

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Conclusions

Reaction of ozone directly affects the physical properties of activated carbon; BET surface area, pore volume, micropore volume, and average pore size diameter. Surface area, pore volume, and micropore volume is increased with increasing ozone treatment time until it reaches the maximum point around 25 min. With high oxidation power, ozone removes carbon on surface into carbon gas compound which later leave the surface and generate high surface area. However, too long ozonation can slightly widen pores of activated carbon lead to decrease micropore volume and surface area

Therefore, the physical properties of activated carbons, including BET surface area, micropore volume, total pore volume, pore size diameter, and natural type of surface play an important role in methane adsorption.

In this study, for methane adsorption, ozone treatment time with flow rate 165 ml/min of 25 min has the highest methane adsorption following by 30, 20, 15, 10, 5, 35, 40, 45, non-treated, 60, 120, and 240 min.

The optimum pore size for methane storage is approximately 11.4 Å. Thus, the larger pore size diameter of activated carbons leads to less amount of methane adsorption than that the activated carbons with smaller pore size diameter. However, this results indicated that, the increased in the methane adsorption capacity probably mainly because of the increased in the surface area and micropore volume.

The addition of the porous adsorbent such as an activated carbon could increase the capacity of methane storage in the CNG tank by treated with ozone with the proper time of ozonation.

#### 5.2 Recommendations

The capacity of methane adsorption could be increased by investigating the most important parameter consisting of two parameters; surface area and pore

structure. In this study, the improvement of activated carbon surface for methane adsorption can be achieved through the ozone treatment process. There are many aspects of the ozone-modified surface to improve adsorption capacity. So, the further development of ozone for methane adsorption on activated carbon could be performed as follows:

- Effect of functional groups on the activated carbon surface on methane adsorption mechanism.
- Effect of temperature on the ozonation process.
- Effect of the nature of activated carbon, such as coconut-based AC, bituminous-based AC, and palm-based AC.