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SYNTHESIS OF NANOZEOLITES/CARBON COMPOSITES FOR THE ADSORPTION OF BIVALENT COPPER

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Linde Type A nanozeolite particles were successfully synthetized and supported over carbon-based materials in order to produce a hierarchical structured composite using a method based on the surface chemistry modification of carbon supports. Carbonaceous supports, exhibiting wide voids and openings, have been prepared using residues from agricultural activities such as cherry stones and hazelnut shells. Carbons using thermal treatment were produced and they were conditioned using polydiallyldimethylammonium chloride in order to promote the zeolites attachment onto the carbon surface. Supports were successfully covered with a consistent layer of zeolites and results showed that the chemical surface modification had a positive effect on the deposition of zeolites on carbons. In addition, copper adsorption experiments using these materials showed that the distribution of zeolite on a support improved their uptake efficiency from 73.80 to 288.22 mg·g^{-1} for synthetic nanozeolite A. In addition, kinetic results showed that materials follow the pseudo-second order equation with high degree of correlation ($R^2 > 0.97$) suggesting that chemisorption is the rate-limiting step and it is more dependent on solid capacity than ion concentration in solution. Finally, equilibrium adsorption results showed a good adjustment of Langmuir model ($R^2 = 0.96$).

Keywords: nanozeolites, hierarchical structures, heavy metals, adsorption, non-linear models.

Introduction

Zeolites are microporous aluminosilicates that have a negative surface charge due the AlO_4 tetrahedra presence in the framework [1], which is neutralized by ions or protons that are easily exchangeable. Nevertheless, ionic species encounter intra-particle diffusion problems with inner adsorption sites due to restrictive pore dimensions and large diffusion path lengths [2].

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