CHAPTER VIII
CONCLUSIONS AND RECOMMENDATIONS

The major findings of this work may be summarized as follows:

1. Admicellar polymerization was successfully applied to produce hydrophobic cotton by covering with the film of polystyrene.

2. The study of adsorption and adsolubilization shows that (1) the adsorption of LAS on cotton reached the equilibrium after about 8 hr., (2) both the pH value and electrolyte concentration of salt had an effect on LAS adsorption and the appropriate conditions for use in admicellar polymerization are pH of 4 and 0.15 M NaCl, (3) the optimum concentration of LAS solution for admicellar polymerization was at 1,000 μM which was slightly lower than CMC at pH 4 and 0.15 M NaCl, and (4) from adsolubilization study of styrene into admicelle, the ratio of LAS:styrene in admicelle was close to 2:1.

3. The amounts of both styrene and initiator had an effect on the polystyrene film formed on cotton. The optimum conditions of both were 1:5 LAS to styrene ratio and 1:1 ratio of styrene to persulfate initiator.

4. Comparison of the two initiator types, persulfate and organic chemical, showed that the amount of organic initiator, AIBN, required was lower. The optimum ratio of initiator:styrene by using AIBN was 0.1:1 whereas that by using sodium persulfate was 1:1. This shows that AIBN is more effective in initiating the film formation in admicelle.

5. Characterization of the coated film by FTIR showed clearly that polystyrene was formed on cotton and the MW of polystyrene formed in admicelle ranged from 5,000-300,000 as studied by GPC. SEM micrographs showed the difference between bare cotton and admicelle-treated cotton. All results confirmed that polystyrene film was successfully coated on cotton fabric.

6. Wettability of treated and untreated cotton can be determined by Wilhelmy method. The contact angle of modified cotton at optimum conditions was higher than 60^{o} thus showing the hydrophobic character and modified cotton absorbed only 3% of water retained by the unmodified cotton. The water transport in yarn can be described by capillary force and radial flow between the fibers along the length as interpreted from the characteristic curves from the Wilhelmy method.

7. The surface feature of treated cotton fiber studied by AFM shows that the cotton surface covered with polystyrene film formed by admicellar polymerization technique did not differ much from a bare cotton fiber surface, but the modified cotton was hydrophobic. This shows that the film coated on cotton was very thin compared with that of the commercial water-repellent cotton. the surface of which was completely different from that of bare cotton.

8. Improvement of coated film can be achieved using DVB as the cross-linking agent and the appropriate amount of DVB was in the range between 1-2% of total monomer.

Recommendations

The information obtained with this study will be more useful if it can be applied in a commercial process. The products made from admicellar polymerization technique were interesting because various degrees of hydrophobicity can be produced by simply varying the conditions of the important parameters. To develop this technique for commercial application, the following investigation should be carried out:

1. To study and apply this process in a continuous manner for mass production, the steps of process mechanism and the machinery required should be studied.

2. To control the quality of the products, the important parameters such as surfactant, monomer, initiator, and operation conditions should be studied in

more details until a standard procedure for production can be established.

3. Other types of surfactant, initiator, monomer may be applied to produce other types of products with other desirable properties.

4. The research to enhance film covering should be carried out to achieve products with higher quality and more durability. Adding crosslinking agents to get a network polymer is one of the methods that can be used to improve film formation.