

CHAPTER VI

SUMMARY AND CONCLUSIONS

INTRODUCTION

An inherent defect of cotton is that it creases and a remedy to remove this defect is by crosslinking. It is known that resin finishing improves the wrinkle resistance of cellulosic fabrics and blends containing cellulose. For good crease recovery, the formation of the finish should be essentially inside the fibre, that is inside the amorphous region of cellulose.

Acrylamide and dimethylol dihydroxy ethylene urea (DMDHEU), separately and in combination, have been used in this study to improve the wrinkle recovery of cotton, polyester and their blend fabrics. Reaction of acrylamide was brought about by a redox catalytic system, including formaldehyde, hydrogen peroxide and ammonium persulphate. Epichlorohydrin was used to assist in crosslinking. Ammonium persulphate enhanced the reaction. Conditions were varied in the application of finishes by varying the steps involved.

OBJECTIVES OF THE STUDY

The specific objectives of the study were :

1. To study a suitable catalytic system for polymerization of acrylamide finish.

2. To study the varied application stages of acrylamide finish on fabrics.
3. To study the effect of acrylamide finish, DMDHEU and their combination on physical properties of fabrics.
4. To study the durability of finishes.
5. To study the appearance rating of fabrics after wrinkling and ironing.

PROCEDURE

Three plain weave, white fabrics were used in the study, cotton fabric (A), 30/70 cotton/polyester fabric (B) and polyester fabric (C).

The finish was applied on fabric samples by pad and dry, (at room temperature and also by curing at 130°C for 5 minutes). The properties determined were wrinkle recovery, stiffness, tensile strength and elongation.

RESULTS AND CONCLUSIONS

In part I :

Acrylamide finish I was found to be quite effective and was so studied in combination with DMDHEU.

The finish I consisted of :

- 1st step : Pretreatment with epichlorohydrin and formaldehyde
- 2nd step : acrylamide finish with mixed redox system (of formaldehyde, hydrogen peroxide and ammonium persulphate)

In part II :

Effect of finishes (acrylamide finish I, combination finish II and DMDHEU finish (III) on the fabric properties were as follows :

- i) The acrylamide finish I, combination finish II and DMDHEU finish III showed an increase in wrinkle recovery with increasing add-on of finish on cotton and cotton/polyester fabrics. The effect being minimum on polyester fabric.
- ii) Stiffness decreased in cotton fabric but increased in cotton/polyester and polyester fabrics with increasing add-on of acrylamide (finish I), combination (finish II) and DMDHEU (finish III) finishes.
- iii) Tensile strength of cotton fabric decreased with increasing add-on of acrylamide finish I, increased in cotton/polyester and remained unchanged on polyester fabric. With the DMDHEU (finish III) and combination (finish II) finishes, higher add-on decreased tensile strength on all fabrics.
- iv) Elongation, in general decreased on all fabrics with increasing add-on of finishes. Similarity of the effect between tensile strength and elongation indicates binding

forces of finish being more effective with cotton content in fabric.

- v) Durability was relatively more with acrylamide finish I and combination finish II than with DMDHEU finish III. Superficial reaction of DMDHEU was the cause, under the conditions of treatment in this study.
- vi) The appearance rating values showed improvement only when the fabrics were ironed with a warm iron (nylon setting) on cotton and cotton/polyester fabrics. The finishes had more influence with cotton content and little influence with polyester.

In part III :

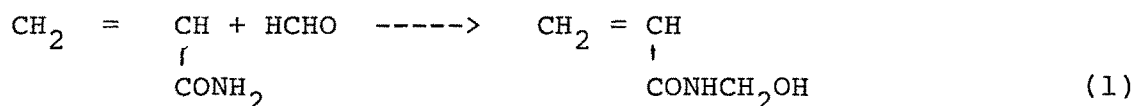
A precondensate of acrylamide finish (termed as Ix) was prepared and its comparison was made with the non-precondensate (I) for their applications using a mixed redox system.

