CHARACTERIZATION AND OPTIMIZATION OF HYDROGEL BIOCHAR FROM SAWDUST BY USING RESEARCH SURFACE METHODOLOGY

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ABSTRACT

Hydrogel biochar has gained an attention these past few years because of its unique properties where it can sense the change in environment, hydrophilicity and modifiable composite. This study primarily is to investigate the characterization of hydrogel biochar and secondly to find the optimize ratio to increase its adsorption capacity. From analysis, it was observed that hydrogel biochar with 50% blending ratio possess the highest BET surface area of 1.4183 m^2/g, highest total pore volume of 0.000687 cm^3/g, average pore size of 18.413 Å and 0.01529 mmol/g adsorption capacity. The FTIR analysis shows that the hydrogel contains hydroxyl and carboxyl functional group, which suggest that it has a potential to become adsorbent. The RSM analysis shows that the optimized blending ratio of biochar: fly ash to be 0.54:0.46 and has the maximum value of adsorption capacity of 0.01534 mmol/g.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Activated carbon or also known as activated charcoal or activated coal is processed carbon acquired from organic material containing large carbon content such as coal and wood. The prime characteristic of activated carbon is that it has considerable microporosity thus increase in its surface area for adsorption. Due to this advantage, it is use as filtration and purification process. Unfortunately, as stated by Shang et al, (2016), activated carbon require high temperature, pressure and an activation process. In addition, certain disadvantages such as low temperature self-ignition, low-capacity of physical adsorption due to pores being impregnate and difficulty in washing during regenerating has been observed.

Other alternative is that to use biochar. Biochar has similar characteristics compare to activated carbon, but the difference is, it is made up from lignocellulosic biomass such as sugarcane bagasse and rice husk. According to Shang et al, (2016), the pyrolyzing temperature is ranging from 100 to 500 ºC some may be little bit higher, under poor oxygen atmosphere in furnace up to few hours long. The advantage of biochar is that it has great degree of porosity, broad surface area and relatively structured carbon matrix, meaning that it may act as adsorbent like activated carbon. To boot, biochar received great importance as soil amendment to soil fertility improvement and production of crop as stated by Shang et al, (2016).

Recently, hydrogel biochar receives quite a spotlight as adsorbent especially in removing heavy metals in water. Hydrogel biochar is a biochar that undergoes polymerization process by using a few chemicals. Hydrogel biochar possess a few