iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** IV **Month of publication:** April 2019

DOI: https://doi.org/10.22214/ijraset.2019.4240

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

A Review on Experimental Investigation on Strength of Concrete by Partial Replacement of Cement by Oyster Shell Powder

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Abstract: ***Concrete is the widely used material in the world. This automatically creates a huge demand for ingredient of concrete (Fine Aggregate, Coarse Aggregate and cement). From the environment point of view, the huge extraction of the aggregate creates reduction and manufacturing of cement causes pollution. This scenario affects the worlds ecological balance. As a civil engineer, we have planned to replace the cement which is widely used in construction by oyster shell powder. For overcoming all these aspect need to present oyster shell powder can be beneficial as partial replacement of cement in concrete. The main objective of these paper is to check the strength of concrete after replacement of cement by oyster shell powder in various percentage such as 5% , 10% and 15% with the help of literature review found and studied. According to previous paper refer all the essential study and test are to be consider such as chemical test on cement and also on oyster shell powder for knowing chemical composition of the oyster shell powder. This is all research done to minimize the use of conventional material and form eco-friendly concrete.***

Keywords: oyster shell Powder, Ordinary Portland cement (53 Grade), chemical composition

I. INTRODUCTION

Half of the worlds population lives within 100 kilometer of ocean, 14 of the 15 largest cities in the world are coastal cities. The increasing worries of resource running down and universal pollution have lead to the development of new materials relying on renewable resources. Many by- products are used as aggregate for concrete. Oyster shell is mainly composed of calcium and the make it suitable to be used as partial cement replacement which provides an economic alternative to the conventional. Concrete is the widely used material in the world. This automatically creates a huge demand for ingredient of concrete (Fine Aggregate, Coarse Aggregate and cement). From the environment point of view, the huge extraction of the aggregate creates reduction and manufacturing of cement causes pollution. This scenario affects the worlds ecological balance. As a civil engineer, we have planned to replace the cement which is widely used in construction by oyster shell powder. oyster shell is the dead remain of the marine organism. We have replaced the oyster shell after grinding it to the powder to replacement of cement. The IS 10262-2009 be followed for the mix design grade concrete after that optimization of cement is done. Oyster shell which is used in concrete confirming to the zone II as per IS 383-1970. Then cubes were casted for the 3 parts of partial replacement as 5%, 10%, and 15 %, for cement by oyster shell powder. An oyster is a soft-bodied invertebrate that is found in the shallow waters of the sea river. It has a rough irregularly shaped, double-hinged shell. There is a high content of calcium carbonate in mussel and oyster shells, which can be used in the formulation of medicine, in construction or as filler in polymer materials. The mussel and oyster shells were heated in an oven at 200 ºC for 1 hour to make the shells more brittle and submitted to milling in a high-speed planetary mill with porcelain jar and alumina balls for 15 minutes with water. The powders are heated again to 500 ºC and maintained for 2 hours and to undo the clusters a new milling was performed without water for 1 minute.

COMPOSITION	RIVER OYSTER (%)	SEA OYSTER (%)
CaCo3	95.99	89.56
Sio2	1.283	4.04
MgO	0.68	0.65
Al2O3	0.40	0.42
SrO	0.35	0.33
Na2O	0.98	0.98
SO3	0.724	0.724

Table 1 - Chemical Composition of oyster Shell

II LITERATURE REVIEW

A. "Feasibility of Pulverized Oyster Shell as a Cementing Material", chou-fu liyang, hung-yu wang This research intends to study the cementing potential of pulverized oyster shell, rich in calcium, when mixed with fly ash and soil. Cylindrical compacted soil and cubic lime specimens with different proportions of the shells and fly ash are made to study the strength variance. Soil, which is classified as CL in the USCS system, commercialized pulverized oyster shell, F-type fly ash, and lime are mixed in different weight percentages. Five sample groups are made to study the compressive strength of soil and lime specimens, respectively. The lime cubes are made with 0.45 W/B ratio and the cylindrical soils are compacted under the standard Procter compaction process with 20% moisture content.

