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Application of thermally-activated *Mactra veneriformis* shells for removing phosphate from wastewater

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ABSTRACT

High concentrations of phosphorus transported by water and domestic and industrial sewers are discharged into surface water bodies. Approximately 1.3 million tons of phosphorus are released into water systems worldwide each year. Excessive phosphorus discharge causes eutrophication. Eutrophication accelerates the proliferation of algae in the water, which has adverse effects such as aquatic oxygen deprivation and loss of aquatic plants and organisms, which can pose serious health risks to animals and humans. So necessary to take highly effective, economical methods to remove P from wastewater before its discharge to water bodies. Adsorption is an effective and economical way to remove P from wastewater. Natural materials, including abundant calcium (Ca), strongly interact with P in water, leading to P removal from water. Recently, recycling of wastes or by-products as a phosphates adsorbent has received much attention, and sea shells have shown significant advantages because of their high $CaCO_3$ content, non-toxicity, and recyclability.

In this study, the Mactra veneriformis shells (MVS) were used as an adsorbent, and heat activation was applied to increase the adsorption capacity of P and to remove microorganisms and odors. The phosphates removal ability of thermal activated MVS at various temperatures was evaluated by batch adsorption experiments. The MVS

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thermally treated at the optimum temperature was performed in various conditions, including reaction time, equilibrium concentration, reaction temperature, pH, competitive anions, and adsorbent injection amount.