

## CHAPTER I



## INTRODUCTION

### Introduction

In recent years, a considerable amount of research by polymer scientists has focused on the development of thickener for their applications to textile printing. Also termed the synthetic thickener polymer, these materials can be starch-based. In textile printing, the print paste is usually required to give good printing effects with sharp outlines together with more or less penetration of the prints. In the past, thickening agent was wheat starch, waxy corn starch, etc., but this material cannot be used due to its biodegradability upon storage for a long time. Natural starch paste tends to gel and forms insoluble aggregates over a period of time, because of the molecular association of linear polymer units. Such change may occur slowly and may not be immediately apparent, but print paste is usually required to be stable for at least one week. At present, sodium alginate is one of the commonly used thickeners, which is imported from abroad. Then the cost is higher (1). Significant progress has been made recently in the chemical modification of industrial starch materials to achieve improved physical and chemical properties. The need for chemical techniques whereby the constitution of starches may be studied has stimulated an interest in reagent, which will react with the starch molecules. The consequent effects that chemical modifications have on the backbone of starches have also interested the technologists. Starches can be particularly amenable to chemical activity. The number and variety of reactive groups in

polysaccharide, which has led to copolymer with novel properties are the importantly technical innovation.

They can be prepared by graft copolymerization of vinyl monomers act as grafting sites initiated either by certain metal ions such as salts of cerium (IV), magnesium (III), ferric (III), etc; or by radical initiations such as benzoyl peroxide, ferrous ammonium sulphate-hydrogen peroxide, hydrogen peroxide-ascorbic acid; or by gamma radiation (2).

Vinyl acrylic acid monomer is used extensively in the chemical industry to make water-soluble polymers, coatings, plastics and resins, adhesive and thickening agent, etc. (3). In this communication, the chemical modification of cassava starch to become a thickener, via grafting with acrylic acid, using hydrogen peroxide-ascorbic acid as an initiator system reported as functions of monomer, initiator, and co-initiator concentrations; amount of starch; reaction temperature; reaction time; and addition rate of monomer-initiator mixture were carried out.

### Objectives

The objectives of this research are the following:

1. To prepare cassava starch grafted acrylic acid thickener for cotton fabrics printing.
2. To develop a suitable synthesis technique of thickener in a form of hydrolyzed starch-g-poly(acrylic acid) by making use of a redox system.
3. To study the effects of reaction parameters on the average-molecular weights of the synthetic thickener.

### Scope of Investigation

In this research, the plan for graft copolymerization of acrylic acid onto cassava starch via the hydrogen peroxide-ascorbic acid initiation to achieve the suitable product for the textile application is as follows:

1. Literature survey and in-depth study of this research work.
2. Preparing graft copolymerization of acrylic acid onto cassava starch via the hydrogen peroxide-ascorbic acid initiation, by studying the following parameters so as to select the suitable technique and to attain the appropriate reaction conditions:
  - a) The optimum quantity of acrylic acid concentration [M].
  - b) The optimum quantity of hydrogen peroxide concentration [M].
  - c) The optimum quantity of ascorbic acid (percent weight based on the monomer added to each of the optimum amount of acrylic acid);
  - d) The optimum quantity of starch (grams);
  - e) The optimum reaction temperature ( $^{\circ}\text{C}$ );
  - f) The optimum reaction time (hour);
  - g) The optimum adding rate of monomer-initiator mixture ( $\text{cm}^3/\text{s}$ );
3. Bringing the graft copolymer obtained from section 2 to the saponification of starch graft copolymer.
4. The viscosities of gelatinized starch and products after grafting were measured.

5. The homopolymer of poly(acrylic acid) resulting from the reaction was extracted.
6. Water absorption capacities of the saponified starch-g-poly(acrylic acid) copolymer in deionized distilled water were studied.
7. The average-molecular weights of the grafted polyacrylate were determined by GFC.
8. Measurement of the viscosity of thickener.
9. Summarizing the result and writing up the report.

