SAWTRI BULLETIN

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SOUTH AFRICAN
WOOL TEXTILE RESEARCH INSTITUTE
OF THE CSIR
P.O. BOX 1124
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Editor: M. A. Strydom, M.Sc.

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INSTITUTE NEWS

National Symposium on "New Developments in Fabric Manufacture"

A National Symposium on "New Developments in Fabric Manufacture" jointly organised by SAWTRI and the S.A. Advisory Committee of the Textile Institute, is to form part of a two day programme in August of this year. On the afternoon of August 16th, the Minister of Health, of Planning and the Environment and of Statistics, the Honourable Dr Schalk van der Merwe, will officially open the new extensions to the SAWTRI complex. At the same time he will also officially open the symposium, the lectures of which are due to start on the following day. The rest of the afternoon and evening of the 16th, however, will be devoted to a cocktail party to celebrate SAWTRI's 25th anniversary. All delegates to the symposium will also be invited to the activities of the previous afternoon.

Announcements about the speakers and the papers will be made in the near future by means of brochures as well as through this Bulletin.

Meetings and Lectures

The Director has been invited to address the annual conference of the American Fiber Society on "Integration of current processing systems for blends of synthetic and natural fibres". To our knowledge, it is the first time that this influential organisation has invited a South African textile technologist to deliver a paper before one of their annual conferences. The conference is to be held in Asheville, North Carolina from the 17th to the 19th May.

The Director addressed the S.A. Dyers and Finishers Association at their monthly meeting in Durban on Friday, January 21st. Several aspects of SAWTRI's latest research work on the liquid ammonia mercerisation of cotton and cotton blend fabrics were discussed.

Mr Neville Vogt attended the annual meeting of the Sheep and Wool Production Advisory Committee of the Department of Agricultural Technical Services at Irene on the 25th January. Several aspects of SAWTRI's wool research findings, as it would affect the producer, were discussed.

The Director and Mr Eric Gee of SAWTRI's Statistics Department will attend the 46th IWTO meeting in Cape Town from the 17th to the 22nd April. (The Director is a member of the Organising Committee.) The meeting is to be held in the Mount Nelson Hotel and has been organised under the auspices of the South African Wool Textile Council. The official opening will be undertaken by the State President, the Honourable Dr Nico Diederichs, on Monday 18th April. On the same day the various Technical Committees will commence with their individual meetings and discussions. Mr Eric Gee will present a paper on the use of the airflow principle for measuring fibre diameter in the light of recent observations made in SAWTRI's laboratories. On Friday, 22nd April the conference will be terminated by a banquet in the Mount Nelson Hotel.

The work of the Organising Committee for the 1980 Wool Textile Research Conference, to be held at the CSIR in Pretoria, is now well under way. The Prime Minister, the Honourable Mr B. J. Vorster, has accepted an invitation to open the Conference on August 26th, 1980.

Visits and Visitors

The Director and Mr Neville Vogt visited a number of firms in Transvaal and Natal from the 16th to the 22nd January for technical discussions and general liaison work.

Lord Barnby, a well-known figure in international wool circles visited the Institute on the 14th February. Lord Barnby has been associated with wool industry for 70 years and is chairman of several industrial boards in the U.K. Lord Barnby also has wide interests vested in Southern Africa and visits the Republic at least once a year.

Several members of the Aberdeen (Cape) branch of the NWGA visited the Institute on the 7th March. During a conducted tour of the processing and laboratory divisions they were addressed on various aspects of wool research as seen from the wool producers' point of view.

