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Investigating the effects of carbon and glass fiber on increasing the Bending strength of artificial Stone and studying their structure using SEM

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Abstract:

Artificial stone is a mixture of natural aggregate and additives such as industrial resin, cement and other polymer materials. In this research artificial stones with different additives and resins were designed to achieve high flexural capacity with mixing design, 84% aggregate, 10% resin and 6% additive completely manually without vacuum and pressure system. FESEM images were taken from specimens to determine fine cracks, elements, manufacturing atoms, weight percentages, and how to add and interconnect the additives used in making artificial rocks. To determine the ductility and evaluation of the quality of artificial rocks by their ability to withstand cracks or other surface roughness over a continuous bending period, artificial rocks made with additives (glass fiber, carbon fiber, polyester resin And vinyl ester) Three-point bending test Based on the three-point bending test, the sample made from wilin ester resin and the carbon fiber, had the most flexural strength and a sample made from wilin ester resin and the glass fiber tolerated the most strain during bending. Also, the type of fracture and cracks in the reinforced rocks are brittle and flexural respectively, and are ductile and shear-bending in rocks without reinforcing.

Keywords: *Artificial stone, glass fiber, polyester resin and ester resin, Three-point bending test, SEM*

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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 compares synthetic and natural stones in terms of quality and application.

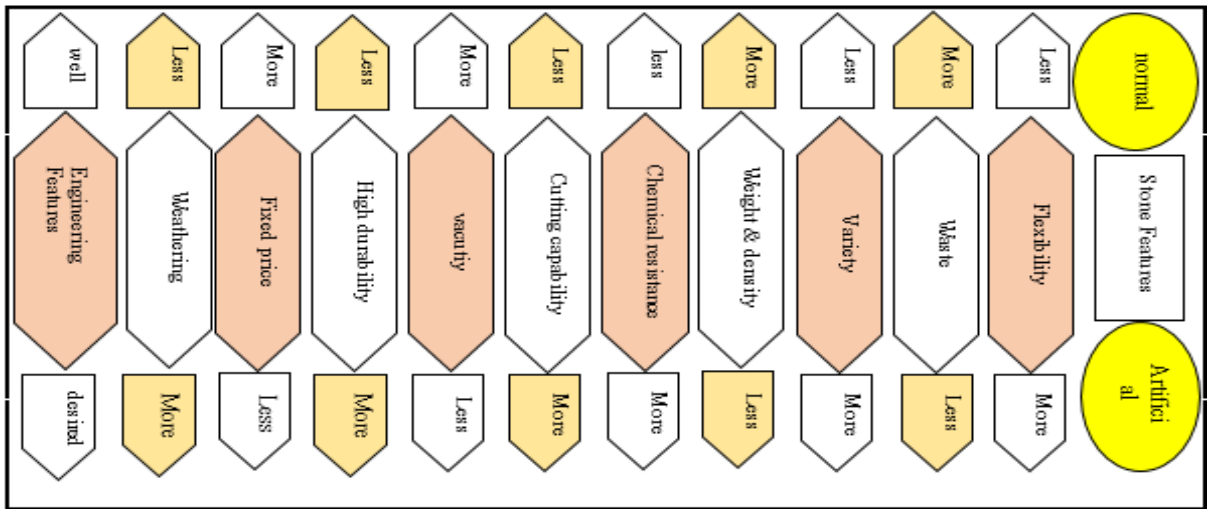

Fig. 2. Compare natural and artificial stone (Stefunidou et al., (2015))

2. Materials and Methods:

the polymeric resin, while fluid, penetrates in between the mineral particles. This not only provides cohesion but also eliminates natural porosity, which always exist in natural rock particles. Unsaturated polyester resins (UPR) and vinyl ester resins (VER) are among the most commercially important thermosetting matrix materials for composites. Although comparatively low cost, their technological performance is suitable for a wide range of applications, such as fiber-reinforced plastics, artificial marble or onyx, polymer concrete, or gel coats. The main areas of UPR consumption include the wind energy, marine, pipe and tank, transportation, and construction industries.

