

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The effects of operating parameters, addition of steam and Ni catalysts on the combined steam reforming with partial oxidation of CO₂-containing natural gas were investigated by using non-thermal plasma corona discharge with the hydrocarbons to oxygen feed molar rate of 2:1 and the gap distance between electrodes of 10 mm. The main product was synthesis gas (H₂ and CO) with other products of C₂H₄, C₃H₆ and C₄H₁₀. The results showed that conversions increased with increasing input voltage, decreasing frequency and feed flow rate. The H₂ selectivity trended to decrease with the increase of conversions. The opposite trend was found in the CO selectivity resulting from the dominated reaction of the oxidative dehydrogenation reactions. The optimum conditions were the input voltage of 15 kV, frequency of 300 Hz and feed flow rate of 75 cm³/min. Under the optimum conditions, steam was introduced into the system and the results showed slightly effect on the system. The increase of mol% of steam firstly increased the yields of synthesis gas, and then at 20 mol% of steam started to drop the reactant conversions and yields. Consequently, the 15 mol% of steam was the best condition for addition of steam. The effects of Ni catalysts were performed by using 5, 7, 10 wt% of Ni loading. The conversions and yields increased with increasing of Ni loading. However, the opposite trend was found in CO₂ conversion due to the increase of CO₂ formation in the system. 5 wt% of Ni loading was provided high conversions and selectivities with low power consumption.

5.2 Recommendation

The effect of catalyst should be continuously studied in a corona discharge such as the effect of other metal or the addition of chemicals as well as other plasma reactors in order to find out the better condition.