



Saving Activated Carbon by Using Inert Material in Adsorption Process

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Abstract: The effect of partially replacing activated carbon in fixed adsorbent beds by inert materials (glass beads) in the adsorption process of phenol onto activated carbon was investigated. Experiments were carried out to study the effect of various activated carbon-glass beads weight ratios, influent phenol concentrations, flow rate and bed depth on the performance of fixed bed. The equilibrium data were fitted with theoretical models and using interparticle diffusion coefficients obtained from separate batch adsorber experiments. Results suggest that replacing 5% by weight activated carbon by glass beads increasing the breakthrough time of the adsorbent bed by 80%. However, replacing 10% or more of activated carbon 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 interpartic diffusion using nonlinear isotherms, provides a good description of the adsorption process for phenol onto fixed bed adsorber.

Key words: *Adsorption, fixed bed, activated carbon, phenol, glass beads, mathematical model, mass transfer coefficient.*

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