EFFECT OF ADDITION OF THE SOLID WASTE OF GLASS REINFORCED PLASTIC (GRP) INDUSTRY ON THE COMPRESSIVE STRENGTH OF THE HARDENED CEMENT MORTARS

Submitted By

Abdel Fattah Mahmoud Abdel Fattah Gharieb

B.Sc. Science (Chemistry – Botany), Faculty of Science, Ain Shams University, 2003

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
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Department of Environmental Basic Sciences
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ABSTRACT

In this study the effect of incorporation of recycled glass reinforced polymer (GRP) waste materials, obtained by means of milling processes, on mechanical behavior of polyester polymer mortars was assessed. For this purpose, different contents of recycled GRP waste powder, with distinct size grading, were incorporated into cement based mortars as solid admixture and filler replacements.

GRP is a composite material made of glass fibers dispersed in a resin, usually polyester, which is widely used in several fields from buildings to furniture to boats. Worldwide, there is a growing use of GRP due to its lightness, high mechanical performance, possibility of production in any shape and ease of installation and good durability.

In fact, most of the glass-reinforced plastics industry solid waste (GRP) have negative effects on the environment and the need for additional costs to remove them or safe disposal. With the progress in the knowledge of environmental science and the use of recycling by recycling waste with high costs for disposal to the products can take advantage environmental protection and environmental development techniques.

According to modern uses of some solid waste has the idea has grown to the use of waste steel output for reinforced plastics industry glass in improving physical and mechanical properties of slurries of cement, mortar and concrete hardened, in order to protect

the environment from the accumulation of this waste and also take advantage of it when it is used in the production of products to build its yield and economic affairs in order to environmental development.

In this study, it adds different proportions of GRP is at 0.5, 1, 2.3, 4, 5, 6% of the cement weight of mortar which made by 1: 3 of cement and sand with using the ratio by weight ,40 from the water to cement weight. The mortar samples cured for 24 hours (from mixing with the water time) when the relative humidity of 100% then submerged under water for various times of a 3, 7, 28 and 90 Days conducted compressive strength measurements and total porosity of the hardened pastes at different times of the cement interaction, and so for the control mortar samples (without the addition of GRP) and samples containing different ratios of residue GRP

The viability of improving some durability aspects of mortars through the addition of dosages of very fine Glass Reinforced Plastic by-product was investigated if was found that GRP dust increases the compressive strength performance of the hardened mortars up to a certain limit (4 – 5% addition); 6% GRP addition leads to a negative effect on compressive strength where GRP act as a filler .

The extent of improvement in compressive strength is higher at early ages of hydration and to a less extent at the late ages of

hydration. The results of scanning electron microscopy (SEM) indicate the densification of structure of the hardened mortar pastes.

the study concluded that the optimal ratio to add GRP to cement mortar is 5% for the weight of the cement, and representing the highest improvement in physical and mechanical properties of hardened mortar slurries containing waste GRP.

GRP waste materials as efficient and sustainable reinforcement and admixture for concrete and cement mortars composites, constituting an emergent waste management solution.

Keywords: GRP waste, Mechanical behaviour, mortars, Recyclability

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