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Partial replacement of E-plastic Waste as Coarse-aggregate in Concrete

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Abstract

The management and recycling of E plastic waste is rapidly growing as it is a valuable resource of IT industries and it is very hazardous substances and with low recycling rate. The Utilization of e plastic waste materials is a partial solution to environmental and ecological problems. As the use of E plastic waste will reduces the Aggregate cost and provides a good strength for the structures and roads. It will reduces the landfill cost and it is energy saving. The e plastic waste consists of discarded plastic waste from the old computers, TVs, refrigerators, radios; these plastics are non-biodegradable components of E plastic waste as a partial replacement of the coarse or fine aggregates.

An experimental study is made on the utilization of E-waste particles as fine and coarse aggregates in concrete with a percentage replacement ranging from 0 %, 20% to 30% i.e. (0%, 10%, 20% and 30%) on the strength criteria of M20 Concrete. Compressive strength, Tensile strength and Flexural strength Concrete with and without E- waste plastic as aggregates was observed which exhibits a good strength. The feasibility of utilizing E-waste plastic particles as partial replacement of coarse aggregate has been presented. In the present study, compressive strength was investigated for Optimum Cement Content and 10% E-plastic content in mix yielded stability and very good in compressive strength of 53 grade cement.

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Keywords: E plastic waste, Concrete, Compressive strength;

Introduction

Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are

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destined for reuse, resale, salvage, recycling or disposal are also considered as e-waste. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, as these countries have limited regulatory oversight of e-waste processing (Subramanian et al 2000).

Electronic scrap components, such as CRT‘s (cathode Ray Tube), may contain contaminants such as lead, cadmium, beryllium, or brominated flame retardants. Even in developed countries recycling and disposal of e-waste may involve significant risk to workers and communities and great care must be taken to avoid unsafe exposure in recycling operations and leaking of of materials such as heavy metals from landfills and incinerator ashes

One of the new waste materials used in the concrete industry is the recycled e plastic. For solving the disposal of large amount of recycled plastic material, the reuse of plastic in concrete industry is considered as the most feasible application. Recycled plastic can be used as coarse aggregate in concrete. However it is important to underline that reusing of waste is not yet economical advantages, due to high cost of transport in these effect on the total costs of production .Moreover, it is important not to neglect other costs, directly referable to the kind of waste, due, in particular, to the need of measuring gas emission, during firing, and the presence of toxic and polluting elements. (Alhozaitly et al 2009).

The environmental impact of the processing of different electronic waste components

E-Waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table - a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove final metals after chips are removed.	Air emissions as well as discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	Hydrocarbons, heavy metals, brominated substances discharged directly into rivers acidifying fish and flora. Tin and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals and hydrocarbons
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominated dioxins, heavy metals and hydrocarbons
Computer wires	Open burning and stripping to remove copper	Hydrocarbon ashes released into air, water and soil.

Plastic recycling

Recycling is the practice of recovering used materials from the waste stream and then incorporating those same materials into the manufacturing process. Recycling is one of the prominent is used in these environmentally conscious era (Hai-Yong Kang et al 2005).

These are three main arguments for recycling:

- Firstly, it preserves the precious natural resources;
- Secondly it minimizes the transportation and its associated costs;
- Thirdly, it avoids the environmental load caused by waste materials, i.e. space requirements

Recycling methods and construction applications:

1. Chemical modification
2. Mechanical recycling
3. Thermal processing
4. Fillers

1) Chemical modifications - Plastics can be recycled by chemical modification or depolymerisation .the two ways to achieve depolymerisation i.e. hydrolysis (chemical decomposition) and pyrolysis (thermal