CHAPTER I

INTRODUCTION

1.1 Introduction

Cellulosic gel

Cellulose is produced by various organisms, including higher plants, certain microorganisms. Among microorganisms, a type of acetic acid-producing bacteria are known to synthesize cellulose extracellularly. The first study of cellulose formation was reported by Brown in 1886 (Yamanaka and Watanabe,1994). In the course of vinegar fermentation, a gelatinous mat sometimes formed on the surface of the broth in static cultures. Analysis of this gelatinous mat revealed it to be cellulosic gel (Zaar,1979)

Application of this gelatinous mat or cellulosic gel appears highly feasible and some are already in use ;

1)Food uses Mostly, cellulosic gel has been used as desserts. Both of raw and processed cellulosic gel (in light syrup) have been used as souce of dietary fiber (Banzon, Gonzalez and de Leon, 1990).

2)Acoustic diaphrams Because of its properties ; high sonic velocity and high internal loss, which is known to be necessary to reproducing clear sound with low noise.

3)Paper products Material from disintregated cellulosic gel can be used in the manufacture of paper. Moreover it can also be combined with various powders to produce sheets. The addition of cellulosic gel enhanced the breaking length of the sheet increased (Yamanaka and Watanabe,1994).

4)Food additives In food processing, suspensions of disintregated cellulosic gel have been found useful as thickener, binder as dietary supplement agent (Okiyama, Motoki and Watanabe,1993).

5)Other applications Disintregated cellulosic gel have been mixed with organic polymers, such as polyvinyl alcohol, to make reinforced materials (Yamanaka and Watanabe,1994).

The various applications of powdered cellulosic gel, use as food additives were interesting. However,it has some problem on preparation of powdered cellulosic gel. Basically, because cellulosic gel can not be dried without great loss of its physical properties (Okiyama, Motoki and Yamanaka,1993). Therefore, the purpose of this study is to develop new form of cellulose from cellulosic gel without the loss of its hydrophilicity and to evaluate its physical properties from the standpoint of thickener. The etherification reaction was used for producing a derivative form of cellulosic gel whch was called as carboxymethylcellulose or CMC.

Commercially, the term carboxymethylcellulose is classified as one of water soluble ethers. It is frequently called cellulose gum, CMC or sodium cellulose glycolate. The production of CMC was first developed by Jansen in 1921 (Hollabaugh and Burt,1945). CMC was commercially available in Europe in the early of twentieth. It was a crude product used as a colloid and adhesive. There must have been considerable industrial research activity in the early thirtieth because several patents were issued in the period from 1936 to 1941. The large scale uses began to emerge and commercial production appear justified since World War II.

The most important ionic cellulose ether is CMC which is sold widespread in two qualities, the purified quality, which is purified similar to hydroxyethylcellulose and a technical (or crude) CMC quality. The CMC is the most important and diversified thickening agent with respect to its industrial applications. Total worldwide sales of water soluble ether are estimated to be about 450,000 tons in 1983, with CMC accounting for approximately 70%. There are about 60 producers throughout the world and it is estimated that more than 250 grades of CMC are commercially available (Felcht,1985). Estimated world usage for CMC is shown in Figure1.1. The wide range of available CMC grades with specific properties is largely responsible for their varied industrial applications.

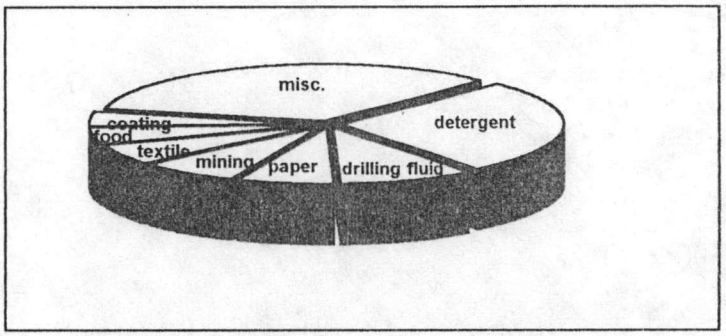

Figure 1.1 World-wide usage pattern for carboxymethylcellulose (modified Kennedy,1988)

Nowadays,according to the wide spread uses of the CMC in Thailand, it was worthwhile to find out a way for producing CMC to use in domestics. Since our industries attained further development especially, agro-industries. Therefore, the CMC production was studied for determination of the optimum condition of CMC production. Most of the CMC production, wood or cotton were used as raw materials (McLaughlin and Herbst,1950), but in this research cellulosic gel from *Acetobacter xylinum* were used instead. There are some ploblems in using cellulose from plant as industrial raw material (Toyoshiwa,1993). Plant cellulose are heterogenous raw material which contains various impurities. That causes, it is very difficult to control the etherification reaction for CMC production. In contrast, cellulose from *A. xylinum* are composed of pure cellulose, which is devoid of lignin, hemicellulose and other substances (Yamanaka and Watanabe, 1994). With characteristic of cellulosic gel, the gel does not have problems such as woods. It could be a potential material for CMC production.

1.2 Objectives

The objectives of this research are :

1.3.1 To determine the optimum conditions for cellulosic gel production by *Acetobacter xylinum*

1.3.2 To determine factors influencing on the carboxymethylcellulose production from cellulosic gel

1.3.3 To analyse physical and chemical properties of carboxymethylcellulose produced from cellulosic gel