

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The experimental results shown that dark fermentation in a two stage upflow anaerobic sludge blanket (UASB) system produced hydrogen and methane continuously under mesophilic temperature (37 °C). Without microaeration, the optimum COD loading rate was found to be $6 \text{ kg}\cdot\text{m}^{-3}\cdot\text{d}^{-1}$ based on the methane UASB volume (or $36 \text{ kg}\cdot\text{m}^{-3}\cdot\text{d}^{-1}$ based on the hydrogen UASB volume) to provide the highest process performance with the highest hydrogen and methane yields of $54 \text{ mLH}_2\cdot\text{g}^{-1}$ COD removed and $652 \text{ mL CH}_4\cdot\text{g}^{-1}$ COD removed, respectively and also gave a maximum SHPR of $47 \text{ mL H}_2\cdot\text{g}^{-1} \text{ MLVSS}\cdot \text{d}^{-1}$ and SMPR of $80 \text{ mLCH}_4\cdot\text{g}^{-1} \text{ MLVSS}\cdot \text{d}^{-1}$. However, when cassavawastewater was oxygen supplied at an optimum COD loading rate, the results indicated that the oxygen supply rate of $6.1 \text{ mL O}_2\cdot\text{L}^{-1}\text{wastewater}\cdot\text{d}^{-1}$ was found to a maximum methane yield of $682.33 \text{ mL CH}_4\cdot\text{g}^{-1}$ COD removed and specific methane production rate of $192.03 \text{ mL CH}_4\cdot\text{g}^{-1} \text{ MVSS}\cdot\text{d}^{-1}$. The oxygen supply rate of $6.1 \text{ mL O}_2\cdot\text{L}^{-1} \text{ wastewater}\cdot\text{d}^{-1}$ was optimum condition for the growth of the facultative anaerobic bacteria via aerobic respiration under anaerobic hydrolysis. An excess oxygen was found to promote higher organic acids and ethanol production, leading to a decreased methane production efficiency. Moreover, the microaeration affected the efficiency of desulphurization of the produced biogas. The hydrogen sulfide gas was reduced from 0.28 % to 0.00 %.

5.2 Recommendations

It is interesting to study the enhancement of the methane production with nitrogen supplied in the cassava wastewater under the anaerobic digestion by using the UASB system. In addition, ASBR (Anaerobic Sludge Blanket Reactor) and CSTR (Continuous Stirred Tank Reactor) system under the optimum condition including the various types of wastewater that may be investigated.