UNIVERSITI TEKNOLOGI MARA

REMOVAL OF HYDROGEN SULPHIDE (H_2S) BY EMPTY FRUIT BUNCH HYDROGEL BIOCHAR COMPOSITE (EFB-HBC)

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ABSTRACT

This research successfully proved that HBC also has potential in adsorption of Hydrogen Sulphide (H_2S) from gas effluent. The HBC from this study were derived from Empty Fruit Bunch (EFB) biochar which were produced by using microwave pyrolysis under 1000 W for 30 minutes with 150 mL/min of nitrogen flow. Followed by the EFB biochar were treated with two different chemical agent (HCl) and (H_2O_2) and labelled as EFB Biochar H100 and EFB Biochar P100 respectively. The formation of EFB-HBC is from polymerization process of treated EFB biochar (Biochar H100 and Biochar P100) with acrylamide (AAm), N,N'-methylenebisacrylamide (MBA) and Ammonium Persulfate (APS) to produced EFB-HBC H100 and EFB-HBC P100. Then the characterization was analysed the Field Emission Scanning Electronic Microscopic (FESEM), Brunauer-Emmett-Teller (BET), Thermogravimetry Analysis (TGA), Differential Scanning Calorimetry (DSC) and Fourier Transform infrared spectroscopy (FTIR). The objective of this research is to prove the ability of EFB-HBC in adsorption of H_2S. Then, the breakthrough performance in adsorption of H_2S were analysed for different effect of studies which are the effect of flow rate, the effect of bed height, the effect of adsorbent size and the effect of water presence. The results for effect of flow rate showed that, the slower the flow rate will provide higher adsorption capacity as the 60 L/hr flowrate resulted 3.59 mg/g compared to flow rate 100 L/hr and 200 L/hr with adsorption capacity 3.47 mg/g and 1.32 mg/g respectively. Meanwhile, results for the effect of bed height showed that, the bed height is corresponding to the amount as the highest bed height 6 inch obtained 3.59 mg/g as compared to 1.5 inch and 3 inch bed height with adsorption capacity 2.30 mg/g and 3.59 mg/g respectively. In addition, three states of adsorbent were tested on adsorption performance which are EFB-HBC in granule size, powder and wet condition. The significant results showed at EFB-HBC in wet condition obtained highest adsorption capacity with 102.9 mg/g compared to granule and powder with 3.59 mg/g and 48.10 mg/g respectively. The results are related with chemisorption as proved in chemical reaction in between H_2S and H_2O. In addition, to investigate the adsorption behaviour, adsorption Isotherm were applied such as Thomas model, Yoon-Nelson model and Adam-Bohart Model. In conclusion, the adsorption happened in the experiments especially in the effects of water presence resulted with the higher adsorption capacity and were fitted with Thomas Model. Meanwhile, by using kinetic modelling, most of the results fitted to pseudo second order which represent that the adsorption process is chemisorption.

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TABLE OF CONTENTS