulometric and dispersed composition of the filler does not create technological difficulties for its similar implementation

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Thank you for the attention

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