

Laboratory Investigation of Fly Ash Based Geopolymer Stabilized Recycled Asphalt Pavement as a Base Material

Authors : Menglim Hoy, Suksun Horpibulsuk, Arul Arulrajah

Abstract : The results of laboratory investigation of recycled asphalt pavement (RAP) - fly ash (FA) based geopolymer as a base material is presented in this paper. An alkaline activator, the mixture of NaOH and Na₂SiO₃, is used to synthesis RAP-FA based geopolymer. RAP-FA with water (RAP-FA blend) prepared as a control material. The strength develops and the strength against wet-dry was determined by the unconfined compression strength (UCS) test, then the microstructural properties were examined by scanning electron microscopy (SEM) and X-ray Diffraction (XRD) analysis. The toxicity characteristic leaching procedure (TCLP) test is conducted to measure its leachability of heavy metal. The results show both the RAP-FA blend and geopolymer can be used as a base course as its UCS values meet the minimum strength requirement specified by the Department of Highway, Thailand. The durability test results show the UCS of these materials increases with increasing the number of wet-dry cycles, reaching its peak at six wet-dry cycles. The XRD and SEM analyses indicate strength development of the RAP-FA blend occurs due to chemical reaction between a high Calcium in RAP with a high Silica and Alumina in FA led to producing calcium aluminate hydrate formation. The strength development of the RAP-FA geopolymer occurred resulted from the polymerization reaction. The TCLP results demonstrate there is no environmental risk of these stabilized materials. Furthermore, FA based geopolymer can reduce the leachability of heavy metal in the RAP-FA blend.

Keywords : recycled asphalt pavement, geopolymer, heavy metal, microstructure

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