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A study to investigate the compressive strength and flow of alkali activated slag mortar using two curing regimes

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Abstract. This research investigates the potential for producing more environmentally friendly mortars by replacing cement with Ground Granulated Blast Furnace Slag (GGBS). The study examines the influence of key factors on the properties of GGBS-based mortar activated using sodium silicate (SS) and sodium hydroxide (NaOH). Specifically, it explores: (1) the effect of different SS types—base and neutral type; (2) the sodium oxide (Na_2O) content, derived from both activators, with concentrations of 12% and 15%; (3) the impact of curing methods, including ambient temperature curing and full water immersion (submerged); and (4) the role of the water-to-binder (w/b) ratio, assessed at 43% and 48%. The performance of GGBS mortars was evaluated in terms of compressive strength and flowability. The results showed no significant difference between the two SS types; however, the base SS was recommended due to its lower NaOH content to reach the same Na_2O content, which leads to reduced generated heat when preparing the solution. Additionally, a 12% Na_2O concentration yielded higher compressive strength and enhanced flowability. While increasing the w/b ratio improved flowability, it had a detrimental effect on compressive strength. Furthermore, submerged curing significantly reduced compressive strength compared to ambient curing.

Keywords: GGBS, Alkali Activation, Curing Regime, Na_2O Percentage, Compressive Strength.