CHAPTER V

CONCLUSION AND SUGGESTIONS

5.1 Conclusion

Among several parameters, the quantity of propylene oxide and sodium hydroxide were vital for obtaining the high degree of substitution. The other parameters, the quantity of sodium sulfate and the temperature, showed minor effect on the degree of substitution but had the direct effect on the gel formation. The most appropriate temperature for this reaction was $40^{\circ}C$ at which gelatinization would not occur. The amount of water in the reaction had also the major influence on gel formation. This was demonstrated by much higher degree of substitution, 0.2057, when 70% ethanol in water was used as the reaction medium. The determination of the degree of substitution by ^{1}H-NMR spectroscopy was more convenient and gave better precision. In compare with the colourimetric method, ^{1}H-NMR spectroscopy gave a slightly higher degree of substitution than the colourimetric method for the same sample. The physical properties of the hydroxypropylated starch depended on the degree of substitution. With higher degree of substitution, its gelatinization temperature was lower and the viscosity was higher. Therefore the hydroxypropylation of the tapioca starch could be controlled in such a way that it would provide the appropriate level of substitution which would lead to the required property suitable for the individual application.

5.2 Suggestions for Further Work

1. The gelatinization is the important problem for improving degree of substitution of hydroxypropylated tapioca starch, may be find the other salts or mediums to prevent gelatinization of starch.

2. In this study, the highest degree of substitution was 0.0927 when water was used as reaction medium. The reaction yield was about 36.88%. It is expected that another method will increase degree of substitution when water medium was used.

3. Other reactions can modify the tapioca starch: acetylation or crosslinking after hydroxypropylation. It will improve the properties of tapioca starch for using in a wide range application.