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## Physical-mechanical behavior of metakaolin-based fiber reinforced geopolymer composites

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Geopolymers have been proposed as alternatives to Portland cement-based matrices, with favorable physical, mechanical and durability properties. This paper presents an evaluation of physical and mechanical properties of geopolymer matrices obtained from alkaline activation of two different commercial metakaolins (MK1 and MK2). Sodium silicate and NaOH solutions were used as activators. Natural sand was used to obtain geopolymer motors which were subsequently reinforced with stainless steel fibers. Two pure geopolymers (GP1-10 and GP2- 15) were formulated from MK1 and MK2 using 10M and 15M NaOH solutions, respectively. Mortars were produced from each pure matrix, with sand content of 40%, in relation to the total volume of the mixture. The mortars were reinforced with 1.2,1.8 and 2.4 volume fraction of stainless steel fibers. Sealed cylindrical specimens were tested under uniaxial compressive loads and prismatic specimens were used for four point bending tests, after complete 7 days of curing. XRD and FTIR analysis were performed in order to confirm the geopolymer structure formation, comparing the geopolymer matrices results against those of raw metakaolin. Microstructure and chemical composition were investigated by SEM/EDX in fractured and polished samples. The geopolymer based pastes, mortars and composites presented high mechanical performance with uniaxial compressive strength from 36 to 50 MPa and flexural tensile strengths ranging from 5.5 to 14 MPa.

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