Indo American Journal of Multidisciplinary Research and Review
ISSN: 2581 - 6292 / Website: www.iajmrr.com

A STUDY ON POLYMER CONCRETE WITH DIFFERENT VOLUME FRACTION OF COIR FIBRE

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Cite This Article: R. K. Manikandan, G. Preethi Sindhu, S. Arthi & P. Dhivya, "A Study on Polymer Concrete with Different Volume Fraction of Coir Fibre", Indo American Journal of Multidisciplinary Research and Review, Volume 2, Issue 1, Page Number 24-26, 2018.

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Abstract:

The in this article it is discussed about the experimental on mechanical properties of polymer concrete with coir fibre of different volume fraction. From this experimental study, it is found that the strength increase slightly, but the split tensile strength increases due to the presence of fibres the development of crack was delayed and the load absorption is higher for polymer concrete with 2% of fibre content.

Introduction:

It has been shown from previous studies (Eether Thanon Dawood et al 2012) that the concept of hybridization with two or three different fibres incorporated in a common cement matrix can offer more attractive engineering properties because the presence of one fibre enables the more effective utilization of the potential properties for the other fibre. Steel fibre has a considerably larger length and higher Young's modulus of elasticity as compared to the other fibre-types. This leads to an improved flexural rigidity and has great potential for crack control, although the volumetric density is high. It is also important to note that steel is conductive in both electric and magnetic fields and hence, the steel fibre content has to be reduced to a certain level. Optimization of mechanical and conductivity properties can be achieved by combining different types of fibres, such as in the case of natural fibres (coir, sisal, and palm fibre) and steel fibres. The attractive advantage of hybrid fibres system is that it provides a system in which one type of fibre, which is stronger and stiffer, improves the first crack stress and ultimate strength, where the second type of fibre, which is more flexible and ductile, leads to the improved toughness and strain capacity in the post-cracking zone. It also contributes to a hybrid reinforcement, in which the smaller fibre bridges micro cracks and reduce crack widths. This leads to a higher tensile strength of the composite. The second type of fibre is larger, so that it can arrest the propagating macro cracks and can substantially improve the toughness of the composite. However, most of the research work and utilization of fibre reinforcement are about monotype fiber. Using hybrid fibres as reinforcement to improve the performance of concrete are not frequently reported. Therefore, the research would present the results of some properties of high strength concrete added with hybrid fibres. Olaoye, et.al. (2013) this paper focuses on utilization of some fibres as solid wastes for making economically-friendly and affordable green environment. Natural fibre is 100% bio-degradable and recyclable, thereby eliminate pollution, promote biodiversity and conservation of natural resources and thus environmentally friendly. Three fibres: Jute, Oil palm and Polypropylene fibres were used as complement in concrete and its suitability, durability and influence on the properties of concrete were assessed. The percentages of fibre used were 0.25 and 0.5 of cement content by weight. A total of 84 concrete cube specimens were prepared for standard tests which include compression test, slump test and compaction factor test. The test results showed that for Jute and Oil palm fibres, the optimum fibre content was 0.25% and for Polypropylene fibre, the optimum fibre content was 0.5%. They all yielded increase in strength when compared to the control specimen and has proven to reduce reasonable environmental waste pollution. Shelorkar Ajay P et al., (2013) in the present day construction industry needs of finding effective materials for increasing the strength of concrete structures. Hence an attempt has been made in the present experimental investigations to study the effect of addition of steel fibre at a dosage of 1.5% of the total weight of concrete as fibres. Metakaolin was used at 8% of the total weight of cement as metakaolin, and the addition of steel fibres at 1.5% and 8% of metakaolin. Experimental investigation was done using M40 mix and tests were carried out as per recommended procedures by relevant codes. The results were compared with control concrete it was observed that concrete blocks incorporated with steel fibre increased its compressive strength by 8.91% and tensile strength by 26.94%. K. Ramesh et al (2013) the present Experimental investigation is to study the Mechanical Properties of the Fly ash concrete reinforced with steel fibers. Steel fibers varied from 0%, 0.5%, 1% and 1.5% by weight of cement. Specimens were tested for 28 days, 60 days and 90 days. Based on the experimental results, it was found that the amount of steel fibers which can be added to the concrete for improving its strength characteristics may be 1% by weight. Addition of steel fibers more than 1% generally affects the Compressive strength, Split tensile strength and Flexural strength of the concrete. The optimum steel fiber may be added to the concrete without flyash may be taken as 1%. Jane Proszek Gorninski et al (2004) this study is to assess the modulus of elasticity of polymer concrete (PC)

compounds produced using two types of binders: orthophtalic or isophtalic polyester. Based on those data, the concentrations of polymer used were 12% of orthophtalic polyester and 13% of isophtalic polyester by weight of the dry materials. Fly ash was used as filler and compositions with 8%, 12%, 16% and 20% of ash by weight of aggregate were studied. The results indicate that all compositions assessed in this study display high modulus of elasticity values. Statistical analysis of the data reveals that the type of resin and the concentration of fly ash, both in isolation and in combination, have a significant effect on the modulus of elasticity of these compounds. Kou Shi-Cong et al (2013), In this metakaolin (MK) and fly ash (FA) were used as filler and compositions with 0%, 10% and 15% by weight of recycled glass sand (<2.36 mm) were used to investigate the mechanical properties of the PC. In this study the resin content 13% by weight of cement. And the results display high strength and modulus of elasticity values. MK and FA have a significant effect on the compressive strength, the flexural strength and the modulus of elasticity of the PC.

