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Comparison of physical and mechanical properties of artificial stone made with conditions (existence and lack of vacuum and pressure), resin and different aggregates

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Abstract

Artificial stone is a mixture of natural aggregate and additives such as industrial gums (resin), cement and other polymer materials. The purpose of this study is to compare the physical and mechanical properties of artificial stones made in different conditions, resins and aggregates. To achieve these goals, synthetic rock samples were made with polyester and vinyl ester resins and granite, lime, silica granules and lime-silica composites, with the existence and lack of vacuum and pressure during the fabrication of artificial stones. To determine the physical and mechanical properties (Brazilian Test, Point Load Test, Uniaxial Compression Test), artificial stones have been tested. Based on experiments, artificial stones made with vacuum and pressure systems have more favorable physical properties and undesirable engineering characteristics than coarse specimens made in completely manual conditions without vacuum and pressure systems. The specimens made with vinyl ester resin have more axial compressive strength than the other specimens and their fracture type is elastic - fracture but the specimens made of polyester resin without paying attention to aggregate type, show the elastic - plastic and creep behevior. Increasing of the resin percentage in artificial stones made of limestone, increases tensile strength but does not have a positive effect on granite. The results show that all the resistive properties of artificial stones are controllable. Also the mixing plan and ratio of mixing percentages are the most important principles in the strength and resistance of the artificial stone and are flexible for any use and taste.

Keywords: *Artificial stone, vinyl ester and polyester resin, plastic, physical and engineering properties, Physical and mechanical properties, presence and absence of vacuum and pressure*

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Extended Abstract:

1. INTRODUCTION

Artificial stone is a mixture of natural aggregate and additives such as industrial resin, cement and other polymer materials. The present invention relates to a process for manufacturing boards that are especially suitable for outdoors, based on artificial stone bound only with methacrylate-type liquid resin, the main application of which is its outdoor placing: external facades, staircases and floors, and the like, also being able to be used indoors, both in kitchens and bathrooms and staircases and floors. Figure 1 shows how to make artificial stone.

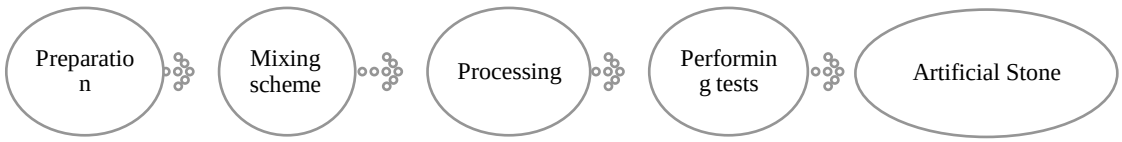


Fig.1. Steps of making artificial stone

2. Materials and methods

Figure 2 shows the mixing scheme and the method of preparing the samples of artificial stones. Figure 3 shows the results of the experiments performed. Figure 4 shows the correlation between the results of uniaxial compressive strength, tensile strength, point load resistance and porosity tests.

