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Efficient nitrate removal by Ca-treated activated carbon derived from agricultural residues

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ABSTRACT

Various agricultural residues such as bamboo chips, bagasse bottom ashes, corncobs and macadamia nutshells were used to prepare activated carbon by steam activation. These materials were further treated by $Ca(OH)_2$ and HCl solution, and the sample originated from bamboo was the best for nitrate removal from water. In addition, the bamboo activated carbon was treated with high concentrations of $CaCl_2$ and HCl solution (BC-CL-A), showing a greater adsorption amount for nitrate removal. BC-CL-A exhibited a nitrate adsorption capacity (0.45 mmol g^{-1}) approximately twice as much as that of the untreated sample. The nitrate adsorbed on BC-CL-A was easily desorbed from the surface by KCl solution due to ion exchange between NO_3^- and Cl^-. Regeneration test for BC-CL-A by KCl solution was also examined. After three cycles of regeneration, the adsorbed nitrate could be removed by 88.6%, implying that some nitrates were irreversibly adsorbed on BC-CL-A.

Keywords: Nitrate; Adsorption; Activated carbon; Ion exchange

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