CHAPTER V
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

An optimal fermentation condition that obtain highest yield for biohydrogen production from starch processing wastewater in this study was initial pH 7.0, thermophilic temperature range, and initial iron concentration 800 mg Fe/L. However, optimal operational value should be consider under circumstances because different parameters, for example source of substrate, source of microbial seed, dominant species in the cultures and so on, may prefer dissimilar environmental conditions. Besides too high iron concentration would harm the microbes and lower the hydrogen production.

Furthermore, cell immobilization by addition of biomaterials (BM) could improve hydrogen yield by 2 folded comparing to the non-addition. BM from plants (loofa sponge) was found producing higher yield than that from animals (silk cocoon), and optimal concentration of BM was 5% (v/v). Decreasing of hydrogen yield observed when increasing BM concentration since too high BM concentration may lower space for microbial growth and limit the circulation of the fermentation liquid.

On BM from the optimal concentration and fermentation condition, it was mostly found rod-shaped, size range of 1-5 μm, Firmicutes phylum, *Bacillus cereus*with population of 47% of all specie detected. This specie was also reported as efficient starch-utilizing hydrogen producers.

5.2 Recommendations

There are suggestions for further study as follow.

5.2.1 For acknowledgement of practical use in future, the optimal condition should be tried operating in larger batch scale or continuous reactor. Especially when adding supporting materials for bacterial growth, the fermentation should be test in high-rate continuous process since the supporting materials could decrease cell washing out.

5.2.2 The remaining COD may be eliminated by second fermentation for methane, so it should be further study for two-stage fermentation using starch processing wastewater.

5.2.3 The fermentation system should be applied and connected with fuel cells system.

5.2.4 The optimal of initial iron concentration should be study at concentration lower than 100 mg Fe/L.