SYNTHESIS AND CHARACTERIZATIONS OF METAL ACTIVATED CELLULOSE OF COTTON WASTE TO PRODUCE SOLID FUEL

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ABSTRACT

Over the years, fossil fuel demands have increased rapidly which results in a decline in resources. Fortunately, biomass waste which was renewable resources have the potential to produce solid fuel and it has been found that the majority of Cotton Textile Waste (CTW) ended up in landfill and can pose risk to the environment. With the help of hydrothermal carbonization (HTC), CTW can be converted to hydrochar (a type of solid fuel) by going through several reactions. However, HTC process with addition of catalyst has been discovered to improve the energy density of the solid fuel produced and it also have been found that Lewis catalyst which usually being used for catalytic HTC have high toxicity, low abundance and high price. In this study, the synthesis of zinc activated cellulose of cotton waste (Zn-CTW) via incipient wetness impregnation at different loading of zinc catalyst was done to produce hydrochars by going through the HTC process. Zinc catalyst has been chosen because it was inexpensive, easy to handle, has minimal toxicity, and can be used in a broad spectrum. In addition, incipient wetness impregnation was used since it was the most well-known, straightforward, and commonly used way of making practical solid catalysts. Besides, this project aimed to synthesize the Zn-CTW and characterized the hydrochar produced from the process. For methodology, four different loading of 0 g, 1g, 1.5 g and 2 g $ZnCl_2$ were synthesized in this process. Then, catalytic HTC was done in a Parr batch reactor for 3 hours at a temperature of 200°C at an autogenous pressure of 15 – 20. The product of the HTC process was then dried and was analysed its physicochemical properties by undergoing proximate analysis, ultimate analysis and energy density. From this project, it has been found that Zn-CTW actually can produce solid fuel with energy density and HHV higher (16.77–18.41 MJ/kg) than CTW that did not impregnate with Zn catalyst (15.37 MJ/kg) through the HTC process. Furthermore, this study has discovered that incipient wetness impregnation of 1.5 g Zn catalyst was the optimum value for the HTC process to produce high energy density hydrochar corresponding to 2 g of raw material used.