UNIVERSITI TEKNOLOGI MARA

THE REMOVAL OF CARBON DIOXIDE BY USING MODIFIED CARBONIZED OIL PALM SHELL IN FIXED BED COLUMN

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Chemical Engineering

June 2013

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Carbon dioxide (CO_2) is the most abundant greenhouse gases which caused severe impact to the environment. This phenomenon could be prevent by reducing the CO_2 at flue gas stream before it can be released to the atmosphere. Therefore, this research intends to investigate the carbonized oil palm shell (CPS) modification by multi-steps chemical treatment of several solvents without activation of carbon for CO_2 adsorption. The comparison between experimental rig of single-fixed bed column (SFB) and multi-fixed bed column (MFB) was evaluated for higher adsorption efficiency. CPS was produced by carbonization at temperature of 600 °C within 5 hours. CPS particle was fixed at 15 g for SFB and MFB. Inlet CO_2 gas was controlled at 0.3 liter per minute during adsorption process and the discharge CO_2 concentration was measured by gas analyzer within 50 minutes. Simpson's rule method was used to calculate graph area for adsorption analysis. It was found that CO_2 removal in three layers of MFB is higher compared to SFB. CPS was treated by soaking with acetone and benzene. Then, it was divided into three portions which two of them were soaked with cyclohexane and acetonitrile separately and the other one with hydrogen peroxide. Surface morphology and BET analysis was done by using FESEM and BET surface area analysis respectively. The adsorption analysis in MFB for CPS treated by acetone-benzene-acetonitrile shows the highest adsorption of CO_2 followed by hydrogen peroxide, acetone-benzene-cyclohexane, CPS without treatment and acetone-benzene. This demonstrates more polar impurities inside the adsorbent which has been clean up from the conventional pore by the combination of polar aprotic, non-polar and non-polar solvents treatment which lead to micropores network formation of hypothetical T-Shirt shape pore model that influence the CO_2 adsorption and desorption of gas.

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