

CORK COMPOSITE CONCRETE: A REVIEW

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ABSTRACT

Cork is a natural material which is obtain from cork oak tree and has always been associated to mankind having huge potential and many uses. The cork industry worldwide consumes more than 280,000 ton of cork a year. However, about 20% to 30% of the raw cork received at the processing units is rejected. Present study has been performed to examine the various research, that have been performed in order to find the impact of cork used as sand replacement or stone replacement on the plastic, mechanical transport and thermal properties of mortar and concrete.

Cork composite concrete is presently used for making lightweight concrete because these granules are lighter than many lightweight aggregate. Cork consist some good qualities so that we are introducing this material to making concrete. This paper discusses the properties of cork and its compatibility with cement.

KEYWORDS - Cork, Composites, Cork Properties, Cork application.

I. INTRODUCTION

Cementations materials, mainly in the form of concrete, are the most successful materials in the world. Every year more than 1 m³ is produced per person worldwide. The huge volumes of cement and concrete produced mean that cement production accounts for some 5–8% of man-made CO₂ emissions. Therefore there is increasing pressure to innovate to improve sustainability [5]. Several type of industrial waste such as blast furnace slag, fly ash, slag and agricultural residues like rice husk & ash, which were used upto recent times in large quantity as raw materials. There are still many other industrial wastes which are not used yet. Cork can also be used in concrete and can be a good waste material to replace aggregate.

Cork is a natural, organic and lightweight product with high dimensional stability. These features allow cork to be used in a wide range of applications, such as, lightweight filler in thermal insulating solutions, aggregate for concrete, reduced weight concrete panels and also for acoustic insulation in floating floors. But cork also has other important characteristics in addition to being a natural and ecological product. It does not release noxious fumes or odors and it is a material that remains unchanged while maintaining its efficiency over long periods of time [6].

II. LITERATURE REVIEW

Matos et al. [1] described the application of the waste material generated from cork industry especially in form of cork powder and using in concrete as an aggregate. An experimental study has been conducted to find the strength, durability and other properties of cork to find whether it can be used in concrete. Some important properties of cork powder have been identified such as water absorption, specific gravity and compared with natural aggregate. The experiment includes preparation of mortar with cement and cork powder, then sand is replaced by cork powder. The compressive strength of mortar cube is calculated with 0.85 of mixing water. Self compaction property of concrete with cork and suitability of cork composite concrete has been analyzed.

D.K. Panesar [2] performed an extensive study to examine the impact of cork by replacing sand and by replacing stone on properties of concrete. The results obtained in the study show the condition between sand replacement and stone replacement gives beneficial result. Mortar prepared with sand replacement as 0%, 10%, 20% and experiments are conducted. All concrete mixtures were prepared in accordance with CSA. Then concrete compressive strength was calculated by ASTM in 3, 7 and 28 days with cork composite concrete. Thermal resistance of cork composite concrete also evaluated. Cork density was also examined and it was observed that density increases as cork size decreases. Workability of cork based concrete was also calculated. All properties were calculated with stone replacement (3-8 mm) to (6-14 mm) to cork material. The permeability test has conducted on cork based concrete to account its durability performance.

Novoa et al. [3] investigated the mechanical behavior of cork mortar. Flexural and compressive strength of cork mortar also estimated according to standard test method. The test results show that the strength of cork composite concrete increases with addition of cork granulates. Modulus of elasticity of cork affected to cork considered in present work.

Karade et al. [4] examined the mechanical properties of cork. Density of cork was compared with aggregate. The variation of various chemical compositions has observed. The main composition is suberin which varies from 35% to 40% in cork. Comparison between characteristic of cork and wood has studied and cork significantly found to be impermeable because presence of suberin in cork.

III. CONCLUSION

Primary results show that there is good compatibility between cement and cork. Cork is a lightweight, water resistant material which is available in large amount. Cork can be replaced with sand and aggregate. Future work must be carried out to improve the properties of cork. Optimum 28 day cube strength of 24.3 MPA for cement–cork composites can be achieved with 10% of 0.5–1 mm cork granules used as sand replacement. Increasing the cork size may reduce the strength and increase porosity. Thermal conductivity of cork composite concrete decreases as the density of concrete decreases. The percentage of cork used in concrete as sand or stone replacement effect the thermal and mechanical properties of cork as compared to the size of cork.

Before cork can be fully exploited in practice there should be some more research to analyses the behavior of this new material.

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