Proceedings of the5rd International Conference on Civil Structural and Transportation Engineering (ICCSTE'20)
~~Niagara Falls, Canada~~ Virtual Conference – November, 2020
Paper No. 244
DOI: 10.11159/iccste20.244

Fresh and Hardened Properties of Engineered Geopolymer Composite with MgO

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Abstract- In this paper, the early results of an ongoing investigation on self-healing engineered geopolymer composites (EGC) are presented. The EGC was developed using powder based alkali activators and MgO was added as self-healing agent. Two types of source materials were used to produce EGC. One EGC mix had slag and class C fly ash as source materials and termed as binary mix. The other one had slag, class C fly ash and class F fly ash and termed as ternary mix. Setting time, slump flow, fresh density and rheology were measured as fresh properties of the developed geopolymer composites. As hardened properties, compressive and direct tensile strengths were evaluated. It was observed that addition of MgO delayed the setting time of both the EGC mixes. The rheology of the developed geopolymer mixes complemented the hardened properties of the mixes. It was found that binary geopolymer mix exhibited superior performance as compared to its ternary counterpart due to presence of class C fly ash only that ensured higher amount of CaO. It was also observed that EGC, developed in the present study, experienced strength values (both compressive and direct tensile) that are comparable to the values of the previous studies even with the addition of MgO. Moreover, strain hardening characteristic was observed for both EGC mixes under direct tension test. Hence, it is evident that the initial outcomes of the experimental investigation are quite promising and exhibit the importance of conducting further comprehensive studies in order to develop design guidelines for EGC with self-healing capability.

***Keywords*:** Engineered geopolymer composites; powder based activators; MgO; Binary mix; Ternary mix; Strain hardening