B. "An Effect on Oyster Shell Powders Mechanical Properties in Self Compacting Concrete" S.Abinaya, S.Prasanna venkatesh. From In this study, pozzolonic replaced with various percentages by oyster shell powder and the fresh and hardened properties of cement concrete were studied. In this study, it has been found that with the increase in various percentage of replacement river and oyster shell powder, hence if we increase the sea and river oyster shell powder replace of pozzolanic properties fly ash .so optimum percentage increase the river and sea oyster shell powder we have a better workable concrete is 5%.The result of the mechanical properties (compressive, split and flexure strength) have shown significant performance difference and the higher compressive strength has been obtained for oyster shell powder replacement level could be of optimum consideration for flow ability, mechanical properties study.

C. "Mechanical properties of seashell concrete" Monita Oliviaa and Annisa Arifandita Mifshellaa.(2015) In this research, the ground cockle seashell was used as a partial cement replacement. The ground seashells were prepared by burning, crushing, grinding and filtering the cockle using no200 sieve. The mechanical properties studied were compressive strength, splitting tensile strength, flexural strength and modulus of elasticity of seashell concrete. These properties were compared with those of a control Ordinary Portland Cement (OPC) concrete. Based on the trial mixes using the ground seashell with proportion of 2, 4, 6 and 8% by weight of cement, the optimum compressive strength was achieved for the mix that replaced cement by 4%. The seashell concrete yielded less compressive strength and modulus elasticity compared to the OPC concrete. It is noted that the tensile strength and flexural strength were higher than those of the OPC concrete, which is advantageous to increase concrete tension properties. In this study, the effect of replacing cement by ground seashell on the mechanistic properties of concrete was examined.

1) Replacement of the cement with the ground seashell led to a decrease of compressive strength of seashell concrete compared with the control OPC concrete.

2) The tensile and flexural strength of the seashell concrete were higher than the control concrete. The Young's Modulus of Elasticity of seashell concrete increased with the age of concrete.

3) It can be concluded that the concrete containing ground seashell yielded relatively better tension properties, but lower compressive strength and modulus of elasticity than the control concrete.

D. "Partial replacement of cement by groudnut shell ash and sea shell powder" V.Samidurai, G.Mahesh, M.Maruthupandi The construction industry relies heavily on cement for its operations in the development of shelter and other infrastructural facilities. Various research workers in the recent past had look into the utilization of agricultural wastes that are known to be puzollanas to partially substitute cement that is the major component of concrete. The use of Ordinary Portland Cement (OPC) and Rice Husk Ash (RHA) concrete in minimizing thermally induced expansion cracks has been identified. The utilization of Groundnut shell will promote waste management at little cost, reduce pollution by these waste and increase the economic base of the farmer when such waste are sold thereby encourages more production. Also, GSA production required less energy demand compared with cement production and safe the needed foreign exchange spent on importation of cement or its constituents. The effective utilization of these oyster shell wastes which are available almost free of cost and in abundance will not only reduce their pollution tendency but will help in reducing the amount of cement used in concrete work. Investigations are made in order to perform the partial replacement for cement in concrete by Groundnut Shell Ash and Oyster shell powder.

E. "Waste Shell Cement Composites" Anibal Ramirez, Steve D. Barker, Timothy J. Love, Edward J. Milazzo ,Lawrence P. McGillicuddy Seashells waste is a growing economic and environmental hazard. The purpose of this project was to use seashells in concrete and determine how the concrete would perform compared to a standard mix. The testing consisted of eight mix designs that contained either conch or oyster shells. The shells were used as a substitute for 10% or 25% sand, and 5% cement powder pending the mix design. Four of the mixes used shells that were vinegar treated to determine if that affected the strength of the concrete. These mixes were all compared to the control and each other through a series of tests. The tests

conducted were the 3-point bend test, compressive test, split tensile test, and shrinkage test. The samples were also examined using electron microscopy and x-ray diffraction.

