

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Flame retardant finishing of polyester, cotton and polyester/cotton fabrics by treatment with various concentrations of DAP solution using pulsed nitrogen plasma generated from theta-pinch device operating at different numbers of plasma shots were investigated. From several characterizations and tests, these results can be concluded as follows:

(1) In the case of polyester fabric, the bond formation between DAP and the fabric was difficult to determine because the main characteristic peaks such as P=O stretching peak overlapped with the peaks corresponding to the functional groups of PET fabric. However, SEM photographs revealed an attachment of DAP onto the fabric surface after washing. Determination of the wetting time showed that the suitable ranges of DAP concentration for the interaction between DAP and the fabric to occur were at 5 and 10 percent. In this range, the process could be done by increasing DAP concentration with decreasing the number of plasma shot or decreasing DAP concentration when the number of plasma shots was increased. From flammability test, it was found that the improvement was observed only for the ignition time but not the combustion time.

(2) In the case of cotton fabric, from ATR/FT-IR spectra of treated cotton fabrics, it was found that new -P-O-C- peak occurred at 825 cm^{-1} confirming the reaction between DAP and cotton fabrics. SEM photographs also revealed an attachment of DAP onto the fabric surface after washing. However, the flame retardancy of the cotton fabrics was not improved by this process.

(3) In the case of T/C fabric, ATR/FT-IR spectra of treated cotton fabrics indicated the formation of imine groups on the fabric surface while SEM photographs

and wetting times indicated the attachment of DAP on the fabric surface. From flammability test, it was found that the optimum condition for flame retardant finishing of T/C fabric was at 2 shots of pulsed nitrogen plasma and 5% of diammonium hydrogen phosphate solution.

The above results suggest the potential of using pulsed-plasma treatment generated from theta-pinch device for flame retardant finishing. However, the type of flame retardant or the type of gas should be changed for each type of fabric.

5.2 Recommendations

1. Flame retardant finishing of polyester, cotton and polyester/cotton by plasma generated from theta-pinch device using other types of flame retardants such as melamine or polyphosphate should be investigated.

2. Flame retardant finishing of polyester, cotton and polyester/cotton by plasma generated from theta-pinch device using other types of gases such as halogen-containing gases should be investigated.