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An investigation on the application of chitosan based organic-inorganic hybrid biocomposites in water treatment

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Chitosan and its derivatives have got a wide range of applications in the field of environmental engineering field for the removal of innumerable noxious contaminants because of their several distinctive features such as being low cost, non-toxic, biocompatible, biodegradable, and adsorptive property. In this study, three types of crosslinked organic-inorganic hybrid biocomposites, such as chitosan/bentonite, chitosan/titanium oxide were prepared and utilized for the removal of nitrate from water by batch biosorption experiments. Effects of crosslinker dose, initial nitrate concentration, contact time, initial pH of the nitrate solution, biosorbent dose, temperature, and the presence of competitive ions on adsorption capacities were investigated. Actual adsorption capacities of ChBT, ChTi, and ChAl at a crosslinker to chitosan solution ratio of 1:40 were 35.68 and 43.62, and 45.38 mg/g as nitrate respectively. The actual adsorption capacities decreased with increase in crosslinker dose. Adsorption equilibrium isotherm models data were well fitted to the linear Freundlich isotherm model. Thermodynamic parameters indicate that adsorption process was spontaneous and endothermic. The adsorption process was better described by a pseudo-second-order equation. The results show that chitosan based organic-inorganic biocomposites are effective, low cost, and reusable for the removal of nitrate from water. This an indication of the applicability of biocomposites in water treatment.

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