F. "Composite cement mortars based on marine sediments and oyster shell powder" H. Ez-zakia, A. Diouria, S. Kamali-Bernardb, O. Sassic Additions of dredged marine sediments and oyster shell powder (OS) as cement substitute materials in mortars are examined by several techniques. The sediments have high water and chloride contents and calcite, quartz, illite and kaolinite as principal minerals. The OS powders are entirely composed of calcium car-bonate and traces of other impurities. Four mixtures of treated sediments and OS powders at 650 °C and 850 °C are added to Portland cement at 8%, 16% and 33% by weight. The hydration of composite pastes is followed by calorimetric tests, the porosity accessible to water, the bulk density, the permeability to gas, the compressive strength and the accelerated carbonation resistance are measured. In general, the increase of addition amounts reduced the performance of mortars. However, a reduction of gas permeability was observed when the addition was up to 33%. Around 16% of addition, the compressive strength and carbonation resistance were improved.

G. "A Review On Seashells Ash As Partial Cement Replacement" , Wan Ahmad Soffian Bin Wan Mohammad, Nor Hazurina Othman, Mohd Haziman Wan Ibrahim, Masazurah A Rahim, Shahiron Shahidanand Raha Abd Rahman. This review paper emphasis on various sea shells ash such as cockle, clam, oyster, mollusc, periwinkle, snail, and green mussel shell ash as partial cement replacement and its objective is to create sustainable environment and reduce problems of global warming. Cement production give huge impact to environment in every stage of its production. These include air pollution in form of dust and, gases, sound and vibration during quarry crushing and milling. One of the solutions to solve this problem is by using modified cement. The modified cement is a cementitious material that meets or exceeds the Portland cement performance by combining and optimizes the recycle and wasted materials. This will indirectly reduce the use of raw materials and then, become a sustain construction materials. Therefore, the replacement of cement in concrete by various sea shell ash may create tremendous saving of energy and also leads to important environmental benefits. This study includes previous investigation done on the properties of chemical and mechanical such as specific gravity, chemical composition, compressive strength, tensile strength and flexural strength of concrete produced using partial replacement of cement by seashells ash. Results show that the optimum percentage of seashells as cement replacement is between 4 – 5%.

H. "The Acoustical Performances of Oyster Shell Waste Based Green Concrete Materials" , Erni Setyowati and Gagoek Hardiman Research on green materials are continuously carried out by researchers, starting with research on middle-low income housing near the airport suffered by airport noise [1]. The orientation of housing facing the runway will have the biggest sound levels [2,3]. Efforts to control noise at middle-low housing annoyed by the noise will be more effective if housing uses a material that can absorb the sound. Therefore, this research is a part of a whole mapping research on housings noise control solution as a material which needs to be layered by another absorber material.Oyster shells in this research have function as cement substitution and provide aesthetic value on concrete materials. Types of shells observed in this research are: green mussels (Perna viridis Linn), blood clams (Anadara granosa Linn) and scallops (Placuna placenta Linn). All three shells were selected as samples in this study because it has a beautiful shell colors as well as having an acoustic performances.

I. "Tile Powder As Partial Replacement Of Cement In Concrete", Ponnapati. Manogna, M. Sri Lakshmi Tile powder is one of the most active research areas that encompass a number of disciplines including civil engineering and construction materials. The tile industry inevitably produces wastes, irrespective of the improvements introduced in manufacturing processes. In the tile industry, about 15%-30% production goes as waste. These wastes creates a problem in present-day society, requiring a suitable form of management in order to achieve sustainable development. In this thesis it illustrates about the behavior of concrete with partial replacement of tile powder in cement accordingly in the range of 0%, 10%, 20%, 30%, 40%, and 50% by weight for M30 grade of concrete. For this purpose the tile concrete samples are tested and compared with the conventional concrete. The following tests are carried out, i.e., compressive strength, tensile strength and flexural strength for 7, 28 and 56 days. The test results shows that the compressive strength

III CONCLUSIONS

As per the studied literature review the Replacement of cement with Oyster Shell powder improved the strength of concrete (M25) and the behavior of compressive strength of cubes changes after a certain point called peak point. The compressive strength increases as the percentage of Oyster shell powder replacing cement increases, this nature continues to the peak point. After the peak point, the compressive strength of cubes start decreasing. According to above paper the partial replacement of cement with oyster shell is up 5-10% is sufficient after that it starting to reduced strength.

