CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This research focused on the effect of nanometer-sized binder of ink jet inks on silk printing and color reproduction and fabric performance. The inks were prepared from two different sizes of acrylate ester/styrene-based binder in which the average particle sizes were 70 and 180 nm. The formulations were studied at the pigment-to-binder ratio of 1:1 and 1:2 (by weight). The inks were characterized in terms of pH, viscosity, surface tension, zeta potential, and particle size. The inks prepared were then printed on the untreated and chitosan treated silk fabrics. The print quality of silk printing was evaluated in terms of color gamut, ink penetration, inter-color bleeding, optical density and physical properties such as dry-wet crock fastness, wash fastness, bending stiffness, and air permeability. Surface appearance of the fiber was observed using SEM technique.

5.1 Conclusions

5.1.1 Effect of the binder size

In conclusion, the sizes of binder in the inks play an important role in this experiment. The ink jet ink with small size binder creates higher optical density than the ink with large size binder. Because of the smoother film obtained from the smaller binder, the inks penetrate into the fabric only in a short distance, especially with the chitosan pretreatment fabric. The color gamut of the printed silk fabrics from the small-rigid inks is wider, probably due to the reason that the ink can penetrate deeper into the untreated fabric. Moreover, the crock fastness evaluation on the printed silk reaches to its highest level of resistance. The printed fabric can endure rubbing

because of film strength. However, the inks with the small-sized binder bleed only a little distance. The bending stiffness and air permeability values are slightly affected by the different sizes.

5.1.2 Effect of the pigment-to-binder ratio

When the quantity of binder is increased, the crock fastness of the printed is also increased. Using this type of binder, the interaction between ink jet ink and substrate is improved. However, a wider color gamut was achieved in the 1:1 pigment-to-binder ratio, suggesting that a thinner film is required for maintaining the wider color gamut. While bending stiffness, air permeability, wash fastness, and ink penetration of the two ratios the similar results.

5.1.3 Effect of chitosan pretreatment

It was found that the treatment helps improving ink deposition and reducing ink absorbency into the fabric. The treatment strongly affects the inks containing the small-sized binder, which is obviously evidenced in the color gamut. An increase in treating concentration also further improves the quality of the printed fabric, such as less ink spreading, and shorter ink penetration depth. However, the treating layer can be weakened under a wet rubbing condition.

As results, the in-house formulated inks prepared from the nano-sized binders were acceptable for a piezo type ink jet printer due to its low viscosity of the Newtonian flow. The chitosan pretreatment helped improving the ink deposition on the silk surfaces, resulting in the increasing color strength.

5.2 Recommendations for future work

Further work can be carried out to make the work more valuable.

1. To study the cause of low optical densities and K/S value of the printed ink color so produced on the fabrics.

2. To increase the amount of amino groups or to modify the group to its higher derivatives this can provide more active sites for holding ink on the fabric surface.

3. To use the modulation transfer function (MTF) and the point spread function (PSF) characterizing the image qualities printed on the fabrics [37].