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COCONUT SHELL AS PARTIAL REPLACEMENT OF COARSE AGGREGATE IN CONCRETE: REVIEW

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Abstract: The prices of building materials are rising day by day. The main ingredient of the concrete is coarse aggregate. Nowadays, many of the researchers are researching the material which can reduce the cost of construction as well as increase the cost. In developing countries, the possibility of using some agricultural wastes as well as industrial by-products from different industries as construction materials will be highly desirable & has found to have several practical advantages. It was observed that the coconut shell has a great potential as a partial replacement of the aggregate in the concrete. The present work is only an accumulation of information about GFRGC and the research work which is already carried out by other researchers.

Keywords: Coconut shell, aggregate, partial replacement, lightweight concrete



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INTRODUCTION

Concrete is an artificial material similar to similar in appearance & properties to some natural lime stone rock [4]. It can be assumed to be manmade composite; the major constituent of it is natural aggregate such as gravel or crushed rock, sand & fine particles of cement powder & ultimately mixed with the water. While the construction material cost is increasing day by day; the reasons are high demand, scarcity of raw material as well as high price of energy

Coconut shell represents more than 60% of domestic waste volume [6]. Coconut shell is an abundantly available agricultural waste from local industries. So, in developing countries like India, these wastes can be used as potential material or replacement material in the construction field.



Fig. 1 Coconut shell as aggregate [4]

This will ultimately lead to the reduction in the cost of construction material as well as a means of disposal of waste.

REVIEW OF LITERATURE

The experimental investigations were carried out [1] for the utilization of three types of aggregate such as quartzite, granite, & river gravel in the concrete work. The test result showed that the concrete made from river gravel has the highest workability followed by crushed quartzite & crushed granite aggregates. While it was also observed that the highest compressive strength at all ages noted with concrete made from quartzite aggregate followed by river gravel & then granite aggregate. It was advised that aggregate made from quartzite to be used for the concrete work.

The study was made for the properties of concrete with coconut shells as the replacement of aggregate [2]. The concrete with normal aggregate as well as coconut shell (CS) concrete with 10-20% coarse aggregate replacement with coconut shell were made. The result showed that

the density of concrete decreases with increase in coconut shell percentage. It was also observed that the compressive as well as split tensile strength of CS concrete was found to be lower than the normal aggregate concrete. Also permeable voids, absorption & sorption were found to be higher for CS replaced concrete than normal aggregate concrete.

The concrete was produced in the study [3] for 20%, 30%, 40 %, 50% & 100% replacement of crushed granite by coconut shell by volume. The several concrete cubes were produced & density as well as compressive strengths of concrete was evaluated at 7 days, 14 days, 21 days & 28 days. The result showed that the concrete produced by replacing 18.5% of the crushed granite by coconut shells can be used in reinforced concrete construction. The use of coconut shell as partial replacement for conventional aggregates encouraged through the study as an environmental protection as well as construction cost reduction measure.

Trial mix proportions for palm oil clinker were studied [5]. The consistency of the paste, slump, fresh unit weight & yield were noted. Three cubes were casted where the mix was considered homogenous. It was observed that the POC aggregate in concrete mix design was possible without any admixture.

The experimental investigation was carried out [8] for the effect of cementitious materials, fine & coarse aggregate content on workability & compressive strength of palm kernel shell concrete. The specimens were cured under three different curing environments & studied the effect on compressive strength. The 28 day compressive strengths of the mixes containing cementitious material were found in the range of 26 to 36 MPa. It was also observed that the difference in strength between water cured & specimen cured under controlled environment was found to vary between 3% & 5%.

The experimental investigations [10] was carried out on the use of kernel shell as lightweight aggregate which produced grade 35 lightweight concrete. In the study, the cementitious materials included 10% of silica fume as additional cementitious materials & 5% fly ash as cement replacement materials. It had been found that the increase in sand content had positive influence on the mechanical properties of concrete. The sand content found likely to increase density as well as compressive strength.

CONCLUSION

From the above literature following point are observed:

- The strength & density of concrete is reduced with the increase in percentage of coconut shell
- 15% to 20% replacement of crushed granite with coconut shells can be used to produce structural concrete
- Addition of coconut shell should be up to certain limit (18%) so that the compressive strength as well as split tensile strength shows good result

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