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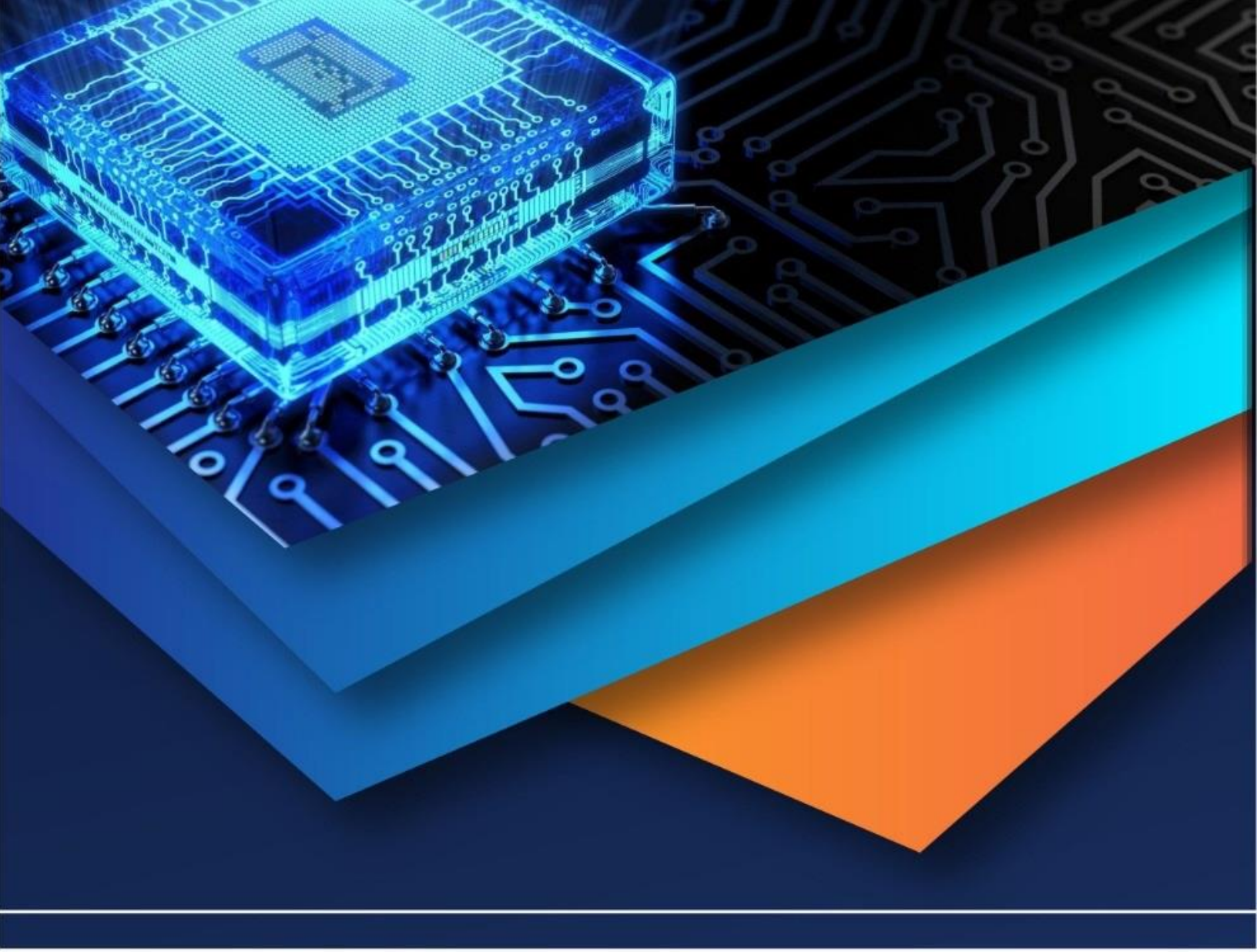

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