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ÁREA: Synthesis and characterization of catalysts and adsorbents

GEOPOLYMER/ZEOLITE COMPOSITE FROM FLY ASH

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Resumo-Abstract

Steel mills generate a high volume of solid waste in their production chain. A large thermoelectric plant produces around 1 million tons of waste per year, with reuse rates usually very low, which generates strong environmental impacts. One of these residues is fly ash, which is obtained from the burning of coal. The use of this type of material in the synthesis of compounds can represent an alternative that offers significant economic and environmental benefits. The conversion of these residues into materials such as geopolymers and zeolites, known for their adsorptive capacities, has proven to be a viable recycling route. This is due to the fact that fly ash has high levels of silica and alumina, which are fundamental components of both geopolymers and zeolites. This work aims to produce composites of geopolymer with zeolites, in the form of cartridges, using fly ash as the primary source of Si and Al. First, zeolite Y was synthesized via hydrothermal route employing colloidal silica (LUDOX 40) and sodium aluminate as Si and Al sources, respectively, and sodium hydroxide solution. Next, the obtained zeolite was added the geopolymer reaction mixture, which was prepared by mixing fly ash with kaolin, the latter as a supplementary source of alumina and silica, and NaOH solution as the mineralizing agent, and the transferring of the reaction mixture to cylindrical PTFE molds (30 mm base × 50 mm height) for subsequent hydrothermal treatment, giving rise to cylindrical monoliths with good mechanical stability. The resulting material was characterized by a set of techniques including X-ray diffraction, infrared absorption spectroscopy (FTIR), and scanning electron microscopy (SEM). X-ray analyses showed the presence of the zeolite Y, that was added during the preparation of the composite, and the appearance of other zeolitic phases, mainly sodalite, accompanied by an amorphous structure, which is expected for a geopolymer. This dual nature of the geopolymer, as well as the presence of the added zeolite Y, is highlighted in the images obtained by SEM and complemented by FTIR. These preliminary results suggest that the use of low-cost materials can be used to prepare porous materials with potential to be applied as efficient adsorbents for multipurpose uses.

Keywords: **Geopolymers**, **Zeolites**, **Fly ash**.

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