ABSTRACT

Geopolymers are sustainable alternative materials to portland cement concrete, because they require less production energy, due contributing to the reduction of CO2 emissions produced , and are obtained from the alkaline activation of a material rich in silica and alumina. This research work seeks to evaluate the possibility of using industrial wastes such as silica fume (SF) to improve the physical and mechanical properties of a pumice-based geopolymer (PP). The first step was the extraction, grinding and sieving of the raw material obtained from the Cotopaxi deposit to perform the physical and chemical characterization of the resulting material, followed by the dosing of the geopolymer mixture. Finally, the mechanical properties of the geopolymer were determined at 7 to 28 days, while the physical properties at the age of 28 days, using 50 mm cubic specimens and 40x40x160 mm beams according to INEN standards. From the application of these conducting tests, it was verified that pumice is a source of aluminosilicates and that combined with HS it produces a lightweight material that reaches a maximum compressive and flexural strength of 14.10 MPa and 4.78 MPa, respectively, for 10% of replaced HS and a molarity of 12M. These results show that strength is directly related to HS content, with 10% being the optimum replacement percentage to improve physical and mechanical properties, as well as geopolymer matrix formation.

Keywords: Geopolymer, pumice powder, silica fume, alkali activation, molar concentration, mechanical properties, physical characterization.

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Fecha: 2022.08.17 12:40:07 -05'00'

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