

EXPERIMENTAL INVESTIGATION ON STRENGTH AND DURABILITY OF CONCRETE BY PARTIAL REPLACEMENT OF CEMENT BY SEASHELL POWDER

Ms.Karthika.S¹, Mrs.Jayashree.J², Vensheeba Delin.P³

^{1&3}M.E scholar , Department of Civil Engineering, Sri Ramakrishna Institute of Technology , Coimbatore, Tamilnadu, India.

²M.E Assistant Professor , Department of Civil Engineering, Sri Ramakrishna Institute of Technology , Coimbatore, Tamilnadu, India.

Abstract- This experimental study of partial replacement of cement by seashell powder in the design mix of concrete M30. The mix design of concrete initially designed as per the IS 10262-2009 code book. The quantity of materials are calculated as per the requirement of cubes and cylinders for further consideration tests in terms of strength of the concrete. The 14th and 28th day of curing completed concrete samples (cubes & cylinders) are under gone to the such as compressive strength test, split tensile strength test and durability test. The seashell powder under gone to the test of X-Ray Diffraction (XRD) test for analysing the properties of seashell powder. It is basically used for the crystalline structure of seashell powder.

Keywords: seashell powder, Durability test, XRD analysis, mix design concrete M30, compressive strength, split tensile strength test.

1. INTRODUCTION

Concrete is a material plays a vital role in the construction industry. Based on the ingredients of concrete consists of cement, fine aggregate, coarse aggregate and water. Concrete easily adorable for all type of weather conditions. Mainly concrete highly classified under the category of unit weight, compressive strength and additives which have been added to the concrete mixture.

The concrete mix initially starts with the procedure of batching, mixing and placing of concrete. The concrete has been allowed to setting for 24 hours. It is simply concrete's final setting time. The concrete workability is also a vital consideration in the concrete utilisation and its quality based on this workability of concrete. The workability tested by few tests slump cone test, vee-bee consistometer, flow table test. Through this tests the workability of concrete has been easily computed as a factor.

2. LITERATURE REVIEW

Monita olivia et al (2017) This paper is a literature review of seashell aggregate concrete. The paper simply made a report about the physical, mechanical and chemical properties of the seashells. Majorly the properties which are studied. Possible applications in the construction industry are also highlighted.

Senthil Nathan L et al (2017) This reference paper explains about the partial replacement of cement by seashell powder. The ratios which are used in this study as 2, 4, 6 % to get the optimum strength of concrete. There were conducting compressive strength split tensile strength and modulus of elasticity of concrete. The bonding has also influenced the tensile and flexural strength. In this case the optimum of concrete obtained at the 4% ratio.

Indhu et al (2016) In this thesis made the study about replacement of sand by seashell powder as the ratio 2, 4, 6, 8 and 10%. With the similar tests are compared to the above study of reference paper. Likewise the tests on compressive strength and split tensile strength. Silica fume also used as an admixture which is a pozzolanic material. It gives the strength to the concrete. Other than this admixture addition, the tests which were similar to the above consideration of reference.

Devendran N (2018) This report said about the partial replacement of seashell by coarse aggregated and cement replaced by fly ash. In this investigation of study cockle seashells were used as replacement in concrete. The mix of concrete chosen for the practice as M30 concrete. The typrpes of ratios of replacement consists of 5, 10, 15% taken for the optimum results were obtained under the conditions of ratio. The main objective is to encourage the use of these products as construction materials in low-cost building materials.

3. NEED FOR THE STUDY

The need of this study majorly for the reason of making construction materials as low cost materials in the process of construction. Seashell is consists of maximized amount calcium carbonate or chitin by utilising these types of biodegradable materials it also helps in the way of using alternatives resources for the construction purposes as replacement. So this investigation made a reference of the partial replacement of cement otherwise coarse/fine aggregate.

4. METHODOLOGY

4.1 MIX DESIGN OF CONCRETE

The design mix of concrete which was designed as per IS 10262-2009 using Indian standard concrete mix proportioning guidelines. Following the IS 10262 norms and conditions the concrete mix of M30 has been designed from the quantity of material as per the weight of materials thus the ratio derived as 1:2.8:3.6.

