CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this research, the ethylene epoxidation was investigated in the low-temperature corona discharge. To enhance the EO selectivity, C_2H_4 was fed into the side of the corona discharge reactor, directly to the plasma zone, to collide with O_2 radicals initially produced. A gap distance between plate electrode and C_2H_4 feed position of 0.2 cm was experimentally found to be the most suitable position, providing the highest EO selectivity. The effects of various operating parameters, including O_2/C_2H_4 feed molar ratio, applied voltage, input frequency, total feed flow rate, and gap distance between pin and plate electrodes, on the epoxidation performance were also investigated in order to achieve the optimum conditions. In order to obtain the highest EO yield of 1.76% and the highest EO selectivity of 8.42%, the corona discharge system must be operated at a distance between plate electrode and C_2H_4 feed position of 0.2 cm, an O_2/C_2H_4 feed molar ratio of 0.5:1, an applied voltage of 18 kV, an input frequency of 500 Hz, a total feed flow rate of 100 cm^3/min, and a gap distance between pin and plate electrodes of 1 cm. Under these optimum conditions, the power consumptions to break down each C_2H_4 molecule and to create each EO molecule were found to be 4.74×10^{-16} Ws/molecule of C_2H_4 converted and 6.07×10^{-16} Ws/molecule of EO produced.

5.2 Recommendations

The optimum conditions for ethylene epoxidation under the corona discharge system should be applied with some epoxidation catalysts, such as 5 wt.% Ag/SiO_2, in order to further enhance the epoxidation performance.