

CHAPTER V

Conclusions and Recommendations

Conclusions

1. Citric acid can be used as an alternative effective esterification cross-linking agent which was not only at reasonable price but proven to be lack of toxicity and free of formaldehyde content, comparable to the conventional formaldehyde-based resin, with certain of phosphorus-containing catalysts . The most suitable concentration of citric acid found in this work is at 7% and the best mole ratio to be used with sodium hypophosphite is 1 : 2. Curing condition, an important factor in the process, must be carefully chosen to obtain the balance between the desirable resiliency, strength retention and whiteness of the finished fabric. In this work, the most satisfactory performance appears to be achieved by curing at 160°C for 90 sec.

2. It was found that the wrinkle resistance of finished cotton fabric varies inversely with breaking strength, however, at an equal improvement in resiliency property, the breaking strength retention of fabric finished with citric acid was higher than those from the conventional formaldehyde-based finishes.

3. Sodium hypophosphite has been proven to be the most effective catalyst for crease resistant finishing with citric acid. Sodium dihydrogen phosphate is less

active, but it is superior to other sodium salt of phosphorus-containing inorganic acid by possessing considerable catalytic activity. However, it is still troublesome with yellowing problem.

4. The use of sodium dihydrogen phosphate as extender for sodium hypophosphite provides a way of greatly decreasing the required amount of the latter, that means the expense of using sodium hypophosphite as the catalyst can be decreased.

5. Citric acid with effective catalyst is found to impart satisfactory wash durability which indicates its permanent finishing effect. The ester groups occurred in cross-linking reaction have also been confirmed by fourier transform infrared spectroscopy.

Recommendations

1. Futhermore comprehensive study of curing at higher temperature of citric acid treatment is needed in order to increase the speed of curing and achieve the most favorable properties of finished cotton fabrics.

2. More basic physical properties of treated fabrics, such as tearing strength, durable press rating and abrasion resistance should be investigated.

3. With its high durable press rating that mentioned in previous researches, formaldehyde-based resins, such as DMDHEU, DMDMEU, etc., are the interesting agents to be studied their used with citric acid as mixed resin which investigation in repeated laundering of treated fabrics is needed.

4. To use sodium hypophosphite still has several disadvantages. Not only its high cost and tendency to cause shade changes in certain dyed fabrics, but practicality of this type of chemical should be done carefully. It can decompose to phosphine which is a toxic, spontaneously flammable gas on heating. Moreover, the use of phosphorus-containing compounds can cause environmental problem, as discharge of these agents into rivers are likely to promote the growth of algae. From these results, the research of finishing with curing agents having low or zero phosphorus content is needed.

5. Investigation of citric acid treatment of dyed cotton is still very limited. Direct, reactive, vat and basic dye are the classes of dye for cotton fabric that the information of dyeing/finishing interactions is needed to be extended. The effect of citric acid on color change as well as color fastness should be studied.

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