# To What Extent Do Different Sodium Silicate (Na2SiO3) to Sodium Hydroxide (NaOH) Ratios in Alkaline Solutions Influence the Durability of Fly Ash Based Geopolymer Concrete Measured Through a Sorptivity Test?

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Geopolymer concretes are an innovative and sustainable alternative to traditional concrete, characterized by their use of lower amounts of energy and raw materials, whilst having durable chemical and physical properties. Geopolymer concretes can be produced through a reaction known as geopolymerisation, commonly made by activating source materials such as fly ash with alkaline solutions. The aim of the investigation was to compare the durability of fly ash based geopolymer concrete, as the ratio between sodium silicate and sodium hydroxide in the alkaline activator solution is changed. The durability of geopolymer concrete was found through a water sorptivity test, defined as a measure of the capacity of a medium to absorb water by capillarity. Experimental data was obtained 7 days after geopolymer concrete cubes of sodium silicate to sodium hydroxide ratios ranging from 0.400 to 2.500 were molded. It was found that as the alkaline ratio increased from 0.400 to 2.500, the water sorptivity of the samples decreased, representing an increase in durability. There was a large reduction in sorptivity as the ratio increases from 0.400 to 0.925. Smaller changes in sorptivity values were seen from a ratio of 0.925 to a ratio of 2.500. In conclusion, a negative relationship between sodium silicate to sodium hydroxide ratios in the alkaline solutions and the sorptivity of the concrete cubes was observed. These findings can be used in industry to produce sustainable and durable fly ash based geopolymer concrete.

**Awards Won:**