

Effect of Alkali Silica Reaction (ASR) in Geopolymer concrete

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ABSTRACT

Alkali silica reaction (ASR) occurs due to the chemical reaction between hydroxyl ions in the pore water within the concrete matrix and certain forms of silica. This reaction could lead to strength loss, cracking, volume expansion and potentially failure of the structure. The manuscript reports the findings of an experimental investigation of the inter-particle bonding between the reactive aggregates and the geopolymer matrix. Specimens were prepared using three different types of Class F fly ash. Class F fly ash was generated by the combustion of lignite coal. Mechanical testing included the potential reactivity of aggregate and length change measurements as per ASTM standards. Petrographic analysis was conducted using Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) and Raman Spectroscopy. The intent of this work was to reduce the ASR expansion by using fly ash based geopolymer concrete. The ability to utilize ASR-vulnerable aggregates in the production of geopolymer concrete products would increase the economic and sustainability appeal of this technology, potentially resulting in significant cost savings and reduce carbon footprint by eliminating the need to transport large volumes of high quality aggregates across the country.

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