The precondensate (finish Ix) was prepared by mixing acrylamide, epichlorohydrin and formaldehyde in 1 g/l teepol and left to stand for 48 hours. The pH was maintained at 8 by adding ammonia. Before padding, formaldehyde, hydrogen peroxide and ammonium persulphate (mixed redox system) were added.

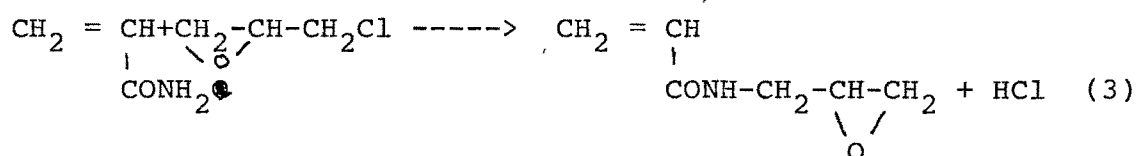
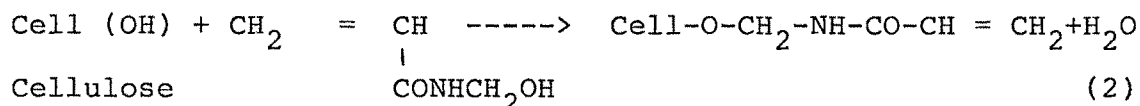
- i) Acrylamide precondensate Ix improved the wrinkle recovery with increasing add-on on fabrics to a great extent, when compared with non-precondensate I.

- ii) In comparison with the non-precondensate I, therefore acrylamide precondensate Ix showed a positive reaction with the fibre as seen from the better durability of finish.

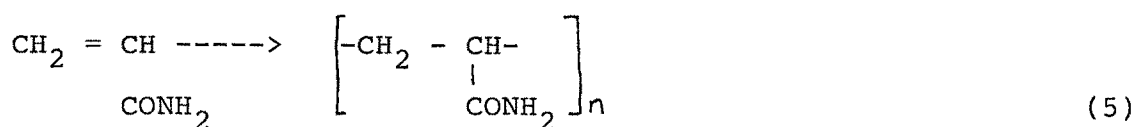
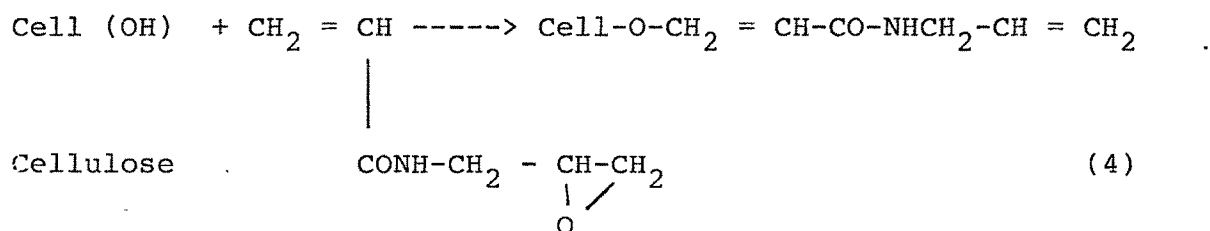
Acrylamide precondensate could partly function as a thermosetting finish. Its preparation is similar to the DMDHEU, and is polymerised under redox system to give some thermoplasticity to the finished fabric. The reaction are given below :



acrylamide formaldehyde



acrylamide epichlorohydrin



acrylamide

Acrylamide precondensate penetrated into the fibre as shown in the reactions above and therefore a high wrinkle recovery angle was observed for cotton and cotton/polyester fabrics. Acrylamide monomer showed more of homopolymer formation therefore the homopolymer finish may not much penetrate inside the fibre. Homopolymer formation was restricted by side chains in precondensate. Further investigation is suggested for getting more effective low temperature reactions in drying.