COMPRESSIVE STRENGTH AND SODIUM SULFATE RESISTANCE OF HIGH CALCIUM FLY ASH GEOPOLYMER MORTAR CONTAINING WASTE POWDER

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Abstract

This objective of this study is to utilize recycled waste powder as a partial replacement fly ash of the high calcium geopolymer mortar to develop a sustainable geopolymer materials. The recycled waste powder is 1) milled container glass (CP), 2) milled high calcium fly ash geopolymer concrete waste (GP), and 3) milled normal concrete waste (NP). Two recycled waste powder replacement ratio were selected for geopolymer mortar preparation (0%, 20%, and 40% by weight). The effect of recycled waste powder on geopolymer mortar was studied by compressive strength and 10% sodium sulfate solution at 7, 14, 28, 56, 90, and 120 days. Sodium hydroxide and sodium silicate were used as activated solutions. The alkaline liquid to binder ratio was 0.75 and that of sodium silicate to sodium hydroxide was 1.0. All samples were cured at 60±2 °C for 48 h and held at 23±2 °C until testing. The results show that the compressive strength of controlled mortar increases with increasing concentration of sodium hydroxide solution. The compressive strength increases for 56 days and then decreases after exposure to 10% sodium sulfate solution. In addition, the results indicated that the high amount of recycled concrete powder can affect the sulfate resistance, while container glass powder can promote the utilization of waste powder on the sulfate attack of geopolymer mortar due to filler effect.

Keywords: *geopolymer, sulfate resistance, compressive strength, waste glass*