COMPOSITE-DECORATIVE TILES WITH GRANITE

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ABSTRACT

The paper presents the results of the authors' scientific research on a composite material with polymeric matrix, hardened with rock particles. It was studied the influence of the quantity of the hardening phase on the compression resistance of the product. These weather resistant materials have a long period of ageing, a permanent finishing and require almost no maintenance.

For the research was used granitee from the Măcin Mountains, Dobrogea România with greenish shade, which was crushed and then granulometric sorted. Granitee is an acid volcanic rock, with over 65% SiO_2; it has granular structure and massive texture. Polyesteric thermorigid resin was used for the matrix.

These resins can be characterized by: easy obtaining and accessibility of the raw materials, quick strengthening without side-off products, good chemical resistance at acids and alcohols. Composite samples were made through shaping in steel mould. After shaping and maturation, the samples were tried at compression.

KEYWORDS: polymeric matrix, composite material, rock particles, Dobrogea

1. Introduction

Dynamic development of the consumer's goods manufacture has imposed new materials to be setting up.

From the advanced materials with great usage expectation are the Composites, named in reference material as Future's Materials.

Composites answer to every industrial demands and almost all human needs. Composites can be obtained by suitable staples association and they can have simultaneous new combinations: rigidity, resilience, toughness, refractoriness, corrosion resistance, dimensional steadiness, absorption of vibration, electrical and thermal conductibility, and, unlike other building traditional materials, composites' price is lower. Today, Composite Materials applications cover very different fields, such as: aeronautics, naval-building industry, electronics, radio-location, machine-building industry, industrial equipments, light industry, industrial and civil – building industries. In buildings field, composites prefab are either even elements or technical ingots. These bad weather resistant materials have long life seasoning, facing continuous and they require almost no maintenance.

Mechanical properties concerning building industry are: compression strength, abrasive resistance, impact, bending strength,, traction resistance, dimensional steadiness, modulus of elasticity and yield impact resistance.

Composite materials are generally made from a hardening phase and a binding compatible matrix. In building industry the most used matrix is polymeric and reinforcement phases could be mineral rocks, like granite, basalt, marble, pumice, and a wide range products can be made from the outcome materials.

The hardened rocks composites offer buildings personality and style being in the same time very practical due of their easier maintenance, being used in various purposes, such as exterior platting and floors for public institutions or areas with intensely traffic, either in ornamentally purposes, for fitting out the indoor of private houses. The raw materials used for obtaining the composites were granite and polyester thermo rigid resin. The granite is a volcanic rock made up from over 65% SiO_2 , CaO, MgO, R_2O_2, Mn_2O_3, TiO_2, Fe_2O_3, etc., in different percentage; it has granular structure and massive texture. Due these integrant elements, the granite can be white, grey, yellowish, pink, auburn –brown, greenish, or bluish. Sometimes, presence of feldspath crystals wide grown dents the rock a freckless structure. The granular structure can be characterized by mineral grains crystallized which are visible with naked eye. This structure is formed in earth depth, where the cooling magma is made very slowly, and mineral crystals have enough time for growing. The granular structure is find

out in all depth magmatic rocks. Our country has mountainous massive all built from granite. Such mountains can be found in Măcin Mountains, Apuseni, Meridional Carpathians and running granite quarry are in Săvârşin, Cladova, Radna, Măcin, Turcoaia, Greci.

2. Experimental procedure

For the research was used granitee from the Măcin Mountains, with greenish shade, which was crushed and then granulometric sorted. Polyesteric thermorigid resin was used for the matrix. These resins can be characterized by easy obtaining and accessibility of the raw materials, quick strengthening without side-off products, good dimensional steadiness, coloring properties, transparency, good chemical resistance at acids and alcoohols.

Polyesteric usage should be aware from following restriction: increased shrinkage through shaping, decreased resistance at alkali and hot water.

3. Experimental results and discussion

Composite samples were manufactured in accordance with the recipes from table 1, through shaping in 18,6 mm steel mould diameter.

After shaping and maturation, the samples were compression tested in hydraulic press, according to diagram 1.

The results are shown in table 1 and hystogram figure 2. Macrostructure of the composites obtained concordant with recipes 2, 4 and 6 are shown in figures 3, 4, 5.

