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Table I
The Effects of Pre-treatments with Hydrogen Peroxide and Thioglycolate followed by Hercosett or Hercosett-SLS Treatment on the Shrinkage of Knitted Wool Fabrics

Pre-treatment	Resin Treatment	Area Shrinkage (%)‡	
		Shetland Wool	Botany Wool
None	None		65
None	Herc*		62
None	Herc-SLS†		57
H ₂ O ₂ , 4 hr, 50°C	None	60	62
H ₂ O ₂ , 4 hr, 50°C	Herc*	55	57
H ₂ O ₂ , 4 hr, 50°C	Herc-SLS†	1	3
H ₂ O ₂ , 2 hr, 50°C		11	9
H ₂ O ₂ , 1 hr, 75°C		3	1
Thioglycolate	None	50	54
Thioglycolate	Herc*	42	49
Thioglycolate (rinsed until neutral)	Herc-SLS†	0	1
Thioglycolate, 20 min		0	0
Thioglycolate, 10 min		0	0
Thioglycolate, 5 min		0	0
Thioglycolate, 1.5 min (squeezed only)		8	16
Simultaneous treatment of wool with thioglycolate and Herc-SLS		63	62

Note

H₂O₂ treatment: 2 vol H₂O₂, pH 9.0 (0.2%, Na₄P₂O₇), liquor ratio 1:30.

HS-CH₂ COONa, treatment: 0.025M, pH 10.5, 50°C, liquor ratio 1:30.

Shetland-wool fabric: R220/2-tex yarns; cover factor 0.9.

Botany-wool fabric: R64/2-tex yarns; cover factor 1.2.

* 8.3 mL/L Herc 57, 30°C, 20 min, pH 9.5, liquor ratio 1:30.

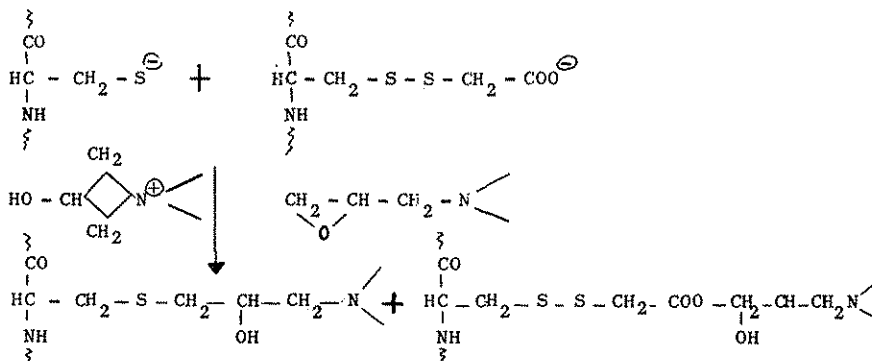
† 8.3 mL/L Herc 57+1.75 mM SLS, 30°C, 20 min, liquor ratio 1:30.

‡ IWS Test Method 185.

It therefore seems that the necessary conditions for successful Hercosett-SLS treatment (i.e., negatively charged wool containing nucleophilic groups capable of reaction with Hercosett) are provided by pre-treatment with hydrogen peroxide.

2.2 Pre-treatment with Thioglycolate

Thioglycolate acid or thioglycolates react with wool cystine to produce cysteine plus a mixed disulphide. Both products are theoretically capable of reaction with Hercosett resin:



The results in Table I show that pre-treatment with thioglycolate followed by treatment with Hercosett-SLS provided a high degree of shrink-resistance in both Shetland- and Botany-wool knitted fabrics.

Again, the same pre-treatment followed by treatment with Hercosett alone did not give a shrink-resistant fabric. It was found unnecessary to rinse the fabric after the thioglycolate pre-treatment; merely squeezing excess liquor from the pre-treated fabric before immersing it in the Hercosett-SLS treatment bath gave the same high level of shrink-resistance as that obtained when the fabric was thoroughly rinsed after pre-treatment. Simultaneous treatment with thioglycolate and Hercosett-SLS gave no shrinkage protection whatsoever, and this was possibly due to reaction in the bath between the thiol groups of the thioglycolate and the epoxide and azetidinium groups of Hercosett.

Table I also shows the effects of pre-treatment time with thioglycolate on the shrinkage of fabrics subsequently treated with Hercosett-SLS. The pre-treatment time required for the development of optimum shrink-resistance is rather too long to allow the possibility of continuous treatment, but there is a possibility that increasing the severity of pre-treatment conditions may lead to shorter optimum times and make a continuous pre-treatment practicable.

2.3 Regularity of Resin Deposition

The distribution of the resin on fibres taken from treated fabrics was determined by staining with an anionic optical brightener at 0°C. As Fig. 1 shows, resin distribution was more even on all the Hercosett-SLS-treated fibres, irrespective of the type of pre-treatment, than it was on fibres from a chlorine-Hercosett-treated fabric. As in previous experiments with the methylamine-Hercosett-SLS process, the fabrics pre-treated with hydrogen peroxide or thioglycolate had outstandingly good after-wash appearance and showed no pilling or fuzzing after the 3-hr Cubex wash test.

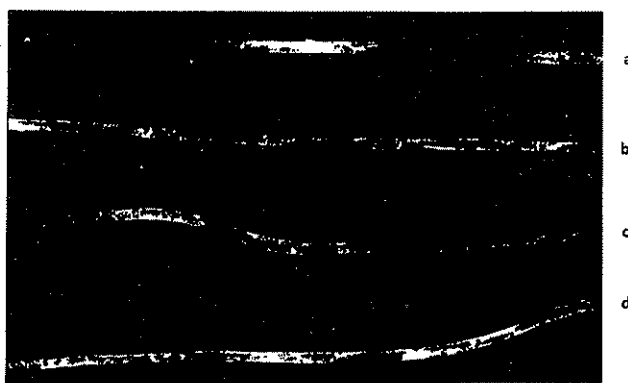


Fig. 1

Resin distribution on wool fibres taken from (a) chlorine-Hercosett-treated knitted fabric; (b) methylamine-Hercosett-SLS-treated knitted fabric; (c) hydrogen peroxide-Hercosett-SLS-treated knitted fabric; (d) thioglycolate-Hercosett-SLS-treated knitted fabric (samples stained with Blancophor BA liq (FBY); 1 g/L, 0°C, 20 min, and viewed in ultra-violet radiation)

3. CONCLUSIONS

Pre-treatment of wool with alkaline peroxide or thioglycolate solutions, as well as with alkylamine solutions, activates the wool in a manner that enables shrink-resistance to be attained by exhaust treatment with Hercosett-SLS solutions provided that the surfactant concentration lies between certain limits. Further physico-chemical mechanistic studies will be required to confirm the mode of action of this new pre-treatment-resin process.

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