CHAPTER I

INTRODUCTION

1.1 Introduction

High-water absorbing polymers (HWAPs) have received a worldwide interest since the hydrolyzed starch-polyacrylonitrile graft copolymer was first developed in the early 1970's by the United States Department of Agriculture (1). As these materials can absorb hundred times their weight in water and also have high-water holding capacity under pressure. Recently, they are being widely used in various fields of agriculture and horticulture. Besides, water-absorbing materials can be used in personal care applications such as baby diaper and sanitary napkin; and also for various industrial usages. Also termed superabsorbents, the materials are not only be starch-based polymers which are biodegradable and normally last about one year, but they are also synthetic-based polymers from petrochemicals which are non-biodegradable and have an absorption efficiency of four years or an even longer servicing life.

1.2 Objectives

The objectives of this research are the following:

1.2.1 To develop a suitable inverse suspension polymerization procedure for the synthesis of a water absorbing polymer.

1.2.2 To characterize some properties of the synthesized water absorbing polymer.

1.3 Expected Benefits Obtainable for Future Developments of the Research

1.3.1 To possibly transfer the far-more developed technology, based on the present investigation, to local industry for a large-scale production of synthetic-based water absorbing polymers.

1.3.2 If the industrial investment of this technology is feasible and economical, it will then be another downstream investment of the local petrochemical industry.

1.3.3 To decrease the import of this type of material in order to save the country's foreign currencies.

1.4 Scope of the Investigation

Synthesis of water absorbing polymers by inverse suspension polymerization is a relatively new idea, the appropriate parameters are theoretically not thoroughly known in the field. The necessary procedures to achieve the best product may be as follows:

1.4.1 Literature survey and in-depth study of this research work.

1.4.2 Preparation of potassium acrylate by neutralization of the commercially available acrylic acid.

1.4.3 Synthesis of Poly(acrylamide-*co*-potassium acrylate) via an inverse suspension polymerization by changing the following parameters so as to attain an appropriate reaction condition:

a) the optimum concentration of the aqueous monomer solution between 10:90 - 90:10 molar ratio of acrylamide:potassium acrylate;

b) the optimum polymerization temperature between 40-60 °C;

c) the optimum concentration of the initiator between 0.5-2.0 g/l of the suspension;

d) the optimum quantity of the crosslinking agent between 0.005 - 0.05 mole%.

1.4.4 Synthesizing the crosslinked poly(acrylamide-*co*-potassium acrylate) by using ammonium persulfate - N,N,N´,N´-tetramethylethylenediamine (2:1 by weight) as a redox initiator.

1.4.5 Measuring the water absorbency of the synthesized beads in distilled water and selected solutions : potassium chloride and magnesium chloride.

1.4.6 Characterizing the synthesized beads by means of:

a) study of the functional groups in the copolymer;

b) structure of the copolymer;

c) study of thermal properties of the copolymer;

d) surface morphology of the copolymer beads.

1.4.7 Summarizing the results and preparing the report.