CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this work, the epoxidation reaction of ethylene was investigated in the low-temperature dielectric barrier discharge (DBD) and compared with the low-temperature corona discharge plasma system. For the DBD system, the effects of various operating parameters, including molar ratio of O_2/C_2H_4, feed flow rate, input frequency, applied voltage, and electrode gap distance, on the epoxidation activity was initially studied in order to achieve the optimum conditions. In order to obtain the highest ethylene oxide yield of 5.62% and the highest selectivity of 6.18%, the DBD system must be operated at an O_2/C_2H_4 molar ratio of 1/1, a feed flow rate of 50 cm^3/min, an input frequency of 500 Hz, an applied voltage of 19 kV, and an electrode gap distance of 10 mm. At these optimum conditions, the power consumptions to break down each C_2H_4 molecule and to create C_2H_4O molecule were found to be 0.37×10^{-16} Ws/molecule of C_2H_4 converted and 6.07×10^{-16} Ws/molecule of C_2H_4O produced. The optimum conditions were also used to comparatively investigate the epoxidation performance with the corona discharge system operated with many catalytically active catalysts. It was still found that the dielectric barrier discharge system exhibited the best epoxidation performance even without the presence of catalyst during the operation.

5.2 Recommendations

The optimum conditions for ethylene epoxidation under the dielectric barrier discharge system should be applied with the best investigated catalyst, which was the 0.2 wt.% Au-12.5 wt.% Ag/(LSA)α-Al_2O_3 in order to further enhance the epoxidation performance. Moreover, the cylindrical dielectric barrier discharge system should be investigated for a comparison due to its ease to pack the catalyst.