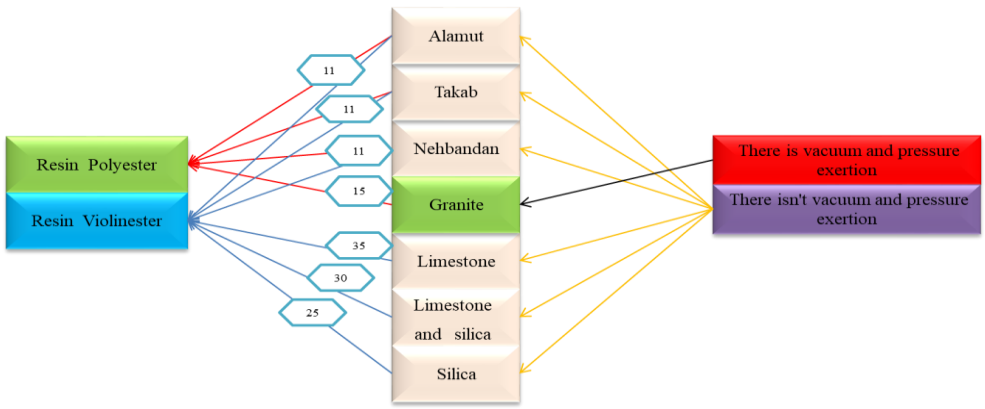
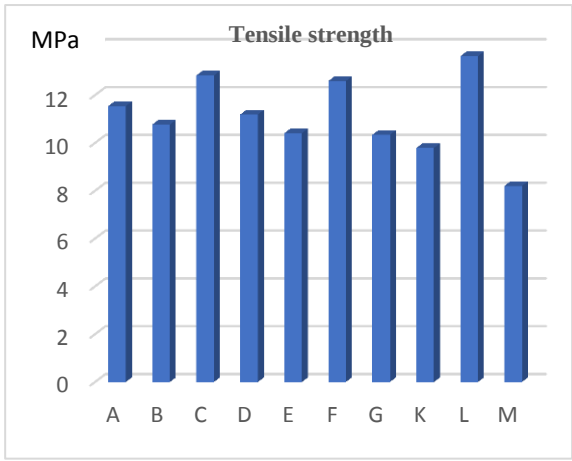
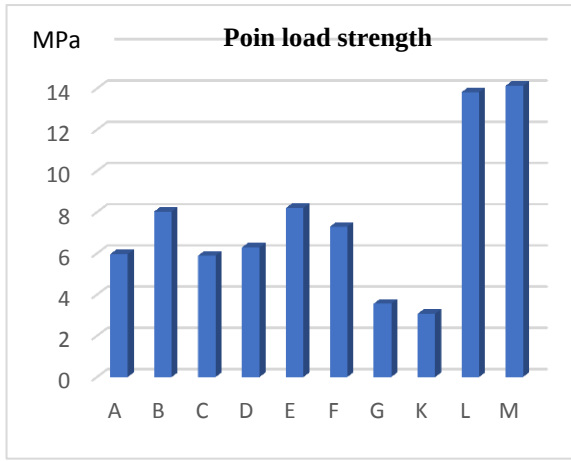
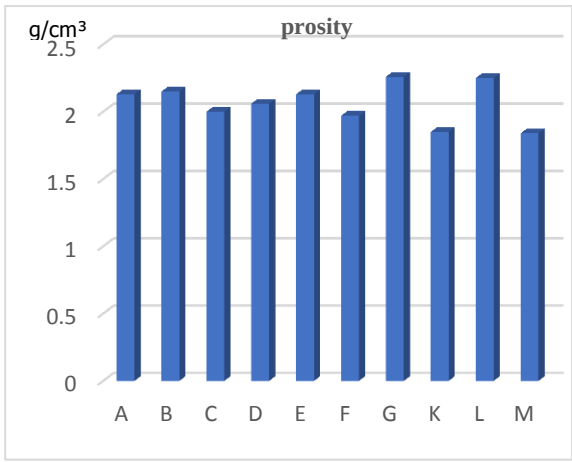
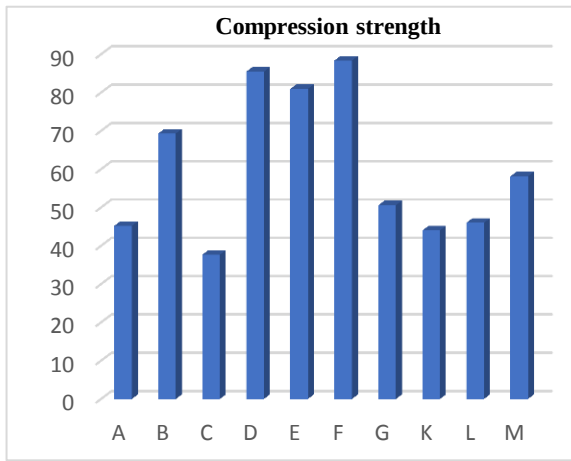


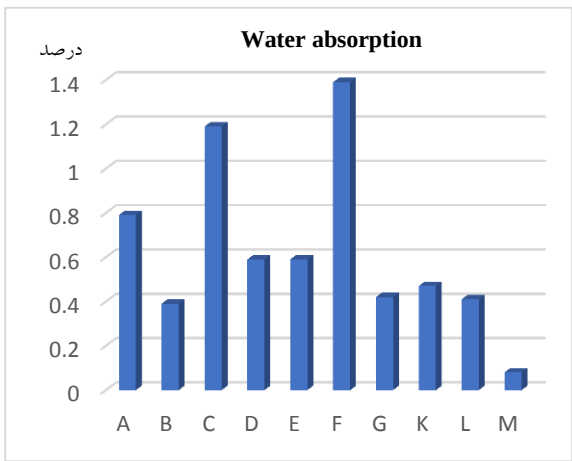
Fig. 2. Mixing design and method of preparing samples of artificial stones.