4.2 XRD ANALYSIS OF SEASHELL POWDER

XRD Analysis by the way of the study of crystalline structure, is used to identify the crystalline phases present in a material .This test reveals the chemical composition information and behaviour of the sample of seashell powder. The configuration of the sample at the type of flat sample stage with the diffractometer system as nature of XPERT – PRO. The scan axis named as Gonio and its Goniometer radius calculated as 240.00 mm. There is no Incident Beam Monochromator arrangement in the sample testing. The scan type is at continuous mode with scan step time counted as 5.7150 secs. The main graphic analyze view of sample

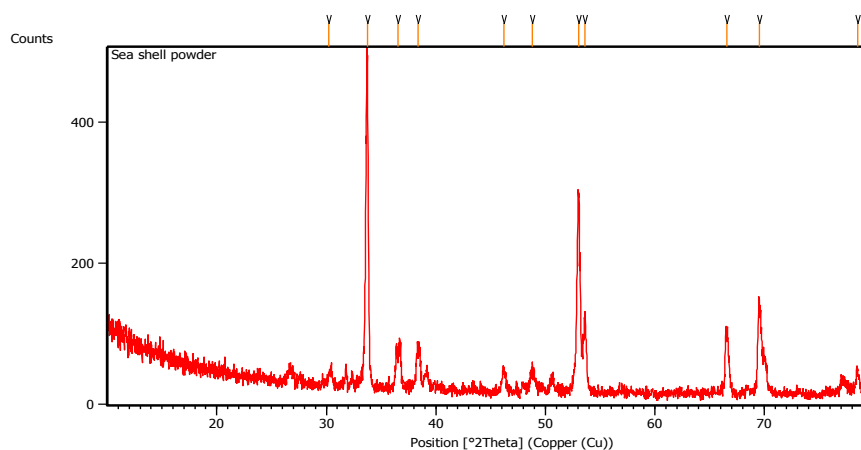


Fig.1Graphical view of sample

5. RESULTS AND DISCUSSIONS

5.1 COMPRESSIVE STRENGTH OF CUBES

The compressive strength of cubes are tested under the ratios of replacement of seashell powder as 2, 3, 4 and 8%. The graphical representation which shows about the seashell powder inducing the strength of concrete. The optimized strength obtained at 6%.

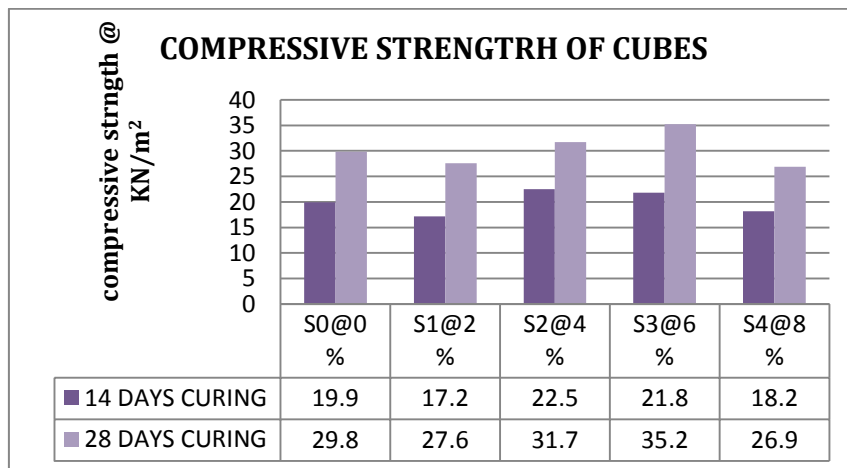


Chart.1 Compressive Strength of Cubes

5.2 SPLIT TENSILE STRENGTH OF CYLINDERS

The split tensile strength of cylinders has been tested in this case, tensile values of cylinders also gets increased and falls down and again rise at the 8% of seashell powder partial replacement in cement. Further on the graphical view explained about the split tensile strength.

