

Preparation and Characterization of Chitosan Encapsulated *Azadirachta Indica* (Neem) Bark and *Strychnos potatorum* (Igini) Seeds Activated Carbon for Water Purification

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Activated carbons play a crucial role in water purification due to their higher adsorption capacities. However, the direct use of activated carbons for water purification causes high filtration costs due to the formation of turbid solutions. Therefore, chitosan, a biopolymer, was employed to encapsulate activated carbon derived from *Azadirachta Indica* (Neem) bark and *Strychnos Potatorum* (Igini) seeds. Commonly referred to as Igini or Clearing Nut, *Strychnos Potatorum* is a botanical resource that is rich in phytochemicals and has special qualities that make it an important candidate for applications involving water purification. The plant *Azadirachta Indica*, better known as the neem plant, is well-known for its uses in traditional medicine, agriculture, and now, possibly, environmental remediation. In this study chitosan and activated carbons were mixed in 1:1 and 1:3 ratios, and the best-encapsulated materials were obtained when the ratio was 75% chitosan and 25% activated carbon. The optimized encapsulated activated carbons were investigated under a stereo microscope in both wet and dried conditions. Moreover, the synthesized encapsulated activated carbons were characterized using scanning electron microscopy (SEM) and Fourier-transform infrared attenuated total reflection (FTIR-ATR) spectroscopy. The FTIR analysis indicates several functional groups responsible for adsorption. According to the SEM analysis, both activated carbons exhibited higher surface areas with dense porosity. Furthermore, the two types of novel encapsulated activated carbons contained nanoporous surfaces with dense porosity. These nanoporous surfaces provide a barrier for the activated carbons inside to come outside and also provide the ability to adsorb small ions or molecules onto the activated carbons. Thus, this encapsulation provides a solution for the filtration issues of the direct use of activated carbons and also easy removal of adsorbents from the solution after adsorption process. Accordingly, the characterization results indicate that these two types of encapsulated activated carbons have the ability to adsorb impurities in aqueous solutions, and further studies are required to verify the adsorption capacities of these adsorbents.

Keywords: *Azadirachta Indica*; *Strychnos Potatorum*; Chitosan; Activated carbon; Encapsulation; Water purification