World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:14, No:06, 2020

Damage in Cementitious Materials Exposed to Sodium Chloride Solution and Thermal Cycling: The Effect of Using Supplementary Cementitious Materials

Authors : Fadi Althoey, Yaghoob Farnam

Abstract : Sodium chloride (NaCl) can interact with the tricalcium aluminate (C3A) and its hydrates in concrete matrix. This interaction can result in formation of a harmful chemical phase as the temperature changes. It is thought that this chemical phase is embroiled in the premature concrete deterioration in the cold regions. This work examines the potential formation of the harmful chemical phase in various pastes prepared by using different types of ordinary portland cement (OPC) and supplementary cementitious materials (SCMs). The quantification of the chemical phase was done by using a low temperature differential scanning calorimetry. The results showed that the chemical phase formation can be reduced by using Type V cement (low content of C3A). The use of SCMs showed different behaviors on the formation of the chemical phase. Slag and Class F fly ash can reduce the chemical phase by the dilution of cement whereas silica fume can reduce the amount of the chemical phase by dilution and pozzolanic activates. Interestingly, the use of Class C fly ash has a negative effect on concrete exposed to NaCl through increasing the formation of the chemical phase.

Keywords : concrete, damage, chemcial phase, NaCl, SCMs
Conference Title : ICCIMA 2020 : International Conference on Civil Infrastructure Materials and Applications
Conference Location : Barcelona, Spain
Conference Dates : June 11-12, 2020