Table 1

No. recipe	Composition	Pressure (daN/cm^2)	Force (daN)	Section (cm^2)	Compression resistance (MPa)
0	**Natural Granite**	11	2200	3,5	62,8
1	➢ **11 g granite;** grain size: 0,73 - 1,27mm; ➢ **resin 9%**	12,5	2500	2,7	92,5
2	➢ **11 g granite;** grain size: 0,73-1,27mm; ➢ **resin 18%**	12	2400	2,7	88,8
3	➢ **11 g granite;** grain size: 0,73-1,27mm ➢ **resin 27%**	11	2200	2,7	81,4
4	➢ **11 g granite;** grain size: 1,85-2,17mm; ➢ **resin 13%**	9	1800	2,7	66,6
5	➢ **10 g granite** grain size: 1,85-2,17mm. ➢ **1 g granite;** grain size: < 0,040 mm. ➢ **resin 22%**	12	2400	2,7	88,8
6	➢ **5 g granite;** grain size: 1,85-2,17mm; ➢ **5 g granite;** grain size: 0,73-1,27mm. ➢ **resin 22%**	10	2000	2,7	74,0

4. Conclusions

➢ During the experiments, especially effect in composite has the granite grain size. It's obvious that the composite samples 1 and 2 (with the finest grain size) have a higher compression resistance than composite 4 (with a bigger grain size).

➢ If a smaller quantity from the finest granite grain size (below 0.040 mm) is added in composite a bigger grain size (1,85-2.17 mm) for filling the space between the particles, the compression resistance will be increased with 25% compare to the composite sample made only of the finest granulation particles. Set beside samples 1, 2 and 3 from histogram 2, the compression resistance has been decreased with 12% by increasing the amount of resin.

➢ Compression resistance of the composite obtained is higher than the compression resistance of natural rocks used for research.

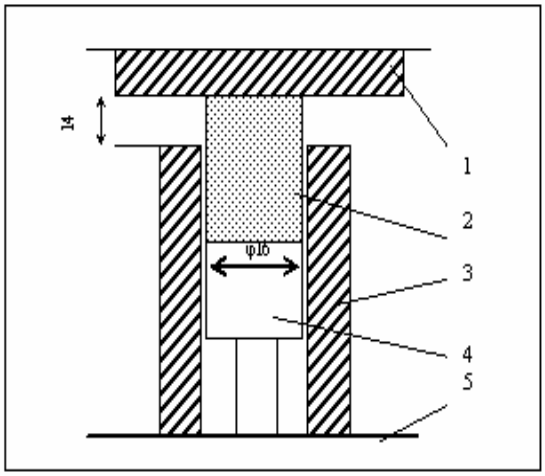

Fig. 1. *The diagram of the compression test 1- anvil; 2 – cylindrical die; 3 – controlled support, 4- blank assay; 5 – the press table.*

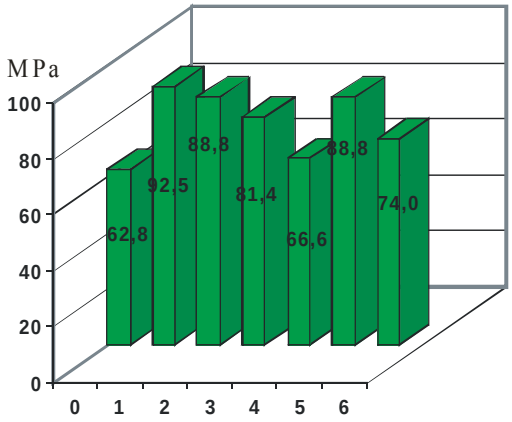

Fig. 2*.The variation of the compression resistance varying with the granite granulation and the resin percent, compared to the granite.*

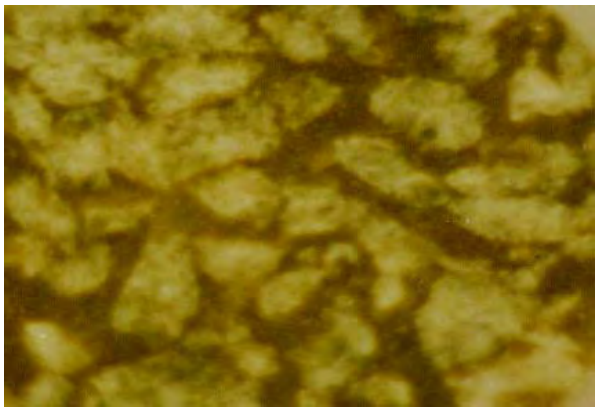

Fig. 4. *The macrostructure of the composite, recipe 4.*

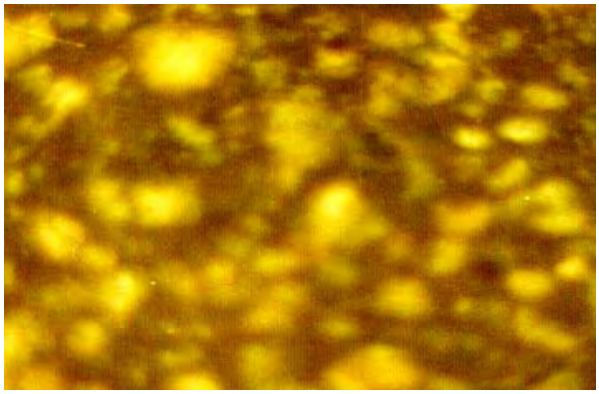

Fig. 5. *The macrostructure of the composite, recipe 6.*

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