CHAPTER 5 CONCLUSIONSAND FUTURE RECOMMENDATIONS

5.1 Conclusions

In series 1, the treated Dindaeng (DD) inoculum contains the hydrogen producing microbes that can consume glucose and polysaccharides as the substrates. The treated Nongkheam (NK) inoculum contains only glucose consuming, hydrogen producing bacteria. The natural seeds may contain the group of hydrogen producing microbes, but they cannot compete with acidogen. As observed, both inocula cannot generate the H_2, even the glucose was fed. The natural DD and NK inocula can produce some amounts of glucose from starch under acidic condition. They behave as the pre-fermentative microbes, which can contribute the glucose from the biotransformation of long chain molecule of starch. The obtained glucose is further consumed by acidogen and VFAs are the products of bioreaction. The glucose consuming-acidogen species may predominant in natural DD and NK. So, the H_2 producing microbes may be completely inhibited. Even in the system fed with glucose, the H_2 producing microbes do not compete with acidogen. The heat treatment and substrate selection may recommend, if the DD seed is employed to the biohydrogen process.

In series 2, the two stages biohydrogen consisting of pre-fermentation and dark fermentations were investigated. The natural DD inoculum was fed with starch feedstock, as soon as the acidogens convert the starch to be glucose, the glucose can be supplied to the H_2 producing microbes. Besides, the starch consuming H_2producing microbes can utilise starch as substrate, distributing the H_2. These pathways can bring the high yield of H_2. The starch consuming H_2 producing microbes can be stimulated under glucose depletion. The glucose consuming H_2 producing microbes can adapt themselves to be familiar with the low concentrated glucose substrate in the biosystem. The highest of amounts of accumulated H_2 were 4727 mLH_2, when the untreated DD inocula were fed with starch. The two stages DD sludge can provide the highest specific H_2 production potential at 1020 mLH_2/(gCOD/L). The acetate and butyrate are the major byproducts of pre-fermentation and dark fermentation. These byproduct can confirm that the active microbes in untreated and treated DD sludge can be boosted up by the substrate selection techniques. The specific H_2 production potential presented in

this research was closed to the reviewed works. The two stage biohydrogen can bring the satisfactorily low cost of H_2 production and these processes can conduct the utilsation of starch waste.

5.2 Recommendations

This research had been demonstrated the source of microbial seed selection and the major key issues on two stage biohydrogen process. However, the biohydrogen process would be dynamically improved as this would be the alternative renewable energy. To be completely understood the biohydrogen process, the future research focus would recommended as follows.

- The biohydrogen production potential of the two stages biohydrogen was acceptable. However, the performance of the system could be enhanced by maintaining the system for longer time. This could eliminate the inactive hydrogen producing microbe or the microbial seed was enough matured. Besides, adding more substrate for the dark fermentation may be recommended.
- The VFAs, glucose and starch remaining in the two stages biohydrogen process may be utilised as the substrates for photo-fermentation process, or the others.
- The maximum organic loading rate of the two stages biohydrogen should be further examined.