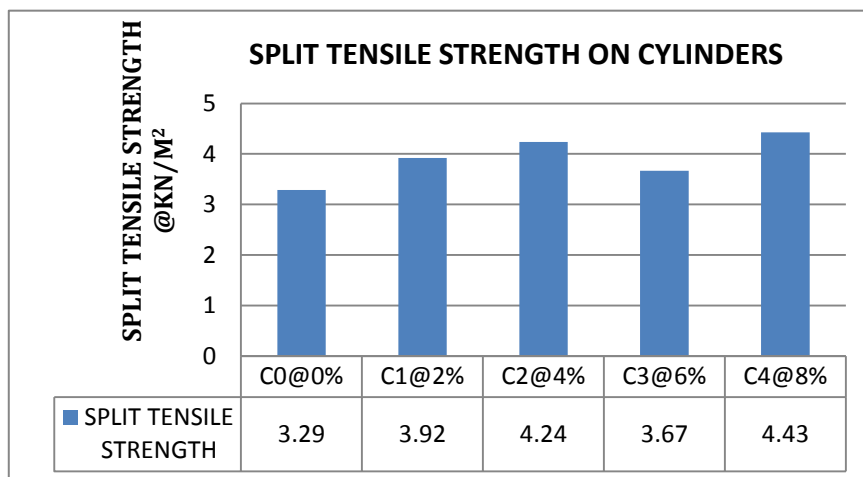


Chart.2 Split Tensile Strength on Cylinders

5.3 DURABILITY TEST

The main test to know about the durability of concrete, there are two major tests used such as Sulphuric acid attack test and Hydrochloric acid attack test. From this two tests the comparative analysis between the nominal mix of concrete and partial replacement of seashell in the concrete mix.

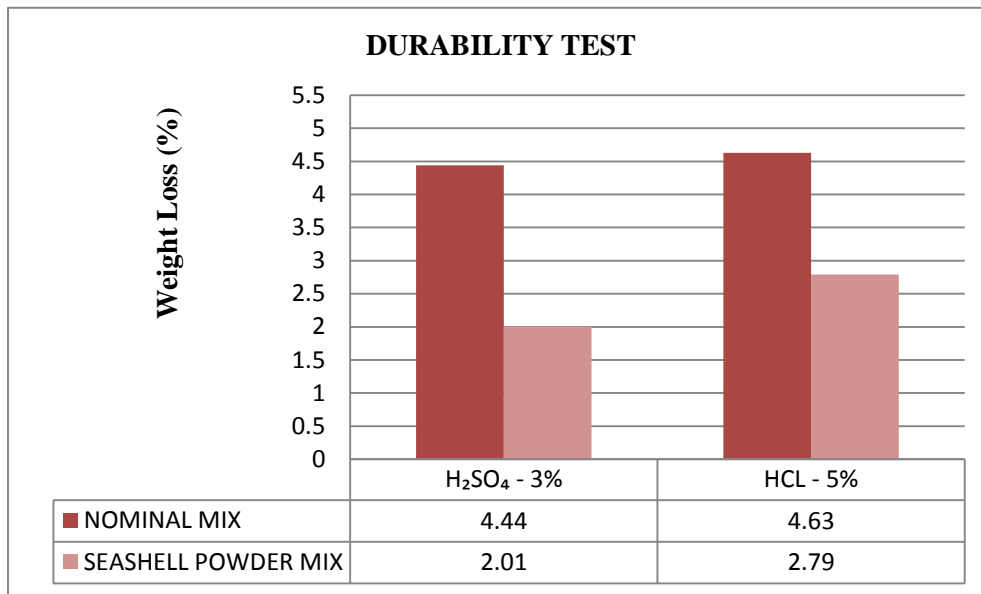


Chart .3 Durability Test

6. CONCLUSION

The mix design and strength, durability of concrete and properties of materials were studied and tested. The mix design has been done as per code of IS 10262 as per weighed quantity of materials the ratio derived as 1:2.8:3.6. The casted and testing of specimens were shown the better results at the replacement of seashell powder by the cement in concrete. The properties of seashell powder studied through the X-RAY Diffraction (XRD) test. It gave the optimized strength of concrete while adding the seashell powder as a replacement.

REFERENCES

1. Devendhran. N “Experimental study on strengthening of concrete by replacing seashell and fly ash”. By IRJET (2017).
2. Uchechi et al “Properties of Seashell Aggregate Concrete- A Review” by Elsevier publications (2017).
3. Senthil Nathan. L “Increasing the compressive in concrete with the partial replacement in cement by seashell powder”. By journal of Engineering and applied sciences (2018).
4. Indhu. S “Developing concrete using seashell as fine aggregate”. By International journal for innovative research in science & Technology (IJIRST) (2017).
5. Monita Olivia et al “Mechanical Properties of seashell concrete”. By Elsevier Publications (2016).