CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The dielectric-barrier discharge reactor has exhibited another feasible means of activating methane molecules for initiating methane conversion. The reactions are achieved by the collisions between high energetic electrons released from the metal electrode and methane molecules inside the discharge gap to form higher hydrocarbons. From the experimental results, conclusions have been drawn as follows:

1. Multiplicity of products produced from this reaction consisted of ethane, ethylene, acetylene, carbon monoxide , hydrogen and methanol.
2. Under the presence of carbon dioxide in methane feed, the methane conversion increased significantly.
3. An addition of helium in the methane feed under discharge environment leaded to exhibit a significant improvement in methane conversion. An increase in helium content in methane feed also resulted in increasing carbon monoxide and hydrogen selectivities but decreasing C_2 products selectivities.
4. An increase in the external voltage supplied to the reactor caused an increase in the energy of electrons and other particles, resulting in increasing the methane molecular energy to overcome its dissociation energy.
5. As an increase in the reaction space time, the methane conversion increased.

6. By increasing voltage and space time on the system, the carbon monoxide and hydrogen selectivities were increased significantly, whereas the C_2 products selectivities were decreased.
7. Even though the products selectivities were found to be significantly affected by helium concentration and applied voltage in this study, the methanol selectivity was, nearly independent to the change of these parameters.

5.2 Recommendations

From the experimental results, a variety of carbon products produced in the reaction were found. Hence, there is an interesting point to determine whether the carbon source of each product is from carbon dioxide or methane by isotope experiments.

Another interesting point is to observe the effect of higher frequency on the methane reaction behavior. This may lead to minimize power supply.

Moreover, an attempt should be done to apply an appropriate catalyst such as Ni-based or noble metal-based catalyst in the system in order to enhance the methane reaction.