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GLASS DOLOMITIC SHEETS PRODUCING

The article contains results of researches at glass dolomitic sheets producing on the basis of the caustic dolomite received from dolomite of a deposit of "Ruba", with use of fillers of organic and mineral origin. Influence of quantity of each component of the core glass dolomitic sheet on its density and durability is studied. The optimal composition of the glass dolomitic sheets core is designed and its basic physical and mechanical properties are studied.

Introduction. Range of finishing materials of domestic production used in the building industry of the Republic of Belarus in comparison with wall and roof materials is low. It also refers to sheet finishing materials which are mainly presented by gypsum plasterboards. But they are known to be used for interior decorating. In recent years in addition to gypsum boards the glass magnesite sheets made in China appeared in the construction market. They favorably differ from the gypsum plasterboard by better physical and mechanical properties.

Glass dolomitic sheet – it is a white light material based on magnesia cement with organic and mineral fillers reinforced with fiberglass mesh [1].

Construction market in Russia, Ukraine and Belarus is actively saturated by Chinese glass magnesite sheets, but the high cost of this finishing material (6–8 \$ per 1 m²) hinders its widespread use in our country.

A raw material for the production of glass dolomitic sheets caustic magnesite is used. It is produced from natural magnesite reserves. These reserves in the world are limited. 25% falls on China. This fact is an obstacle to large-scale production and use of magnesia cement.

Another more accessible material for the production of magnesia cement can be dolomite reserves of the Republic of Belarus from the field "Rube". This field has very big reserves of dolomite. It creates many opportunities for obtaining magnesia cement in the form of caustic dolomite from the specified raw material. The aim of this research was the producing (obtaining) of glass dolomitic sheets using local raw materials.

Main part. In the process of the obtaining of glass dolomitic sheets composition as an analogue was taken glass magnesite sheets made in China. They consist of the following components: caustic magnesite, sawdust, expanded perlite, magnesium chloride solution and reinforcing coating (glass mesh) [2].

The high content of magnesia cement gives the material high strength, moisture resistance and fire resistance. Expanded perlite improves the

quality of sound insulation material, reduces flammability. Low density of sawdust provides good thermal insulation properties. Taking into consideration that glass dolomitic sheets must be flexible the core is reinforced with fiberglass on both sides. Fiberglass with magnesia cement product provides high flexural strength (flexibility). And for the realization of a water-resistant front side of the sheet is protected by a waterproof adhesive tape [3].

The effect of the composition of the mentioned above components to the main performance characteristics of the developed material – strength, density was investigated at the first stage of the research.

The caustic dolomite was used as the binding material. It was obtained by the burning up of the dolomite break-stone (fraction 5–10 mm at a temperature of 835°C). It was gauged by sulfate and magnesium chloride mixture.

The quality of core of glass dolomitic sheets was evaluated by compressive strength, flexural strength and density at seven days age.

Fig. 1 shows the correspondence of properties of the core of glass dolomitic sheets to the quantity of expanded perlite.

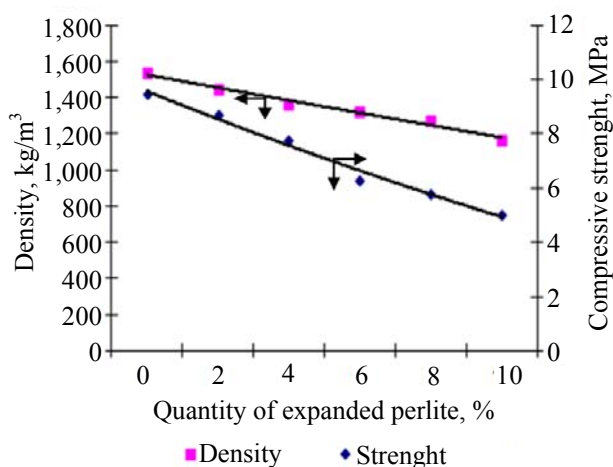


Fig. 1. Correspondence of strength and density of glass dolomitic sheet samples to the quantity of expanded perlite

The graph shows that as increase in quantity of expanded perlite of changes in the properties core samples is linear: the strength is reduced from 9.45 to 2 MPa, and the density decreases from 1,537 to 1,163 kg/m³.

Similarly, a linear effect has influence of amount of sawdust on the properties glassdolomite list (Fig. 2).

