CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this research, the epoxidation reaction of ethylene was investigated in the low-temperature corona discharge. To enhance the ethylene oxide selectivity, four catalysts, including Ag/(LSA)α-Al_2O_3, Ag/(HSA)α-Al_2O_3, Au-Ag/(HSA)α-Al_2O_3, and Au/TiO_2, were examined as the combined catalytic-corona discharge system. Ag/(LSA)α-Al_2O_3 was experimentally found to be the most suitable catalyst, providing the highest ethylene oxide selectivity. The amount of Ag loading content also greatly affected to such the selectivity with 12.5 wt% as the optimum content. The 12.5 wt% Ag/(LSA)α-Al_2O_3 was therefore taken to further investigate the effects of various operating parameters, including applied voltage, input frequency, molar ratio of O_2/C_2H_4, and feed flow rate, on the epoxidation activity in order to achieve the optimum condition. The obtained optimum condition of the combined catalytic-corona discharge system toward ethylene epoxidation was concluded as follows:

Catalyst	= 12.5 wt% Ag/(LSA)α-Al_2O_3
Input frequency	= 500 Hz
Applied voltage	= 15 kV
Molar ratio of O_2/C_2H_4	= 1/1
and feed flow rate	= 50 mL/min

The optimum condition gave the conversions of C_2H_4 and O_2 of 39.7 and 47%, respectively, and the C_2H_4O selectivity of 12.98%. The power consumption to break down each C_2H_4 molecule and create each C_2H_4O molecule were 1.6×10^{-16} W.s/molecule of C_2H_4 converted and 12.6×10^{-16} W.s/molecule of C_2H_4O produced.

5.2 Recommendations

The optimum condition for ethylene epoxidation should be applied with the multistage corona discharge reactors in future work. Addition of promoters, such as Cs and Cu, onto the Ag/(LSA)α-Al_2O_3, which have been reported to help enhance the C_2H_4O selectivity in conventional catalytic system, should also be investigated.