CHAPTER I

INTRODUCTION

1.1 Introduction

In recent years, superabsorbent polymer (SAPs) has received considerable interest in water-swellable materials capable of absorbing and holding large amounts of water. These polymers have found extensive commercial application as sorbents in personal care products such as infant diapers, feminine hygiene products, and incontinence products, and have received considerable attention for a variety of more specialized applications including matrices for enzyme immobilization, biosorbents in preparative chromatography, materials for agricultural mulches, and matrices for controlled release devices [1].

Biodegradable polymers are a newly emerging field. A vast number of biodegradable polymers have been synthesized recently and some microorganisms and enzymes capable of degrading them have been identified. In developing countries, environmental pollution by synthetic polymer has assumed dangerous proportions. As a result, attempts have been made to solve these problems by including biodegradability into polymers in everyday use through slight modifications of their structures [2]. Thailand is the great producer of cassava roots and is the world's largest exporter of cassava products. Quite often, the production of cassava starch exceeds the export and consumption scales that make the country too much surplus and unused cassava products. Besides its low cost and availability, the biodegradability has gained even more importance in this environmentally concerned era and reliable process to use the surplus cassava starch to increase its commercial value by modifying its chemical structure to produce a SAPs for various applications.

1.2 Objectives

The objectives of this research are as follow:

1. To synthesize a new superabsorbent polymer based on cassava starch as a grafting substrate, using a chemical initiaton.
2. To study influences of the reaction parameters on water absorption of newly synthesized superabsorbent polymers.
3. To study biodegradation of the new superabsorbent polymers.

1.3 Expected Benefits Obtainable for Development of the Research

The benefits for the development can be:

1. To obtain a technique for the synthesis of cassava starch-*g*-poly[acrylamide-*co*-(itaconic acid)], which can be modified for a production of cassava starch-based superabsorbent polymer
2. To investigate some influences of the reaction parameters which can improve water absorption of the superabsorbent polymers.

1.4 Scope of the Investigation

In this research, the necessary procedure of graft copolymerization of acrylamide and itaconic acid onto cassava starch via a chemical initiation to achieve the best product is as follows:

1. Surveying literature and in depth studying of this research work.
2. Preparing graft copolymers of acrylamide and itaconic acid onto cassava starch via chemical method using a redox initiation, by studying the following parameters so as to select the suitable technique and to attain the appropriate reaction conditions:
    a. The effect of mole percent of acrylamide-to-itaconic acid ratio.
    b. The effect of cassava starch (g) to monomer (g).
    c. The effect of initiator content of ammonium persulfate (APS) (%based on the total of monomers).
    d. The effect of crosslinking content: *N, N'*-methylenebisacrylamide (N-MBA) (%based on the total of monomers).
3. Extracting the homopolymer of poly(itaconic acid), and polyacrylamide and free copolymer of poly[acrylamide-*co*-(itaconic aicd)] of the crude product.
4. Bringing the obtained graft copolymer to further characterization steps:
    a. Determination of the free polymer formation.
    b. Determination of grafting efficiency of the grafted copolymer.
    c. Determination of the percent add-on of the grafted copolymer.
    d. Determination of grafting ratio of the grafted copolymer.
5. Studying the absorption capacity of the starch-*g*-poly[acrylamide-*co*-(itaconic acid)] in distilled water, salt solution, and pH buffer solutions.

6. Determination of grafting characteristics of cassava starch-*g*-poly[acrylamide-*co*-(itaconic acid)] by thermal gravimetric analysis.
7. Surface morphology of the graft copolymer by scanning electron microscopy.
8. Investigating the biodegradation of the starch-*g*-poly[acrylamide-*co*-(itaconic acid)] via the α-amylase and quantified by a colorimetric method.
9. Summarizing results and preparing the report.