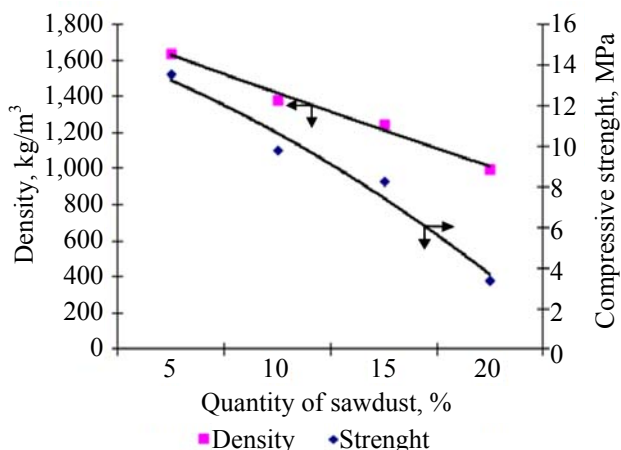


Fig. 2. Influence of the quantity of sawdust on the sample properties of glass dolomitic sheet

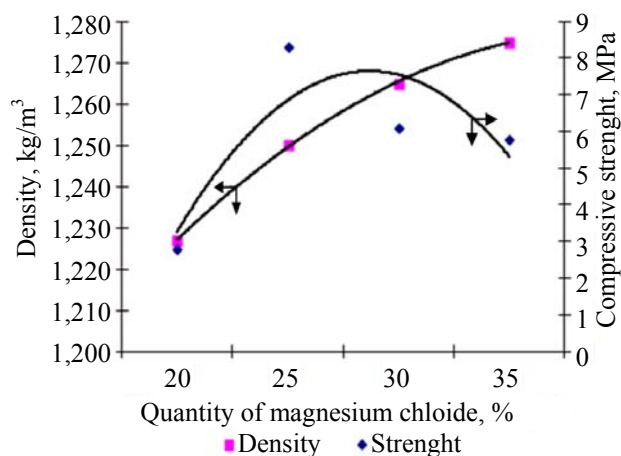


Fig. 3. Correspondence of strength and density of glass dolomitic sheet samples to quantity of magnesium chloride solution

In contrast to the effect of fillers on glass dolomitic sheets properties the impact of the quantity of the sealer is more complex (Fig. 3).

When the quantity of magnesium chloride solution is augmented the core density increases from 1,227 to 1,275 kg/m³, at the same time the strength is being increased. Better wetting caustic dolomite results to the fully use of its astringent potency.

However the introduction of more than 30% of magnesium chloride solution leads to its reduction in strength. It is connected with the decrease of saline concentration. The slowing of the processes of crystal nucleation of new formations (magnesium hydrochlorides) takes place due to needle crystal structure of the composite reinforcement [4].

Based on these researches, the best composition of a core glass dolomitic sheets wt % was developed. It is caustic dolomite – 50, expanded perlite – 8, wood chips – 15, sealer – 27.

Table 1 shows the properties of the different glass dolomitic sheets on the base of different sealers.

Properties of glass dolomitic sheets gauged by the solution of magnesium sulfate are more similar to those of glass magnesite sheets (850–1,300 kg/m³, flexural strength of 6–20 MPa). So for the further researches the solution of magnesium sulfate was used as a sealer. It was connected with the possibility of its obtaining in the process of sulfuric acid decomposition of dolomite powder.

The research of the rate of increasing of glass dolomitic sheets strength showed that with increasing of hardening time the strength of glass dolomitic sheets increases, it is a reflection of needle crystal structure of the new formations, their fusion. It provides the dense structure of the composite.

Table 2 presents the results of researches of basic physical and mechanical properties of the glass dolomitic sheets.

The represented data show that the developed composition of the glass dolomitic sheets core by their basic physical and mechanical properties is on the level of its famous analogue.

Table 1

Physical and mechanical properties of glass dolomitic sheets on the base of different sealers

Properties	Sealer	
	magnesium chloride solution, (density is 1,250 kg/m ³)	magnesium sulfate solution (density is 1,300 kg/m ³)
Density, kg/m ³	1,256	1,117
Compressive strength at the age of 7 days, MPa	8.30	10.5
Flexibility strength at the age of 7 days, MPa	3.82	5.56

Table 2

Properties of sheet finishing materials

Indicators	Glass dolomitic sheet	Glass magnesite sheets made in China
Density, kg/m ³	1,114	850–1,300
Compressive strength, MPa	12.5	–
Flexibility strength, MPa	6.4	6–20
Flammability Group	non-ignitable	non-ignitable
Thermal Conductivity, W/(m · °C)	0.36–0.38	0.32
Water Adsorption, %	24.3	26
Plasticization coefficient	0.75–0.95	0.75–0.80

Conclusion. It is demonstrated the prospectivity of the production and using of the material as a finishing sheet material produced on the base of magnesium cement, obtained on the basis of caustic magnesite and dolomite.

As a result of researches a composition of the glass dolomitic sheets based on caustic dolomite gauged by the solution of magnesium sulfate was developed.

It was demonstrated that the properties of the glass dolomitic sheets produced from domestic magnesia cement with mineral and organic fillers is highly competitive with the foreign analogues and it can be recommended for use in building materials industry.

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