# EFFECT OF THE INCORPORATION OF SPENT NUCLEAR GRADE ION-EXCHANGE RESINS ON THE REACTION KINETICS OF ALKALI-ACTIVATED SLAG–ASH CEMENT

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## Abstract

The final disposal of spent ion-exchange resins generated in the operation of nuclear power plants is managed by their immobilization in cement matrixes based on Portland cement. In order to replace this formulation with a more sustainable one, the reaction kinetics of alkali-activated cement in presence of spent resins are studied in this work. Three binder blends (100% slag, 85% slag-15% fly ash, 70% slag-30% fly ash) activated with sodium silicate (7% by weight) incorporating spent resin (2.5%-12.5% resin-binder ratios) have been evaluated through Isothermal calorimetry and Vicat Needle tests. The maximum resin content assessed was set considering a logistically viable setting time (initial setting <24h).

The isothermal calorimetry results show that increasing the resin content delays the appearance of the acceleration/deceleration peak, which corresponds to gel formation. In addition, the spent resin produces a decrease in the intensity and broadening of the shapes of the peaks. The same trend is observed for the increase in the proportion of fly ash. To simulate the reaction with other binder blend ratios and resin-binder content, the location, and intensity of the acceleration peak have been statistically modeled using multi-variable linear regression obtaining an $R^2$ of 0.83 and 0.90 respectively.