EFFECT OF CATALYST LOADING IN HYDROTHERMAL CARBONIZATION OF COTTON WASTE

MUHAMMAD KASYFIL ADHA BIN ROSLY

BACHELOR OF CHEMICAL ENGINEERING (ENVIRONMENT) WITH HONOURS

UNIVERSITY TEKNOLOGI MARA

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By

MUHAMMAD KASYFIL ADHA BIN ROSLY

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ABSTRACT

The goal of the research was to determine how catalyst loading affected the production of hydrochar during hydrothermal carbonization (HTC) of cotton waste using ZnCl2 as a Lewis catalyst. Biomass is a rich and renewable resource that may be converted into several types of energy via biological, physicochemical, and thermochemical processes. HTC is a thermochemical conversion process that uses various wastes to create hydrochar. Cotton fibers are rich in cellulose, pectin, and protein, which can be utilized as a sustainable source of energy. A cross-linked, hydrophobic, carbon-dense, polymeric solid material is referred to as "hydrochar". To examine variations in the Hydrogen/Carbon and Oxygen/Carbon ratios, surface functional groups, and surface morphologies of the hydrochar, the catalyst loading varied from 0g, 1.0g, 1.5g, and 2.0g. Cotton textile waste (CTW) as feedstock, and zinc chloride (ZnCl2) as the catalyst. CTW and ZnCl2 will be combined to create Zn-CTW. The HTC process carried out in a 100 mL Parr Batch Reactor for 3 hours at 200°C. The CHNS analyzer determines the ultimate analysis to calculate H/C and O/C ratios. The catalyst loading of 1.5g is shown to be the most compatible to produce clean solid fuel. The surface functional groups of the hydrochar were identified using FTIR. Thus, the presence of carboxylic acids and esters in the hydrochars was caused by C-O stretching in carbonyl groups. Then, the hydrochars' surface morphology determined by SEM analysis. From results, show that a catalyst is crucial to CTW conversion during the HTC process. When a catalyst was present, the surface was rougher; when a catalyst was absent, the surface was smoother.