The Development of Water Filter Resin Quality Using Sodium Hydroxide from Clam Shells

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Abstract

This research aimed to synthesize sodium hydroxide from cockle shells at different quantities to investigate its chemical properties, as well as to compare its effectiveness in regenerating ion exchange resin. The results showed that prior to regeneration, the ion exchange resin exhibited an ion removal efficiency of only 55.56 ± 0.00%. After regeneration with sodium hydroxide synthesized from cockle shells at various quantities, the ion removal efficiency of the resin significantly increased. Among all conditions, sodium hydroxide synthesized from 20 g of cockle shells, which provided the highest concentration (0.267 M), demonstrated the best regeneration performance, resulting in an ion removal efficiency of 91.67 ± 1.31%. In contrast, sodium hydroxide synthesized from 10 g and 30 g of cockle shells yielded lower ion removal efficiencies of 88.89 ± 3.70% and 81.48 ± 0.00%, respectively. These differences were statistically significant ($p < 0.05$). The observed results are consistent with the FTIR spectra of the synthesized sodium hydroxide compared with commercial sodium hydroxide. The sodium hydroxide synthesized from 30 g of cockle shells exhibited a higher level of impurities, which may interfere with access to the active sites of the resin or cause partial blockage on the resin surface. Although the sodium hydroxide synthesized from 10 g and 20 g of cockle shells contained fewer impurities, the concentration effect played a crucial role. The sodium hydroxide obtained from 20 g of cockle shells provided an optimal driving force, enabling effective activation of the resin's active sites and leading to superior regeneration performance.

Keywords: Sodium hydroxide, ion exchange resin regeneration, ion removal efficiency