

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The effect of carbon dioxide on the methane adsorption on CSAC to modify surface was investigated. For the competitive adsorption, carbon dioxide is more strongly adsorbed on the activated carbon than methane. The weakly adsorbed component, methane, breaks through first at about 5 min. Some methane is displaced from the adsorbent to give a higher gas phase concentration than that originally presents in the feed. As carbon dioxide 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 2.25 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. Finally, from the comparison of competitive adsorption on different adsorbents, similar breakthrough patterns were observed for both gases on all adsorbents including the untreated CSAC, the CSAC/ H₂SO₄, CSAC/H₃PO₄, CSAC/HNO₃, CSAC/KOH, CSAC/NH₃.H₂O, CSAC/NaOH, CSAC/MES at 15 mg/l, CSAC/MES at 50 mg/l, and CSAC/MES at 152.8 mg/l. 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 adsorption selectivity was also studied for all adsorbents. The results illustrate the decrease in the adsorbent selectivity of CH₄/CO₂ for the CSAC/H₂SO₄, CSAC/H₃PO₄, CSAC/HNO₃ and CSAC/MES at 152.8 mg/l. However, the untreated CSAC, CSAC/KOH, CSAC/NH₃.H₂O, CSAC/NaOH, CSAC/MES at 15 mg/l, and CSAC/MES at 50 mg/l does not have a significant change in the selectivity like the others.

5.2 Recommendations

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

1. Adjust concentration or temperature of sulfonate that may improve hydrophobic surface for methane adsorption.
2. Find other surface treatment methods that can adjust the surface functional groups of the adsorbent to enhance the methane adsorption.