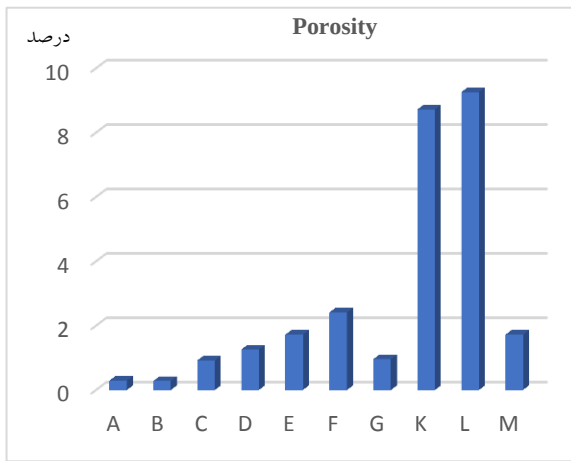


Fig. 3. Test results performed

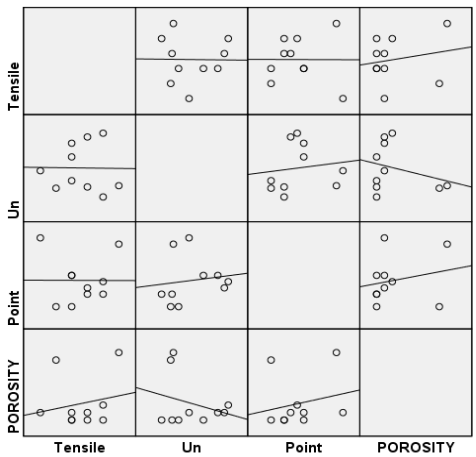


Fig. 4. Correlation of the results of uniaxial compressive strength, tensile strength, point load resistance and porosity tests

3. Results and discussion

The purpose of this study is to compare the physical and mechanical properties of artificial stones made with different conditions (presence and absence of vacuum and pressure), resins and different aggregates. To achieve these goals, samples of artificial stones with polyester and villin resins and granites, lime, silica and equal composition of lime and silica, with the presence and absence of vacuum and pressure Artificial stones were made during the construction.

Samples of artificial stones made of polyester resin and lime aggregate and silica lime, which are introduced with the symbols K and L, respectively, had higher porosity and tensile strength than other samples. The reason for the high tensile strength Can be related to the proportion of more resin in the mixing design.

Sample G has more favorable physical parameters than other samples because by applying a vacuum system and pressure, the empty space between the grains is reduced and as a result, we see lower porosity and water absorption. Less mechanical properties than its twin specimens (A, B, and C), which did not meet the requirements for vacuum and pressure systems, were attributed to the 15 percent resin used in its manufacture. Artificial stones with granite aggregates The resin content of 11% gives the highest resistance to artificial stone.

Samples of synthetic stones made with villosterone resin (D, E and F) reach their final strength at low strains and their behavior is elastic-fracture, but samples made with resin Polyesters (A, B, C, G, K, L and M) reach their maximum strength at higher strains and their behavior is elastic-plastic-elastic. The uniaxial strength of samples made of villin ester resin is higher than that of samples made of polyester resin.

The sample of artificial stone made with equal proportion of lime and silica with the symbol L has more point and tensile load resistance and less uniaxial resistance than other samples, so it can be

said that the higher the percentage of resin in the mixing design. The artificial stone made of lime, despite the low strength of limestone, has a higher tensile strength and point load.

The results show that all the strength properties of artificial stones can be controlled and the mixing design and the ratio of the combined percentages is the most important principle in the strength and durability of artificial stone and flexibility for any use and taste. Has flexibility.

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