Carbon nanotubes have been considered as a promising means of enhancing the properties of advanced composites in a range of polymer systems. Expected property enhancements include high strength and stiffness, improved toughness, impact and through-thickness properties.

Fiber reinforced composites (FRCs) with promising mechanical, physical, chemical properties, light weight, and multi-functionality play a key role in technological advances in aerospace, automotive, energy, and offshore industries .

In this research, to investigate and compare the resistance properties (Three point flexural test, SEM) and the physical properties of artificial stones made with additives (polyester resin, vinyl ester resin, glass fiber, Caqrbon fiber and aggregate type) With a Takab granite. (Figure 2)

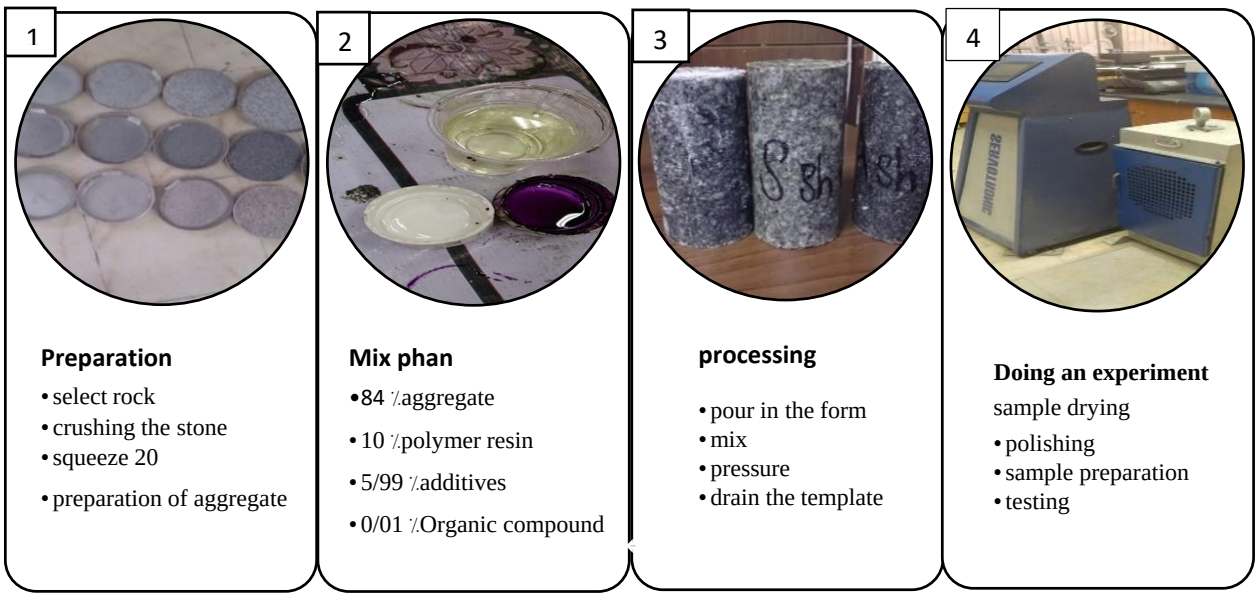

Fig. 2. Processes for the production of artificial stone

3. Results and discussion

FESEM images were taken from specimens to determine fine cracks, elements, manufacturing atoms, weight percentages, and how to add and interconnect the additives used in making artificial rocks. (Table 1)

Table 1. Analysis of XRD and SEM The name of the geology and mineralogical composition of Takab granite

Brand	Name of geology	Mineralogical composition	Analaze of SEM & XRD
Takab Granite	Milonite –Granite	Alkali feldspar ،quartz ،biotite ، colorite ،serist	albite ،labradorite ،orthocracy ، quartz ،hornblade ،muscovite

To determine the ductility and evaluation of the quality of artificial rocks by their ability to withstand cracks or other surface roughness over a continuous bending period, artificial rocks made with additives Three-point bending test Based on the three-point bending test, the sample made from wilin ester resin and the carbon fiber, had the most flexural strength and a sample made from wilin ester resin and the glass fiber tolerated the most strain during bending. Also, the type of fracture and cracks in the reinforced rocks are brittle and flexural respectively, and are ductile and shear-bending in rocks without reinforcing.