Effect of olive pomace fibre reinforcements on properties of alkali-activated cements based on blast furnace slag and biomass bottom ash

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Portland cement has been used in civil construction, due to mechanical properties. However its manufacture present problems of greenhouse gas emissions. For these reason has been appeared new materials to replace of use of traditional Portland cement. One of the most investigated materials are geopolymers (Davidovits, 1989). They have achieved high values of mechanical strength, and better durability than Portland cement. In last years have been appeared research adding fibres to improve strength properties (Ardanuy, 2015; Al-Mashhadani, 2018). These studies have been achieved great result in terms of mechanical strength.

A study of use of olive pomace fibres as reinforce of alkali activated cements has been development. Fibres with different treatment have been compared with several percentage of fibres in pastes. Pastes without reinforcement were manufactured as control. Untreated fibres were used and they were compared with fibres treatment. Fibres were treated by immersing them one hour in different solutions: 5% wt NaOH, 10% wt Na_2SiO_3, 3% wt $CaCl_2$. Precursors, a mix of 50% wt blast furnace slag and 50% wt biomass bottom ash, were activated with a solution of 50% wt KOH (8M) and 50% wt K_2SiO_2. The activator was optimized in previous works.

Raw materials were mixed and poured into prismatic and cylindrical moulds. Past one day, they were demould and they were cured in a climatic chamber until testing day (1, 7, 28 and 90 days). Alkali activated cements were characterized by compressive and flexural strength and thermal conductivity.

The best treatment for fibres was using a solution of 3% wt $CaCl_2$. Any treatment did not achieved better results than fibres untreated or control paste. Fibres treatment that achieved better results, they improved flexural strength, but compressive strength decreased. Although the decrease was consider it admissible.

List of references

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