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Management of radioactive contaminated electric arc furnace slag using cement immobilization method

Scrap steel metals have played an important role in the steel manufacturing industry because they can be recycled without any damage or degradation of its property. Like other countries, scrap steels are imported from abroad. Some were found radioactive contamination both natural and artificial radioisotopes. In case, once contaminated scrap steels are introduced into the melting process, radioactive electric arc furnace slag is produced. In order to prevent migration of radionuclide contaminated in the furnace slag, immobilization of such radioactive waste by cementation was conducted. In this work, we studied the physicochemical and mechanical properties of waste form that is appropriate for store and transfer to long term disposal site. The element compositions of Portland cement type I (PC) and EAFS were characterized by X-ray fluorescence (XRF), they were found that the main element composition of PC and EAFS is Calcium oxide (CaO) and Iron oxide (Fe2O3), respectively. The EAFS waste forms were produced using water/cement ratio of 0.40 and EAFS replacement of 0%, 15%, 25%, 35%, and 50%. All samples were cured at ambient temperature for 14 days and 28 days. It was observed that the compressive strengths of EAFS replacement of 0%, 15%, 25%, 35%, and 50% were found to be 111.28, 109.35, 107.58, 93.64, and 65.02 kg□f/cm2, respectively, for 14 days curing. The compressive strengths of all samples were measured to be 93.57, 105.53, 80.73, 111.90, and 102.88 kg□f/cm2 for EAFS replacement of 0%, 15%, 25%, 35%, and 50%, respectively, for 28 days curing. The mixing between PC and EAFS of all conditions exhibited good workability for cementation. The EAFS replacement of 50% seems to be appreciable for cementation due to the high increasing compressive strength.

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