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ORIGINAL RESEARCH PAPER

Modeling of adsorption isotherms and competitive adsorption breakthroughs of Nicotine/Pyridine removal from aqueous solution by activated Montmorillonite

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ABSTRACT

Activated Montmorillonite (AM) reveals as a low-cost and efficient adsorbent for the adsorption of nicotine and pyridine from aqueous solutions. In this study, the influence of several operation conditions (initial compounds concentration, volumetric flow rate, and height of bed) on the shape of breakthrough curves and the mass transfer resistance was evaluated. Adsorption experiments were developed to determine the adsorption isotherm of the system, then the adsorption of pyridine and nicotine onto activated Montmorillonite in single and binary systems has been studied using fixed-bed adsorption column. In continuous adsorption, Results show that the maximum nicotine uptake 0.68 mmol/g of AM was achieved through electrostatic attraction and hydrogen bond at a pH = 6.3, a flow rate of 1 ml/min and a height of bed equal to 12 mm. In binary mixtures, zeolite adsorption is governed primarily by the size of pollutants present in water. Thus, the bigger compound (in this case, Nicotine), was adsorbed more easily than the pyridine present in the mixture. Experimental data were fitted according to Fowler Guggenheim for the isotherms and Wolborska model for the breakthroughs. AM was regenerated by ethanol and the results show that about 94% of the adsorption capacity is maintained after three times of cyclic adsorption-desorption process.

Keywords: *Adsorption, Nicotine, Pyridine, Fixed-Bed Column, Activated Montmorillonite*

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