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MAGNETIC ZEOLITES A AND P SYNTHESIZED FROM KAOLIN: SYNTHESIS AND CHARACTERIZATION

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Zeolites are hydrated aluminossilicates of open chain, formed by silica and alumina tetrahedral structures linked by common oxygen atoms, generating interconnected pores and cages with molecular dimensions and well defined sizes that limit matter transference between internal surface and application medium. They can be found naturally or synthesized using different aluminum and silicon sources that may modify the produced zeolite. Their industrial application has grown enormously over the last century. However, a big issue that still remains is the difficulty in retrieving zeolite powders when used in aqueous media. This work reports the use of kaolin as an alternative raw material for zeolite syntheses by means of hydrothermal route and subsequent preparation of magnetic composites through magnetite impregnation. The syntheses of two different zeolites were carried out by mixing appropriate amounts of metakaolin (kaolin previously calcined at 600 ºC for 2 h), sodium metasilicate and sodium hydroxide solution, aged for 18 h and heated at 100 °C for 4-48 h. After these processes, the final materials were washed several times with distilled water, filtered and dried at 80 ºC for 12 h. Magnetic composites were prepared by impregnating the zeolites with of Fe3O4 nanoparticles (NP) synthesized by the partial oxidation and precipitation of Fe2+ ions. The obtained materials were characterized by X-ray diffraction, scanning electron microscopy, FTIR spectroscopy and magnetization measurements. The results of XRD and FTIR provide evidence of the success in the synthesis of both zeolites A and P as well as Fe3O4. Subsequently, composites were formed by mixtures of zeolite A + NP and zeolite P + NP. The existence of secondary crystalline phases was also confirmed. However, it did not interfered significantly in the results as these phases appear as minor amounts and are most likely residues from the clay used as the main silica and alumina sources. Scanning electron microscopy images show cubic and pseudo-spherical morphologies, which are characteristic of zeolites A and P, respectively. After the impregnation process, the crystals morphologies remained unchanged, and presented a homogenous distribution of spherical nanoparticles over zeolites surfaces. Magnetization measurements presented hysteresis and low values of remanent magnetization, indicating a not purely paramagnetic behavior. Saturation magnetization referent to magnetite decreased according to the addition of non-magnetic material (zeolites) in the same proportion used during the synthesis. Nevertheless, it remained intense enough to allow composites separation from aqueous environments. Thus, all results indicated effective syntheses of zeolites and formation of stable composites that can potentially be used for adsorption processes in aqueous medium.