CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The methane adsorption on the CSAC in the presence of carbon dioxide was investigated. From the single gas adsorption, changing the methane concentration from 75 to 85 vol% does not affect the adsorption ability of methane on the CSAC. In contrast with the carbon dioxide adsorption, the change in its concentration from 5 to 20 vol% significantly affects the adsorption ability of carbon dioxide. When the concentration of carbon dioxide is increased from 5 to 20 vol%, the eluted time decreases from approximately 22.5 to 15 min due to shorter saturation time on the CSAC. And from the competitive adsorption, carbon dioxide more strongly adsorbs on the activated carbon than that of methane. The weakly adsorbed component, methane, breaks through first at about 5 min. Some of the methane is displaced from the adsorbent to give a higher gas phase concentration than that originally presents in the feed. As carbon dioxide then begins to break through, some methane is re-adsorbed and its gas phase concentration reverts to that of the feed indicating that the bed is saturated with respect to methane. In other words, methane roll up increases from the methane concentration ratio of 1.34 to 2.14 with the increase in the concentration of carbon dioxide from 10 to 30 vol%, respectively. And from the adsorbent stability, repeating of methane and carbon dioxide adsorption on the CSAC from 1 to 3 times slightly affects the stability of the adsorbent. The breakthrough times of methane and carbon dioxide increase due to longer saturation time on the CSAC as a result of the adsorbent lost its ability to adsorb gases. Not the same as from the three desorption cycles, the result shows that repeating of methane and carbon dioxide desorption barely affects the stability of the adsorbent to desorb gases. Finally, from the comparison of competitive adsorption on different adsorbents, the similar breakthrough patterns were observed for both gases on all adsorbents including of the untreated CSAC, the CSAC treated by potassium hydroxide, the CSAC treated by sulfuric acid, and the untreated PSAC. The difference in the breakthrough times of methane and carbon dioxide on each

adsorbent surface was observed due to their difference in terms of physical and chemical properties. The adsorbent stability was also studied for all adsorbents. The results illustrate the decrease in adsorbent stability throughout the 3-cycle adsorption-desorption for the untreated CSAC, the CSAC treated by potassium hydroxide, and the untreated PSAC. However, the CSAC treated by sulfuric acid does not have the significantly change in its stability like others.

5.2 Recommendations

Based on what has been discovered in this study, the following recommendations are suggested:

1. Find other adsorbents that can be selective towards methane.
2. Find other surface treatment methods that can adjust the surface functional groups of the adsorbent to enhance the methane adsorption.