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Use of recycled polyethylene terephthalate (PET) & rice hull in polymer concrete

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In this work we study the application of recycled post consumed Poly (ethylene terephthalate) (PET) products in polymer concrete composites since it helps to reduce the environmental pollution created by PET. The PET source of the present study was the used plastic soft drink bottles. Those were cut into small pieces and depolymerized into oligomers using glycolysis method. Propylene glycol was used as the solvent for the depolymerization process & it was done at 240 °C & under inert condition. After depolymerization process mixture of Diglycol terephthalate was obtained. Depolymerized product was repolymerized into unsaturated polyester with maleic anhydride to obtain unsaturated polyester (UP) resin. Repolymerization process was carried out at 180 °C under inert condition. Water was removed from the reaction mixture by heating in an oven at 105 °C. The resultant high viscous UP resin was mixed with styrene monomer to obtain low viscous UP resin.

In the preparation of polymer concrete, UP resin was cross-linked with styrene monomer using radical copolymerization reaction. For this process Methyl ethyl ketone peroxide (initiator) & Cobalt Napthenate (accelerator) was added. Before the resin get cured fillers (Rice Hull Ash (RHA), gravel and sand) were mixed with UP resin in different ratios to obtain the highest strength for the polymer concrete

The results of the present study point up a potential method of using recycled PET and RHA to produce a concrete composite with higher strength compared to normal concrete. Highest compressive strength obtained for the polymer was 64.24 N/mm^2 & the filler ratio was 45% gravel, 21% sand, 14% RHA and 20% UP resin. Compressive strength obtained for the cement concrete was 45.30 N/mm^2 & the cement: sand: gravel ratio was 1: 2: 4.

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