

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

These experimental results demonstrated that the combination of a gaseous plasma environment produced by corona discharge and a Pt supported zeolite catalyst exhibited another feasibility of oxidative coupling of methane to produce higher hydrocarbons as well as synthesis gas at ambient conditions. The results obtained during the experiment can be concluded as follows:

1. Multiplicity of products produced from these plasma systems with and without catalysts consisted of carbon monoxide, hydrogen, ethylene, acetylene and carbon dioxide.
2. For the plasma system without catalysts, an addition of ethane in methane and oxygen feed could enhance the methane and ethane conversions and synthesis gas selectivity but lowered the C₂ product selectivity.
3. Methane, oxygen and ethane conversions and yields of C₂ hydrocarbons decreased with increasing the flow rate or decreasing the reaction residence time because the probability that methane, oxygen and ethane molecules had adequate time to come in contact with any electrons of sufficient energy to initiate the reactions decreased.
4. Methane, oxygen and ethane conversions, and the yields of C₂ hydrocarbon with increasing the frequency because of a lower number of electrons available for initiating the reactions.
5. An increase in the applied voltage caused an increase in the current, which means more electrons and ions are available for attacking

methane, oxygen and ethane molecules, and thus converting to active species suited for the reactions.

6. Methane, oxygen and ethane conversions, and the yields of C_2 hydrocarbon increased significantly with increasing applied voltage.
7. The oxygen conversion was extremely high and nearly independent of the frequency and voltage change in the 1% Pt/KL system.
8. The presence of 1% Pt/KL zeolite enhanced the conversion of oxygen and the selectivity of ethylene while, for the non-catalytic system, hydrogen and carbon monoxide were main products.
9. 1% Pt/NaOH treated Y led to have the maximum conversions of methane and ethane, while the highest oxygen conversion was obtained with Pt/KL and Pt/NaX.
10. The most selective zeolite for ethylene formation was 1% Pt/KL. The plasma system was observed to be effective in maximizing the acetylene selectivity.

5.2 Recommendations

Other types of catalysts and feed component still have to be employed to selectively convert methane molecule in a gaseous plasma environment to produce higher hydrocarbons. The optimum platinum loadings for different support materials are highly recommended for future works. Power and power factor measurement should also be studied, which will lead to a better understanding in the future work.