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Study on Structural Behavior of Oyster Shell Powder in Concrete

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Abstract: The oyster shell usually which are disposed is used as an alternate for the cement, since, the shell is made up of calcium. This study reports the results of experiments evaluating the use of oyster shell powder from oyster production industry as partial replacement for ordinary Portland cement. Cement is partially replaced with oyster shell powder as 5, 10 and 15% by weight of cement. The compressive strength and flexural strength was determined at curing days of 7, 14 and 28 days.

Key words: Oyster shell, structural behavior, concrete strength, compressive, flexural, cement

INTRODUCTION

Evaluate the recyclability of oyster shell powder as a pozzolana as partial replacement of cement in the concrete. The strength of oyster shell powder concrete and plain concrete are discussed by Kumar and Deepak (2015). The scope of the study is to cast the concrete specimens and conduct the compressive strength test and strength test and flexural strength test with the specified percentage of oyster shell powder and compare it with the controlled concrete specimens (Hg and Mutusva, 2015).

In this study the chemical compositions of the oyster shell to find which is suitable of replacement of oyster shell powder in the concrete. In this study the strength parameters of the oyster shell powder mixed specimens and to compare it with plain specimens. Growth, optical, dielectric and ferroelectric properties of non-linear optical single crystal: Glycine-phthalic acid was briefly described by Suresh (2016). This helps to increase the rapid growth in the chemical compositions using growth and characterization of non-linear optical single crystal: L-cysteine hydrochloride monohydrate (Azeezaa *et al*., 2015).

An attractive component of integrated waste management scheme includes engineering applications as well as constructions. It has the ability to reuse, reduce and recycle mollusc shell waste for civil and construction (Adekunle *et al*., 2015). Pervious cement enables water to invade through the asphalt, consequently decreasing the overflow and the necessity for stormwater administration frameworks (Nguyen *et al*., 2013). Seashell By-Products (SBP) are created in an imperative amount in France and are considered as waste. To increase the strength of concrete the seashell is added as admixture (Mageswari *et al*., 2016).

MATERIALS AND METHODS

The physical properties like specific gravity and porosity of the oyster shell powder (shown in Fig. 1) is discussed in the Table 1. Oyster shell powder is nothing but a powder form of the oyster.

The 100 g of the oyster shell powder contains 52 g of calcium oxide and another 48 g contains some chemical components, the exact composition is given in the Table 2.

The different samples were gathered and examined on the halfway substitution of the aggregate by steel slag various quantities. As per these samples, the procedure of the trial and the strategy for the experimentation and the distinctive tests led in those samples were considered and learned. On the premise of the investigations of the samples gathered for the test, the test procedure for the venture was picked.

Fig. 1: Oyster shell powder

Table 1: Physical properties of oyster shell powder

Description	Properties
Specific gravity	0.81
Moisture content	1.20
Bulk density (g/m^3)	0.79
Particle density (g/m^3)	1.215
Porosity (%)	23.4 bet

Table: 2 Chemical properties of oyster shell powder

Contents	Percentage
SiO_2	1.60
Al_2O_3	0.92
CaO	51.56
MgO	1.43
Na_2O	0.08
K_2O	0.06
H_2O	0.31
LOI	41.84

As indicated by the technique took after for the venture, the materials were gathered for the test, the reparatory tests were led to the materials to know the properties, for example, particular gravity, fineness modulus and the water ingestion. In light of these properties the outline blend was done to know the amount of the materials required for the M25 Grade concrete.

The examples with the three distinct rates of the halfway substitution of concrete by oyster shell powder, for example, 5, 10 and 15% alongside the control examples. The compressive, split and flexural quality of the examples was tried.

RESULTS AND DISCUSSION

The mix design was prepared for the M_{25} grade concrete and the concrete was cast and tested with partial replacement of cement by oyster shell powder with various percentages o f 0, 10, 15 and 20%. The test results of compressive strength and flexural strength of different concrete samples are listed in Table 3 and 4. Figure 2 and 3 shows the comparison chart of compressive strength of different cube samples and flexural strength of different beam samples.

The 20% achieves the maximum flexural strength for partial replacement of cement with oyster shell powder is found to be greater than the conventional concrete. It reached maximum compressive strength when there is the partial replacement of cement with oyster shell powder (20%). So, the maximum percentage of replacement of oyster shell powder is 20%.

Table 3: Test results compressive strength for cubes

	Average compressive strength (N/mm^2)			
		Oyster shell powder concrete (%)		
No. of curing days	Control concrete	5	10	15
7	20.44	23.72	24.86	27.30
14	24.77	25.90	28.32	32.97
28	31.61	40.67	44.47	44.59

Table 4: Test results of beam for flexural strength

	Average flexural strength (N/mm^2)			
		Oyster shell powder concrete (%)		
No. of Curing days	Control concrete	5	10	15
7	3.46	2.78	2.85	3.05
14	4.28	3.29	4.32	4.52
28	5.86	5.61	6.53	6.81

Fig. 2: Comparison of compressive strength of different cube samples

Fig. 3: Comparison of flexural strength of different beam samples

CONCLUSION

The mix design was prepared for the M_{25} grade of concrete and the concrete were casted and tested with partial replacement of cement by oyster shell powder with

various percentages of 0, 5, 10 and 15%. The maximum flexural strength for partial replacement of cement with oyster shell powder be achieved by 15% is found to be greater than the conventional concrete. It achieved maximum compressive strength when there is partial replacement of cement with oyster shell powder (15%). So, the optimum percentage of replacement of oyster shell powder is 15%.

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