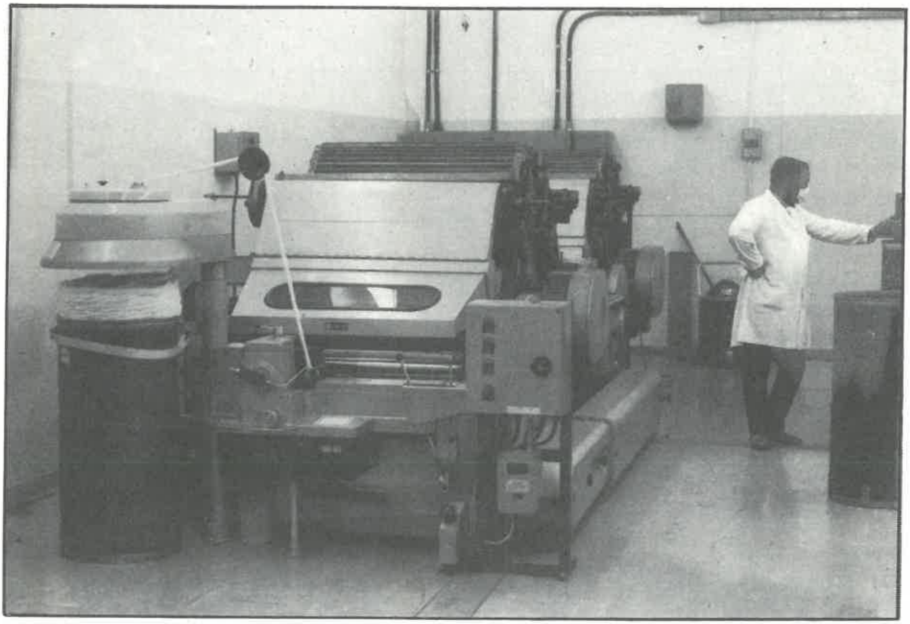
Lord Barnby, inspecting wool lots in the Scouring Department during his recent visit to SAWTRI. On his left is Mr Neville Vogt of the CSIR regional office

The Director leaves for America and U.K. in the middle of May. Apart from addressing the American Fiber Society as guest speaker he will also visit the United States Department of Agriculture's Cotton Research Laboratories in New Orleans, the Textile Research Centre in Lubbock, Texas and Cotton Inc., Raleigh, North Carolina. From America Dr Veldsman flies to the U.K. to attend the annual meeting of the Research & Development Committee of the IWS in Ilkley from the 24th to the 26th May.

Sulzer training courses at SAWTRI for 1977

Two multiracial courses for Sulzer loom attendants are to be held at SAWTRI during 1977. The first of these joint collaborations between SAWTRI and Messrs Sulzer Bros (S.A.) Ltd was held in 1976 and was very successful. The first of the courses for this year is scheduled for the 9th May to the 3rd June, and the second for the 20th June to the 15th July. These courses have been designed especially for assistant loom tuners who have worked with the machine for some time, but who have never done any fittings or readjustments of different machine parts or have never performed minor repairs.

Application forms and more information about the courses can be obtained from Sulzer Bros (S.A.) Ltd, P.O. Box 930, Johannesburg.



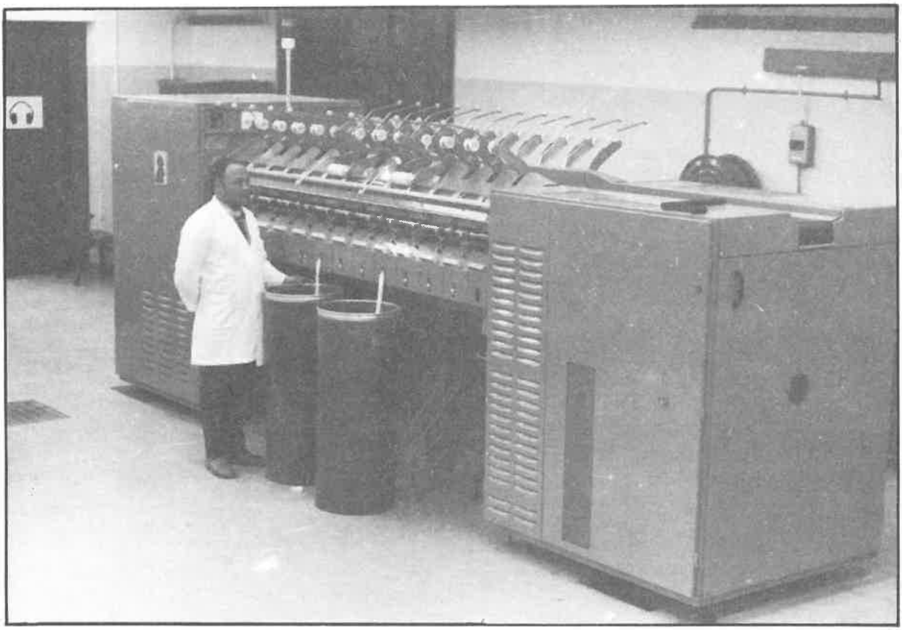
SAWTRI's recently commissioned Crosrol Tandem card

