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Application of chemically modified chitosan nano activated carbon beads with 3-aminopropyl triethoxysilane (APTES) and hexadecylamine (HDA) surfactants for acetaminophen removal from aqueous solution

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The effects of modification conditions, such as surfactants concentration for APTES and HDA and reaction time in APTES preparation were investigated in the adsorption process of ACT. Modified beads with these surfactants were compared with un-modified beads through characterization tests and in removal percentage of ACT. The chosen beading parameters were Cs concentrations of 1.75% (w/v) employing 70% (w/w) of NAC, the dripping flow rate of 2 mL/min at a dripping distance of greater than 9 cm were used to form chitosan nano activated carbon (Cs-NAC) beads. APTES and HDA at varying amounts of 1% - 3% (w/w) were impregnated into the beads and parameters such as the concentration and reaction time (2-10 h) in adding APTES and HDA concentration were studied. It was found that APTES reduces the equilibrium time significantly from ~22-24 h to 2-4 h as compared to unmodified beads. Nevertheless, addition of HDA inhibited the adsorption process due to formation of micelles. FESEM, XRD, FTIR, zeta potential and Raman spectroscopy were used to characterize the developed beads and to confirm the adsorption of ACT on the surface of the beads in all the previous stages. Characterization tests also approved the surface modification of the beads with APTES. For the preparation method, 6 h of reaction time with APTES was sufficient for the beads with 40% and 60% NAC to reach the maximum uptake of ACT. On the contrary, modified beads with HDA had lower ACT uptake as compared to the unmodified Cs-NAC beads. The adsorption data were evaluated using Langmuir and Freundlich isotherms and the kinetics adsorption were analysed by pseudo-first order and pseudo-second order models. The isotherm data for the studied adsorbents could explain by Freundlich model and the kinetic results could fit properly within the pseudo-second-order rate model.

Biography

Parisa Amouzgar is a chemical engineering student in Monash University at Malaysia. Her main interest is nanocrystaline cellulose and she published 3 articles in reputed journal.

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