CHAPTER V
CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Beta is a good adsorbent for all of studied impurity gases. The result shows that not only pore size affects the adsorption ability. They are also zeolite structure and surface area. Temperature was studied at -196°C, 0°C, ambient (25°C). Decreasing temperature would increase H_2 purity. The outlet gas has a grate concentration of H_2 at -196°C. Adsorption is an exothermic reaction so it occurs easily at low temperature. At -196°C, All gases which have boiling point higher than -196°C will condense to liquid and literally freeze. As solid material, these condensed gases are capture. H_2 purity is not much significant difference when using 1-2 and 2.5-5 mm pellet size of beta zeolite. During the subsequent adsorption or occlusion of various substances, the micropores can be filled and released reversibly. Therefore, adsorption is a matter of pore filling and the usual surface area concepts as they are applied to other solid adsorbents. The suitable ratio of alumina:zeolite is 9:3. Alumina has a great potential for methane adsorption while beta zeolite has a great potential for CO, CO_2, N_2 adsorption. The inlet pressure was studied at 5, 10, 15 and 20 barg. Decreasing inlet pressure would increase H_2 purity because there is a longer time of adsorption. At inlet pressure of 5 and 10 bar g does not show much difference in H_2 purity. Therefore inlet pressure of 10 bar g was chosen to increase productivity. By this selected condition, hydrogen industrial grade was used as a feed gas, hydrogen purity would increase up to 99.9999%. Beta zeolite was tested its stability. After four times of adsorption cycles, this adsorbent can be reused without a significant changing in H_2 purity.

This would raise the product quality and make it is valuable to meet the today's application such as PEM fuel cell which needs the hydrogen with trace impurities.

5.2 Suggestion

It was concluded that beta zeolite is a good candidate for applications of hydrogen purifications. Anyway, the test in industrial scale should be done