

Assessment on water purification capabilities of activated charcoal prepared from Palmyrah (*Borassus flabellifer*) kernel shell by different carbonization and chemical activation processes

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Abstract

The adsorption capability of activated carbon is applied to remove large variety of compound from contaminated water through carbon adsorption. The scope of this study was to investigate the water purification capabilities of prepared activated charcoal from dried Palmyrah (*Borassus flabellifer*) kernel shell. 18 types of different activated charcoal samples were prepared through the following steps as carbonization, chemical activation and pyrolysis. Carbonized kernel shells which were prepared at 400°C, 500°C and 600 °C for 10 minutes and 20 minutes, were chemically activated by base (Potassium hydroxide), acid (Phosphoric acid) and water. Finally activated kernel shells were pyrolyzed at 800°C for 30 minutes. Physico-chemical analysis of collected pond water before and after filtration using prepared activated charcoal was carried out. The pH and conductivity were measured by electrometric method. The calcium and magnesium were determined by ethylene diamine tetra acetic acid compleximetric titration method. Mohr's argentometric method was used to determine chloride. Nitrate and ammonia were determined by Kjeldhal method. The phosphate content determination was carried out by spectrophotometric (Vanadomolybdate colour development) method. All results were analyzed in SAS software and the mean separation was done by LSD at $p=0.05$. Results of analyzed water quality parameters revealed that the best thermal condition to carbonize the kernel shell was at 600 °C for 20 minutes and base chemical activation was the best than acid or water activation. 41.7 % of nitrate, 54.5 % of ammonia, 58.3 % of calcium, 57.8 % of phosphate and 42.3 % of chloride were removed from collected pond water during water treatment by using activated charcoal produced at best carbonization and activation conditions. The physical characteristics such as colour, odour and taste were analyzed by organoleptic method and these characteristics were also superior in treated pond water than untreated pond water for all the activated charcoal treatments. This study will be a positive sign to prepare activated charcoal by applying different pyrolysis conditions and which is applied to treat water from natural contaminated water bodies and industries.

Key words: Palmyrah (*Borassus flabellifer*) kernel shell, pyrolysis and carbonization