Área: ORG

Effect Of The Ratio Between Tung Oil And Superplasticizer In CAD: Analyzed By Spectroscopical And Calorimetric Techniques

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Highlights

CAD modified with tung oil and superplasticizer has an impact on hydration, resistance, and pore filling. It is the development of a generation of competitive materials with high durability and quality, and low maintenance costs.

Resumo/Abstract

The objective of the work is to investigate the superplasticizer (SP) through the influence of tung oil (TO) on pathologies in civil works, from anthropogenic or environmental causes in CAD. Among the parameters affected by molecular interactions are hydration kinetics and mechanical properties, such as compression force (fcm). The characterization of CAD and the influence of its association with components were carried out using non-destructive and invasive instrumental techniques: Hydrogen Nuclear Magnetic Resonance Spectroscopy (^{1}H NMR) with measurements of longitudinal relaxation time (T_1), according to Jin et al. (2019); Fourier Transform Infrared (FTIR) in transmission mode, according to Horgnies et al. (2013); and Differential Scanning Calorimetry (DSC) on ground CAD samples, according to Abbas et al. (2020). The fcm value in CAD with 4% SP without OT was 121.5 MPa. With 2 g of OT it increased to 136.04 MPa, but with 3% SP and the same mass it was 118.18 MPa. Using 1H NMR relaxometry, the results of 4% SP without OT compared to 4% SP and 2 g of OT showed a reduction in T1 by almost half, indicating greater dispersion, less evaporable water and hydration kinetics more favorable to pore filling (JIN, 2019). The FTIR technique analyzes the peaks referring to vibrations of both hydroxyl (OH) and silicate (Si-O) peaks, verifying that OT (in the CAD containing 4%SP 2g) has a direct effect on Portlandite, increasing the interaction forces of hydrogen bonds by approximately 6 times in relation to the sample without OT. However, the SP (referred to the sample containing 3%SP 2g) affected the CSH peak, demonstrating that the reduction of SP influences the reduction of the interaction forces of the hydrogen bonds of this component. Finally, using the DSC technique, the ΔH values associated with exothermic and endothermic processes and the transition temperature (Tm) were analyzed. Comparing samples containing 4% SP with 0g OT with 4% SP with 2g OT, OT promotes a reduction in ΔΔH by 6.2 °C and Tm by 60.51 °C, leaving the system more fluid. However, the 1% SP reduction while maintaining the OT mass, reduced the ΔΔH by 18.48 °C and the ΔTm by 47.19 °C, making the system more unstable, and demonstrating that the SP also had a fluidifying effect.

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