Cotton processing expanding rapidly

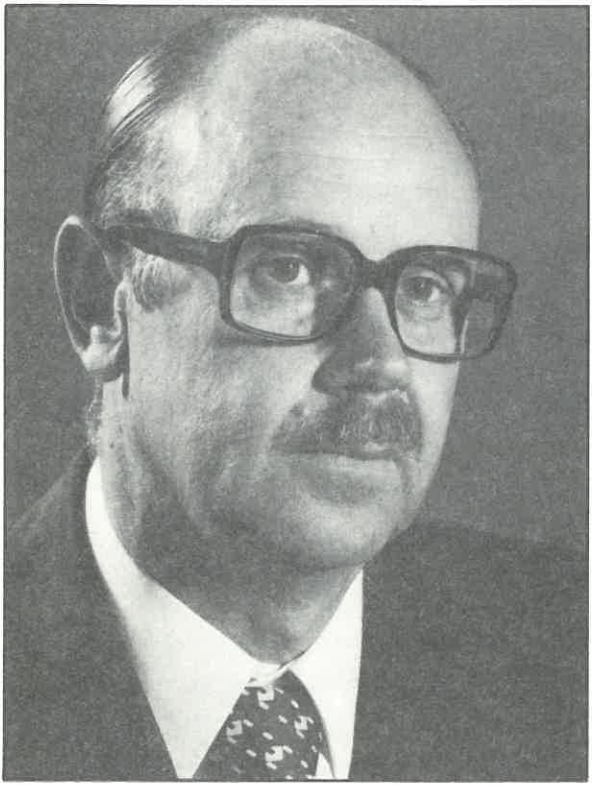
The Institute is now in the fortunate position to have the facility of tandem carding through the kind co-operation of Messrs Crosrol of Halifax (represented by Messrs Marcusson in South Africa). The tandem card sliver will be used for direct spinning on to the OE machines, thereby obviating the two normal drawframe passages. Firms are invited to visit the Institute to see the tandem card/OE plant in operation with a view to discussing industrial trials for individual firms interested in implementing these developments. The Institute is now also in a position to conduct scientific studies of the processing characteristics of local cotton cultivars on this equipment, which should without doubt be of considerable use to local mills.

New subscribers

We wish to welcome Messrs Klip River Textiles (Pty) Ltd of Ladysmith, Natal and Messrs S.A. Woollen Mills Ltd, of Cape Town as new subscribers to the work of the Institute. We hope that our mutual co-operation will also lead to mutual benefits for both Research and Industry.



The Schulert & Salzer (Ingolstadt) 24 rotor OE spinning machine



Dr D. M. (Danie) Joubert

New CSIR Vice-President appointed

Dr D. M. (Danie) Joubert has been appointed Vice-President of the CSIR and took office on the 1st February. Dr Joubert will be the Executive Committee member responsible for a number of Institutes, including SAWTRI, a function which until Dr Joubert's appointment had been the responsibility of Dr C. van der Merwe Brink. Dr Joubert was Director of the Transvaal region of the Department of Agricultural Technical Services before his appointment to the CSIR Executive. He obtained his Ph.D. from Cambridge University in 1955 and is also a member of various scientific organisations, both local as well as international. We wish to extend a hearty welcome to Dr Joubert to the CSIR in general and to SAWTRI in particular. At the same juncture SAWTRI wishes to thank Dr Brink most sincerely for the many years he acted as the Executive member responsible for SAWTRI. Dr Brink's personal interest in SAWTRI's research activities throughout the years since 29th April, 1970 when he became Chairman of SAWTRI's Research Advisory Committee, is highly appreciated.

