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The Effect of Ceramic Waste on the properties of concrete by Using steel tube

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ABSTRACT

Waste management is one of the major challenging issues in the modern world due to rapid urbanization and industrialization over the past decades. The use of ceramic waste, originated from construction sites and industries, as fine and coarse aggregate in concrete presents an effective and sustainable endeavor to environmental problems through the reduction in the degradation of natural resources caused by extraction of natural aggregates and decrease in dumping volume as well. A plethora of researches has been attempted to analyze the suitability of ceramic wastes from various sources as a possible alternative to natural aggregates in concrete. This paper presents an assembled and up-to-date review of the physical, mechanical, durability, and other notable functional properties of ceramic aggregate concrete. From the outcome of the researches, it has been observed that ceramic aggregate concrete possesses comparable mechanical and durability properties to that of conventional concrete. The results show that it is possible to produce medium and high strength concrete with the incorporation of ceramic aggregates instead of natural aggregate. It is also seen from the results that the compressive strength, permeability characteristics, bond strength, etc. of ceramic aggregate concrete met the

required criteria set by various international standards and codes, which confirms the potentiality of ceramic waste to be used as an efficient substitute to natural aggregates in structural concrete. However, the structural performance of ceramic waste-based reinforced concrete members is not yet explored in the researches, and therefore, recommendations are provided for future research.

INTRODUCTION

In the present construction industry, the utilization of ceramic materials is growing day by day in the form of ceramic tiles, electrical insulators, sanitary ware fittings, etc. But a huge quantity of ceramic materials goes to waste during manufacturing, transporting, processing, and placing due to its brittle nature. Waste ceramic (WC) is produced majorly by ceramic industry. WC has different types like ceramic tile, waste ceramic powder (WCP), sanitary ware, and ceramic electrical insulator waste. The utilization of WC in concrete can decrease the utilization of natural raw materials, which leads to sustainability and economic competence of the construction industry.

Concrete incorporating WC decrease the fresh density and hardened density, and it reduce linearly with the increase in the ceramic content. The hardened properties of concrete commonly reduce as the ceramic content incorporated is increased. However, the compressive, flexural, split tensile strength (STS) and modulus of elasticity of ceramic concrete, which is slightly above of reference concrete (RC)

Use of hazardous waste in concrete will lead to green environment. The concrete made so is called sustainable concrete which can also be called as Green concrete. Production of by-products and waste are increasing rapidly which need proper disposal , it's recycling and reuse is necessary for protection of environment, reduction in dependency on natural materials, reduction in CO2 and making concrete efficient and economical. The importance of sustainable concrete has become considerable for academia and industries.During manufacturing process and transpiration lots of ceramic product brake and ceramic waste generated every year. Ceramic products made of glazes, stains and clay which contains toxic metals like Antimony, vanadium, cadmium, copper, cobalt, lead,

manganese, chromium, selenium and barium [2]. Ceramic wastes is mostly used for landfilling which makes neighboring land unfertile and contaminate groundwater.

The objective of this investigation is to study and evaluation of the effects of the recycled ceramic as fine, coarse aggregate and ceramic fume as replacement for conventional material on the properties of concrete and cement matrix. In this study the effect of the replacement of conventional material with ceramic waste on the properties of concrete such as workability, Compressive strength, flexural strength, modulus of elasticity, split Tensile strength, Adhesive strength are studied in depth.

LITERATURE REVIEW

R.M. Senthamarai et al. (2005) substituted conventional crushed stone aggregate with ceramic electrical insulator. Different water cement ratio of 0.35, 0.40, 0.45, 0.50, 0.55 and 0.60 were adopted. Compressive strength, split N IJSER International Journal of Scientific & Engineering Research, Volume 7, Issue 4, April-2016 248 ISSN 2229-5518 IJSER © 2016 http://www.ijser.org tensile strength, flexural strength and Modulus of elasticity were found out. It is found that the compressive, split tensile and flexure strength of ceramic coarse aggregate are lower by 3.8%, 18.2% and 6% respectively when compared to conventional concrete

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Alves et al. studied the replacement of 0%,20%,50% and 100 % of total natural aggregate volume with recycled aggregate (recycle brick and sanitary ware aggregate) for determination of its mechanical properties i.e. workability, Fresh density, compressive strength , split tensile strength, modulus of elasticity, abrasion resistance and influence of superplasticizers.

Medina et al. (2012) investigated on the reuse of waste as recycled coarse aggregate in partial substitution of 15%, 20% and 25% in the manufacture of structural concrete. Compressive strength is found out t 7, 28 and 90 days. There is an increase in strength with increase of percentage replacement, the best results shown is at 25% with increase of 21.12%, 11.04% and 6.70% at 7, 28 and 90 days respectively.

Wioletta et al. Studied about the properties of cement matrix modified with ceramic waste by the addition of ceramic filler (10%, 15% and 20% of cement mass) with Mortar and tested its consistency retention, workability retention, shrinkage test, freeze-thaw resistance test, flexural

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