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Synthesis of geopolymers from rice husk ash and aluminum anodizing residue

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Abstract:
The 2008 world economic crisis has required changes in the way of handling most of the raw materials. The building industry has been one of the precursors of these changes, with respect to its inputs. In addition, the climatic and environmental changes have warned the academic community that increasingly engages in research to improve production methods and optimization of raw materials consumption. In this context, research has been conducted on waste reduction efforts in several sectors, such as industry and agribusiness. The Santa Catarina state, Brazil, is a large producer of rice, thus generating large amount of ashes, resulting from the burning of the husk of this grain. In addition, another sector that produces lots of waste is the aluminum anodizing. As the rice husk ash contains high silica content (~92 wt.%), it is a valued waste, already being used in various industries, such as electronics, construction, ceramics, chemical industry, manufacturing of photovoltaic cells, among others. Therefore, this study aimed to synthesized geopolymers from the mix of rice husk ash with aluminum anodizingresidue, the last as source of alumina required for the production of polissialates. The wastes were characterized (FRX and laser diffraction) and ground. NaOH and sodium silicate were used for the alkali activation according to a statistical experimental design where the factors were the molarity of the alkali, the ratio between ash and anodizing residue and the temperature synthesis. The geopolymer samples were tested by diametral compression test (1 MPa/s) in order to determine their compressive resistance, deformation under maximum load and elastic modulus. As a result, geopolymers can be obtained from the combination of rice hullashes and aluminum anodization residue. The only treatment required for both residues is particle size reduction. The compressive strength depends on the interaction among the molarity of the alkaline solution, the synthesis temperature and the mixing ratio of the waste. The modulus of elasticity depends on the molarity of the alkaline solution and the synthesis temperature. In turn, the deformation depends on the molarity of the base and the ash/aluminum residue ratio.

Keywords: Waste.Geopolymerization.Rice husksash. Recycling. Aluminum residue.