CHAPTER V
CONCLUSIONS

Biohydrogen production from wastewater is of interest because it can be carried out under ambient conditions. In this study, anaerobic sequencing batch reactors (ASBR) were used to produce hydrogen from synthetic wastewater under mesophilic conditions. Glucose was used as a substrate for the carbon source. The ASBR units were operated at different chemical oxygen demand (COD) loading rates, and the produced gas composition and the concentration of the volatile fatty acids (VFA) in the effluent were analyzed using a gas chromatograph (GC) with a thermal conductivity detector (TCD) and a GC with a flame ionization detector (FID), respectively.

5.1 The Effect of COD Loading Rate

The biohydrogen production in anaerobic sequencing batch reactor (ASBR) operated without pH control was initially examined as function of COD loading rate in the range of 10 to 40 kg m^{-3} d^{-1} with 10 kg m^{-3} d^{-1} increment. As the COD loading rate increased from 10 to 40 kg/m^3d, the system pH decreased from 6.68 to 5.2. At the optimum COD loading rate of 30 kg/m^3d, gas production rate was 2.085 L h^{-1}, the produced gas was found to contain 38% H_2 and 62% CO_2, and the highest hydrogen yield was 1.16 mol-H_2/mol-glucose consumed.

5.2 The Effect of COD Loading Rate at Optimum pH (pH = 5.5)

For the ASBR system with pH control at optimum pH of 5.5, when COD loading rate was further increased, the hydrogen yield reached the highest value of 1.46 mol-H_2/mol-glucose consumed at COD loading rate of 40 kg/m^3d in the ASBR with pH control. At this COD loading rate, gas production rate was 2.88 L h^{-1}, and the produced gas was found to contain 43% H_2 and 57% CO_2. There was no methane gas in produced gas in all experiments. From all of the experimental data, it can be

concluded that the optimum COD loading rate was 40 kg m^{-3} d^{-1} for the system with pH control.

5.3 Recommendations

Upon completion of the study, although several conclusions can be drawn, but there are still few issues needed to be further investigated. For example, the system temperature seems to have strong effect on the biohydrogen production. Because the system temperature was not varied in this research but only controlled at the mesophilic temperature (37°C), the thermophilic temperature (55°C) might help increase the biohydrogen production efficiency. Moreover, real wastewaters should be used in future study because the system can be potentially applied with wastewater treatment system to produce the energy used in the plants. If this process is applied, it will help save the cost of energy use.