# IMPACT OF CALCIUM HYDROXIDE ON PHYSICAL CHARACTERISTICS AND LEACHING STABILITY OF METAKAOLIN-BASED GEOPOLYMER WASTE FORM CONTAINING RADIOACTIVE BORATE WASTE

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Immobilization of radioactive borate waste using metakaolin-based geopolymer is beneficial in terms of waste loading, physical characteristics, and leaching stability. However, boron in borate waste reacts with silicon in geopolymer resulting in the setting retardation and low compressive strength. Herein, calcium hydroxide was used to enhance the durability of geopolymer waste form containing 30 wt% borate waste. The $CaO:K_2O:Al_2O_3:SiO_2:H_2O$ molar ratio of geopolymer waste form was x:1:1:2.8:10 (x = 0, 0.25, 0.50. 0.75, and 1.0). All geopolymers containing Ca showed higher 7-day compressive strength than geopolymer without Ca (5 ± 1) and the highest compressive strength was achieved in geopolymer with Ca/Al ratio of 0.25 (14 ± 2 MPa). As a result of long-term leaching test for 100 d, the leachability index of boron increased from 7.5 to 8.6 in geopolymer with Ca/Al ratio of 0.25 and controlling leaching mechanism was diffusion. The appropriate dosage of Ca formed the calcium silicate aluminate hydrate gel together with geopolymer and accelerated the geopolymerization reaction, resulting in the enhanced compressive strength and leaching stability of geopolymer waste form. This study provides insight into the geopolymer solidification process for the borate waste and can increase the understandings of the impact of Ca on the geopolymer waste form containing borate waste.

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