

Saving amberlite XAD4 by using inert material in adsorption process

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Received 20 June 2009; Accepted in revised form 11 January 2010

ABSTRACT

The effect of partially replacing amberlite XA4 in fixed adsorbent beds by inert materials (glass beads) in an adsorption process of methylene blue onto amberlite XAD4 was investigated. Experiments were carried out to study the effect of various amberlite XAD4-glass beads weight ratios, influent methylene blue concentrations, flow rate and bed depth on the performance of fixed bed. The equilibrium data were fitted with theoretical models using interparticle diffusion coefficients obtained from separate batch adsorber experiments. Results suggest that replacing 5% by weight amberlite XAD4 by glass beads increasing the breakthrough time of the adsorbent bed by 80%. While adding 7% glass beads reduce the weight of amberlite XAD4 by 7% and increase the breakthrough time by 20%. However, replacing 10% of amberlite XAD4 makes the adsorption process inefficient compared with 0% glass beads. A mathematical model was formulated to describe the mass transfer kinetics in the fixed bed adsorber. The results show that the mathematical model includes external mass transfer and pore diffusion using nonlinear isotherms, provides a good description of the adsorption process for methylene blue onto fixed bed adsorber.

Keywords: Adsorption; Fixed bed; Amberlite XAD4; Methylene blue; Glass beads; Mathematical model; Mass transfer coefficient.

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