

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

(Mohamad Syukri Bin Hashim)

ABSTRACT

A research project consisting of experimental study is currently underway to generate information required for the Separation of carbon dioxide (CO_2) from feed gas using wetted activated carbon. The components of feed gas mixture source-separated domestic gas supplies studied for the first major in operation. Methane, carbon dioxide and C6-C11 hydrocarbons were determined by gas chromatographic methods. The content of methane was found to be just over 70% (v/v). The major polluting hydrocarbon in the feed gas was CO_2 to be separated in a Pressure Swing Adsorption (PSA) at a constant room temperature in the range of 27°C to 30°C using wetted activated carbon as the adsorbent. The aim of this exploratory research is to understand the concept and to address some of the effects of such technique to ultimately separate CO_2 using adsorption method from feed gas mixture of methane, CH_4 and carbon dioxide, CO_2 using water-preloaded activated carbon as the adsorbent and to compare the performance and effectiveness of the separation of carbon dioxide, CO_2 from a feed gas mixture of methane-carbon dioxide ($\text{CH}_4\text{-CO}_2$) with a ratio of 60% CO_2 (NL/min) and 40% CH_4 (NL/min) or mathematically 3:2 using both dry granular and wetted activated carbon at pressures of 30 and 60 bars to investigate the effect of operating conditions towards the separation performances at different operating pressures comparatively. The equilibrium adsorption data of CO_2 and CH_4 on an activated carbon with a wide pore-size distribution are to be collected at the temperature of an approximated hydrate formation in the presence of water. Differently from methane, the adsorption behavior of CO_2 has a remarkable influence of pore dimension of activated carbons no matter the carbon is wet or dry. However the challenge in this project as the whole would be on how to show that it affects the isotherm shape and the molar ratio of water to the fixed CO_2 in wet activated carbon. In the study, the effect of pore dimension and the difference in the adsorption behavior between CO_2 separation using dry granular and wetted activated carbon are also explained with regards to the phase behavior of CO_2 .

ACKNOWLEDGEMENT

Praise to the Lord for this project has finally come to its accomplishment. During this year of coping with this project, assistance, guidance and support had been given by many parties, the author would like to express the utmost gratitude to the project supervisor, Dr. Khalik M.Sabil, for the guidance and support provided along with the progression of this project. A heart-felt gratification is addressed to a very helpful laboratory partner, Natasha Othman for the patience devoted amongst one other with resilient help and continuous assistance from a very hard-working laboratory technician, Mr, Shahafizan for the helping towards the completion of this project. Immense thanking would not suffice to the supports coming from the Chemical Engineering Department staffs of Universiti Teknologi PETRONAS for the advice and assistance offered in order to complete this project.

Besides, the whole work would have never been possibly completed without the never-ending assistance from these people that at the same time makes engineering knowledge so much more than it seemed to be. The author has been inspired by a very big influence of his life for the unconditional blessings given from the very immediate family members throughout the entire period spent finishing this project.