

# **GREEN AND ENVIRONMENTAL PROTECTION PERFORMANCE OF SHELL AGGREGATES AND REED FIBERS**

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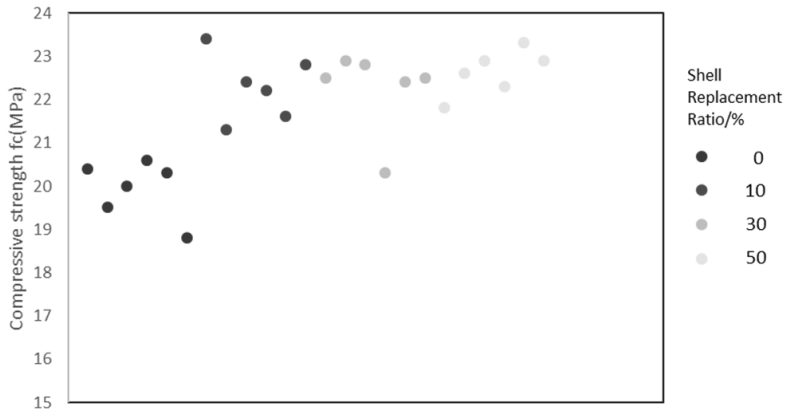
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Introduction: Shellfish are abundant worldwide, and the disposal of large quantities of discarded shells every year can cause serious environmental problems. Some studies have found that waste shells can replace natural aggregates, which has a good application prospect, which is also a way to solve the increasing shortage of natural aggregate resources. Yang et al [1] analyzed the possibility of using shells as aggregates in concrete. The results show that the increase of the proportion of shells replacing river sand has a significant effect on the overall compressive strength and dry shrinkage of cement-based materials [2]. Scholar Nikolenko believes that adding fibers to concrete can significantly improve the strength and crack resistance of the structure [3], so it can be considered that adding reed fibers to shell aggregate concrete can help expand its use range, thereby further reducing the cost of building materials, solving the environmental damage caused by mining natural aggregates, and becoming a more environmentally friendly and green building material in structural applications.

## 2. Feasibility of shell aggregate reed fiber reinforced concrete

### 2.1. Feasibility of shells used as aggregates

Studies have shown that the crack and impact resistance of the cementitious material system can be improved when the shell is incorporated in a certain proportion, and the strength of the block does not decrease at 28 days in the performance test of concrete with shell as aggregate [4]. The microstructure test showed that the adhesion between the shell and the cement slurry was good, and the irregular shape of the shell significantly improved the distribution of the latter in the cement matrix. In addition, according to the test, when the replacement rate of shell replacement of traditional aggregate is less than 50%, the higher the replacement rate, the greater the strength of concrete, and the strength curve is shown in Figure 1.



## 2.2. Feasibility of adding fibers to concrete

It is believed that fibers are widely used in concrete and mortar, and the incorporation of fibers can improve the mechanical strength of mortar or concrete, especially the tensile strength and flexural strength of splitting. In addition, the number and width of cracks in mortar or concrete can be reduced due to the bridging effect of the fibers. At the same time, the interface bonding between the fiber and the matrix effectively reduces the drying shrinkage of the material. The incorporation of fibers into shell mortar can compensate for the disadvantage of reduced performance [5].

### 3. The significance of shell aggregate reed fiber reinforced concrete for a green environment

#### 3.1. The significance of using shell aggregates to the green environment

There are studies that have passed the life cycle assessment of traditional aggregates, found that the carbon emissions of natural aggregates alone ranged from 323 to 332 kg of  $\text{CO}_2\text{e}$  per cubic meter of cement, compared to concrete using only natural aggregates, using 100% Recycled aggregates with lower carbon emissions [6]. In addition, waste shells, as renewable aggregates, also occupy a large share of kitchen waste, and the use of shells can not only alleviate the shortage of natural aggregates, reduce the damage to the environment caused by mining natural aggregates, but also alleviate the environmental problems caused by the disposal of waste shells.

#### 3.2. The significance of adding fibers to the green environment

Scientists Montaña Jiménez-Espada, Daniel Herrero-Adán has studied that surface reed fiber is a new type of sustainable building energy, an environmentally friendly building ecological material, which has at least similar structural properties to the ecological materials currently used [7].

Among the common mechanical properties such as ultimate stress, yield stress and elastic modulus, it is a sustainable and biodegradable lignin fiber material, and reed concrete meets the development concept of green building and the requirements of structural stress, and the low price, mostly agricultural waste, can provide sustainable energy for buildings.

Result: Shell aggregate and reed fiber can improve the crack and impact resistance and mechanical properties of the cementitious material system, and the compressive and flexural strength of the ordinary concrete test block is greatly improved, which fully proves the feasibility of its application in the building structure, in addition, it also has greater enthusiasm for environmental protection and green development, and reduces the damage to the natural environment in the construction project, reduces the carbon contained in the building and the operating carbon, thereby reducing the greenhouse effect and improving the sustainability of the building environment.

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