

CHAPTER VIII

CONCLUSIONS AND RECOMMENDATIONS

The UV-protective cotton fabric can be produced via admicellar polymerization technique using 2-hydroxy-4-acryloyloxybenzophenone (HAB) as the monomer. From adsolubilization study, the mole ratio of HAB to DBSA at equilibrium was about 1:2 indirectly indicating the existence of a surfactant bilayer on the fiber surface. With HAB concentration greater than 1.2 mM, the cotton fabric, which has a low UPF of 4.02 before treatment, can provide excellent UV protection with UPF of 41-69 after treating with admicellar polymerization. The copolymerization of BEM and HAB can provide a uniform UV-protection over a broad UV range of 200-400 nm. Compared to homopolymer at the same total monomer concentration, the fabric coated by the copolymer has a higher UPF at all concentrations with the highest UPF value of 97 being obtained at the monomer ratio of 1:1. The BEM-HAB copolymer system shows an alternating arrangement tendency and exhibits an azeotropic polymerization at the BEM composition of 0.46. Besides the UV-protective fabric, the two functional, UV-protective and water repellent, cotton is also achieved by a double coating via admicellar polymerization of HAB and MSi. The doubly coated fabric provides an excellent UV protection with a UPF value of around 40 and it has very good water repellency as indicated by the high contact angle of 120°. Moreover, UV-protective cotton fabric can also be produced by the polymerization of BEM on vinyltriethoxysilane-treated fabric. VTES plays an important role of providing vinyl groups on cotton surface to polymerize with BEM resulting in a more uniform coating and a fabric with a higher UPF than that of the fabric coated without VTES pretreatment. Due to the covalent bonding with the cellulose molecules provided by VTES, the protection remains almost unchanged even after 10 times of 30 min washing at 30°C.

In summary, admicellar polymerization is the potential method to produce the UV-protective fabric with shorter process and less amount of organic solvent needed, compared to the grafting polymerization using VTES. Due to the covalent bonding to cotton fibers, the fabric grafted with VTES can result in a better durability. However, the grafting polymerization using VTES is limited for a cotton

fabric only due to the presence of hydroxy groups in its structure. Whereas, admicellar polymerization can be applied for other kinds of fabrics.

Although the UV-protective cotton was prepared successfully, the other properties of fabrics such as drapability, gas permeability, and durability may be questionable. The future work should study these aspects for more information and industrial application. For further improvement in UV-protection properties, a hybrid coating of inorganic absorbers such as ZnO nanoparticles and poly(HAB) or poly(BEM) may be the good answer. Moreover, introducing other properties to a fabric by the surface polymerization using a suitable monomer is interesting for further investigate.