

Production of Activated Carbon from Saw Dust Biomass Using ZnCl_2 Activator as a Water Biofilter

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Abstract. The scarcity and depletion of liquid and solid fuel sources in Indonesia have prompted researchers and practitioners to develop renewable and environmentally friendly alternative fuel sources derived from biomass. One technology for converting biomass waste into activated carbon is through the pyrolysis process. This study aims to determine the ratio of sawdust biomass and the chemical characteristics of activated carbon produced through pyrolysis at temperatures of 320, 340, 360, 380, and 400°C. The potential of sawdust for use as a water biofilter, determining the usefulness of ZnCl_2 as an activated carbon activator. Sawdust is introduced into the pyrolysis system, then sealed and subjected to pyrolysis with varying ratios of 1:3, 1:5, and 1:7, with a holding time of 1 hour. The pyrolysis product, carbonized sawdust biomass, is then activated using ZnCl_2 . The activated carbon activation process involves soaking the carbonized sawdust in the ZnCl_2 activator. The adsorbent is then filtered and placed in an oven at 110°C for 3 hours. In the iodine adsorption capacity analysis, the adsorbent showed optimal performance at a carbonization temperature of 320°C with an iodine adsorption capacity of 1045.9 mg/g, while the lowest value was obtained at 380°C, which was 1033.2 mg/g. The filtration process using activated carbon increased the pH of the water from 7.75 to 8.06-8.16, reduced the TDS value from 650 mg/L to 590-450 mg/L, and reduced the TSS value from 50 mg/L to 40-20 mg/L. Morphological analysis using SEM showed that ZnCl_2 activation produced larger pores and cleaner structures free of contaminants, thereby supporting increased adsorption capacity. This study demonstrated that sawdust can be processed into activated carbon through pyrolysis with ZnCl_2 activation. The resulting adsorbent effectively reduces water pH, TDS, and TSS, making it a potential candidate for use as an environmentally friendly biofilter.

Keywords: Biofilter, Activated Carbon, Pyrolysis, Sawdust, ZnCl_2