Staff matters

A number of new staff members have joined SAWTRI at the beginning of 1977. We wish to extend a hearty welcome to all and hope that their stay will be a pleasant one.

Mr L. T. van der Walt has joined the Protein Chemistry Division as Technician. Mr Van der Walt holds a National Diploma for Chemical Technicians and was employed by the Atomic Energy Board before joining SAWTRI.

Mrs S. G. McCormick, also a holder of the National Diploma for Chemical Technicians has been appointed Senior Technician in the Protein Chemistry Division. Mrs McCormick has considerable experience in textile research, having previously been employed by both SAWTRI and the IWS Technical Centre in Ilkley.

Miss C. I. Watermeyer has been appointed Assistant Technical Officer with the Textile Physics and Statistics Division. Miss Watermeyer obtained a B.Sc. degree at the University of Port Elizabeth and was employed by the Department of Agricultural Technical Services in Pretoria before joining SAWTRI.

Mr G. R. Mitchell has been appointed Assistant Technical Officer with the Machine Development Section. Mr Mitchell holds a NTCIII certificate as well as a National Diploma for Electronic Technicians. He was previously employed as an electronics service technician with a local television company.

Mr Jaroslav Klazar has been promoted to Group Leader for the Machine Development and Maintenance Workshop divisions.

SAWTRI PUBLICATIONS

Technical Reports

No. 335 : Robinson, G. A., Marsland, S. G. and Ellis, R., Production of Mohair Yarns on the Repco Spinner, Part II: The Spinning of Wrapped Core-Spun Mohair Yarns and their Use in Lightweight Mohair Suiting Fabrics (February 1977).

No. 336 : Barkhuysen, F. A., Liquid Ammonia Mercerisation of Cotton, Part VII: Liquid Ammonia Treatment of a 67/33 Cotton/Wool Blend (February 1977).

No. 337 : Robinson, G. A., Cawood, M. P. and Dobson, D. A., Cotton in Fine Gauge Single Jersey, Part II: Fabrics from Mercerised and Unmercerised Singles Yarns – All Cotton and 60/40 Cotton/Polyester (February 1977).

No. 338 : Mozes, T. E. and Turpie, D. W. F., Treatment of Wool Scouring Liquors, Part I: Flocculation by Alum and Polyelectrolytes, Part II: The Effect of pH on Flocculation by Anionic, Non-Ionic and Cationic Polyelectrolytes (March 1977).

No. 339 : Turpie, D. W. F. and Mozes, T. E., Treatment of Wool Scouring Liquors, Part III: A Preliminary Investigation into De-Stabilisation by Sea-Water (March 1977).

No. 340 : Van Rensburg, N. J. J. and White, Josée, Autoclave Setting of Wool Yarn, Part II: The Effect of Fibre Regain and Various Setting Conditions on the Rate of Dye Exhaustion and Snarling Twist of Different Yarns (March 1977).

Papers appearing in local and overseas journals

Veldsman, D. P., Meissner, H. D. and McIver, B. A., Solvent Dyeing of Wool, *Proc. 5th Int. Wool Text. Res. Conf.*, Aachen, 5, 221 (September 1975).

Veldsman, D. P., Knittability, *S.A. Textiles,* 24 (12), 13 (December 1976).

Strydom, M. A., Advantages of Liquid Ammonia, *Textile Asia,* 7 (11), 42 (November 1976).

Strydom, M. A., Mohair : A Bibliography Relating to the Fibre and its Processing, Letter to the Editor, *J. Text. Inst.*, 67 (12), 456 (December 1976).

Turpie, D. W. F., The Unconventional Scouring of Wool in Concentrated Wool Grease Emulsions, *Proc. 5th Int. Wool Text. Res. Conf.,* Aachen, 4, 67 (September 1975).

Hunter, L. and Gee. E., The Relationship Between Certain Yarn and Fibre Properties for Wool Worsted Yarns, *Proc. 5th Int. Wool Text. Res. Conf.,* Aachen, 4, 244 (September 1975).

