Application of Various Hydroxide Treatments to Increase Plastic Waste Ratio as a Substitute for Sand in Concrete Solutions

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Environmental and economic concerns over accumulating plastic waste and dwindling reserves of fine-grade sand are on the rise. A proposed solution to both problems has been to replace sand with plastic for concrete aggregate. Past research has shown that concrete aggregates can be made with a 1:9 plastic to sand ratio without compromising structural integrity. The objective of this research was to determine if shredded plastic could be treated with different hydroxide treatments to increase the plastic to sand ratio. The results revealed that plastic treated with a 5% hypochlorite + sodium hydroxide treatment or 5% hypochlorite + calcium hydroxide solution produced stronger concrete solutions than untreated plastic and allowed for a higher plastic to sand ratio. A t-test was completed at a= 0.01 and revealed the data for both treatments to be statistically significant. It is believed the results of the experiment occurred mainly due to the treatments increasing the hydrophilicity of the plastic and making surface functional groups more likely to bond with available agents in the rest of the cement mixture. From the results of this experiment, it can be supported that by treating plastic with either a 5% hypochlorite + sodium hydroxide or 5% hypochlorite + calcium hydroxide treatment, the plastic to sand ratio in concrete aggregates can be increased.

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