CHAPTER 5

CONCLUDING REMARKS

Theoretical Aspect

Etherification can take place with a larger extent in the medium of ME-EtOH than in B-EtOH. Explanation for this incident is as follows. Etherification is frequently and commonly performed in accordance with the following reaction:

$$R\text{-}X + Na\overset{+}{\overline{O}}\text{-}R' \longrightarrow R\text{-}O\text{-}R' + Na\overset{+}{X}^{-}$$

$$R\text{-}X + Na\overset{+}{\overline{O}}\text{-}Ar \longrightarrow R\text{-}O\text{-}Ar + Na\overset{+}{X}^{-}$$

where R = Alkyl group

Ar = Aryl group

An alkyl halide (or substituted alkyl halide) is allowed to react with a sodium alkoxide or a sodium phenoxide. The reactions involve nucleophilic substitution of alkoxide or phenoxide ion for halide ion. Theoretically, the more polar solvent, the stronger the solvation forces and the faster the ionization (26). In the presence of certain polar solvent, the leaving group of the substrate (halide ion) is probably easy to pull off from the whole molecule. The nucleophilic substitution of alkoxide or phenoxide for halide ion is also faster to proceed. As a result from this suggestion, degrees of substitution of etherification products in this experiment are higher in the medium of polar solvent (ME-EtOH) than in the medium of non polar solvent (B-EtOH).

Practical Aspect

The method of purification of cellulose derived from the waste from local cotton-seed oil manufacture was studied in order to obtain purified cellulose as source of cellulose used for the preparation of Na-CMC with high D.S.. Treatment techniques including cotton fuzz separation, digestion and bleaching were conducted under various conditions involving different alkali concentrations, pressures and times. It was found that physical parameters involving in the treatment influenced some effects on the physical appearance of cellulose and yield of α-cellulose. Such parameters are concentration of sodium hydroxide, pressure and digestion time including technique of bleaching.

In short, two treatment procedures for purification of cellulose which is suitable for using as source of cellulose for preparation of Na-CMC are as follows:

(1) Digest the cotton fuzz with 10% NaOH under 10 lbs/in^2 pressure for 2 hours and then bleached with about 0.1% $Ca(OCl)_2$ for 0.5 hour.

(2) Digest the cotton fuzz with 10% NaOH under 20 lbs/in^2 pressure for 2 hours and then bleached with about 0.1% $Ca(OCl)_2$ for 0.5 hour.

The first procedure yields 60.99 % of α -cellulose whereas the second yields 64.60%. It is also found that purified cellulose derived from the first procedure is more suitable than one from the second for using as starting material for the preparation of Na-CMC with high D.S..

By using purified cellulose derived from the first procedure and by multistep of etherification technique, Na-CMC with D.S. 2.767±0.031 is obtained after 5 steps of etherification under the following condition:

reaction medium: mixture of methyl ethyl ketone and ethyl alcohol (80:20)

reaction time : 5 days for each step

In conclusion, the waste from cotton-seed oil manufacture can be treated in order to obtain purified cellulose with approximately 60-65% of α -cellulose. Such purified cellulose is not only benefically utilized as source of cellulose for preparation of Na-CMC but it is also probably suitable for preparation of other cellulose derivatives. Now-a-days, Na-CMC and several cellulose derivatives are of industrial and daily life interest. It can be, therefore, expected that the preparation techniques involved in this experiment will be broaden to industrial scale. It may also be a guide-line for purification of cellulose from other sources

besides cotton-seed fiber. It should be noted however, that the raw material used in this experiment is the waste from cotton-seed oil manufacture using cotton plant in the Gossypium hirsutum species. The raw cotton of other origin may have different physical and chemical charactors due to variations in the plant species and conditions of growth and hence some modifications of the experimental conditions used in this work may be necessary.

Since the extent of sodium substituted in cellusose chain is related to several physical properties of Na-CMC in its application, we would suggest that further research should be done in order to study its physical properties and to obtain complete detail of Na-CMC derived from conditions mentioned in this experiment.