Materials:

In this project, 53 Grade Ordinary Portland cement is used. Aggregate which is passed through 4.75 IS Sieve and retained on 75micron (0.075mm) IS Sieve is termed as fine aggregate. The coarse aggregate for the works should be river gravel or crushed stone. Angular shape aggregate of size is 20mm and below. The super plasticizer used in this project conform the guide lines drawn by IS 9103-99, ASTM C 494 Type A or F. Silica fume is the most commonly used mineral admixture in concrete. Coir fibre of Average fibre length (55 mm) and Average fibre diameter (0.45mm)

Mix Proportions:

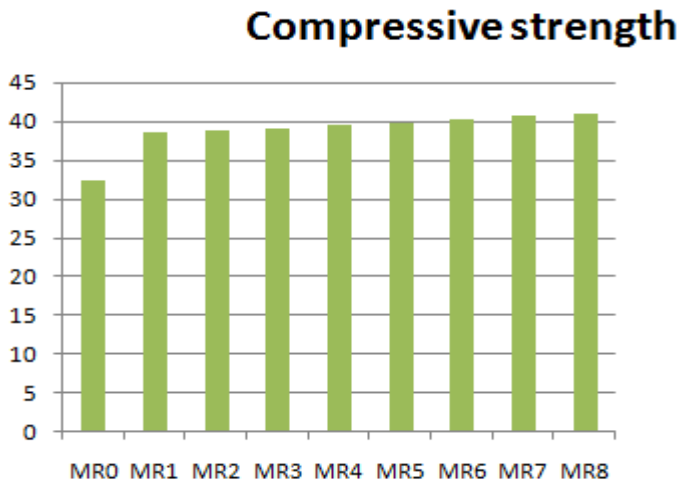
The mix design for the above grade of concrete was done as per IS 10262:2000 and mix ratio of 1:1.32:2.83.

Mix	Cement (%)	Epoxy Resin (%)	Fly Ash (%)	Silica Fume (%)	Coir Fibre (%)
MR0	100	0	0	0	0
MR1	52.0	8	25	10	0.25
MR2	52.0	8	25	10	0.5
MR3	52.0	8	25	10	0.75
MR4	52.0	8	25	10	1.0
MR5	52.0	8	25	10	1.25
MR6	52.0	8	25	10	1.5
MR7	52.0	8	25	10	1.75
MR8	52.0	8	25	10	2.0

Results and Discussion:

Compressive Strength:

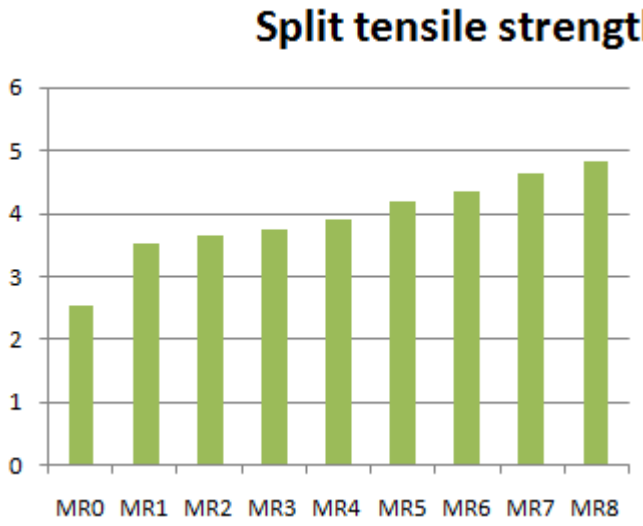
Three cube samples of 150 mm are used for each mix to test the compressive strength. Specimens stored in water shall be tested immediately on removal from the water and while they are still in the wet condition. The test results are plotted in graph below.



Split Tensile Strength:

The test was carried out according to IS standard to obtain the splitting tensile strength using the average of three concrete cylinders (150 X 300 mm). The results are shown for the average split tensile strength in graph below.

From the graphs shown above the compressive strength increases slightly due to increase in percentage of lower modulus fibre. And from split tensile strength it was observed that the reinforcement produces good improvement in strength which was influenced due to the fibre present.



Conclusion:

The result showed that the compressive strength slightly increases but because of the presence of fibre, the splitting tensile strength increases and due to increase in ratio of volume fraction of fibre the strength increases.

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