Veldsman, D. P., Cockling in Single Jersey Fabrics, *Dyers Dyegest,* 6 (2) (March 1977).

TEXTILE ABSTRACTS

Anon., Low Formaldehyde Finishing, *Japan Text. News,* No. 263, 95 (Oct., 1976).

This article deals with the use of non-formaldehyde or low-formaldehyde finishing agents on cotton which will comply with the very stringent regulations being applied to certain textiles in Japan. Various crease resist and shrink resist treatments which would comply with the different requirements on formaldehyde are described and their performances discussed.

(L.H.)

Shah, J. K. and Sadhu, M. C., High Temperature Desizing, a Rapid and Continuous Process, *Colourage, XXIII,* 15 (16 September, 1976).

The merits of various desizing processes are discussed, with the enzyme desizing process being discussed in some detail. Results of a continuous high temperature enzyme desizing process are reported and it is concluded that efficient size removal can be achieved within 30 to 45 minutes, at a temperature of between 70 and 85°C.

(L.H.)

Srinathan, B., Oka, P. G., Ukidve, A. V. and Bhyrappa, K. S., Comparative Performance of Different Drafting Systems, *Ind. Text. J.*, **86**, 169 (Sept., 1976).

The quality of cotton yarns produced on different drafting systems viz. three roller, Casablanca A-500, SKF PK211E and GX2 is compared at different yarn linear densities. It is concluded that yarns spun on top arm drafting systems are superior to those spun on conventional systems with the SKF drafting system the best of those studied, particularly for the coarser yarns.

(L.H.)

J. Lewis, Unwanted Shine, *Text. Asia,* **4**, 36 (Nov., 1976).

The development and prevention of shiny surfaces on worsted fabrics during wear are discussed. It is stated that the development of shine on wool fabrics can be attributed to fibre abrasion, fibre and yarn deformation and accumulation of grease and dirt in the cloth. Scanning electron microscope examination confirmed earlier observations that "shine" is associated with progressive removal of cuticular cells from wool fibres. Accumulated grease and soil apparently only contributed very slightly to the overall degree of lustre of the fabric surface.

Laboratory investigation of "shine" can be carried out by using a goniophotometer for measuring the degree of shine and by using PVC as a mildly-abradant surface to simulate wear. Cloths which are firmly constructed to increase their durability are often more liable to become shiny because the fibres are relatively immobile and hence always abrade in the same place and plane. Finishing, such as autoclave-setting, can also increase the rate at which fabrics become shiny during wear. Certain synthetic resins, e.g. polyurethane resins, can reduce the rate at which fabrics become shiny during wear.

(L.H.)

Bechter, D., Optimisation of the Lustre Increase of Cotton during Mercerisation, *Textil Praxis* **31**, 1431 (1976).

The effect of various processing conditions during yarn and fabric mercerisation on the lustre of cotton was studied. Lustre appeared to depend mainly on the degree of stretch applied, and not so much on the degree of shrinkage. Lustre was found to increase with an increase in the degree of stretch. Depending on the number of repeats, a small and progressive increase in lustre was also observed upon repeated mercerisation treatments. It was furthermore also observed that lustre increased with increasing mercerisation temperatures. The highest temperature investigated was 60°C.

(N.v.R.)

SOLVENT EXTRACTABLE MATTER LEVELS FOR SOME COTTONS GROWN IN SOUTHERN AFRICA A PRELIMINARY INVESTIGATION

by L. HUNTER and S. A. MUSMECI

ABSTRACT

Some preliminary work is reported on the levels of extractable matter obtained with different solvents for eleven cottons grown in Southern Africa. Reducing sugar contents have also been determined.

INTRODUCTION

During the processing of cotton into yarn, "sticking" can occur at various stages from the carding process to spinning. This problem, normally referred to as "sticky cotton", results from the build-up of a tacky deposit on rollers and other machine parts. Perkins[1] states that the result is at best a cleaning problem and at worst a serious production and quality problem. Wyatt[2] mentions that unpublished data gathered from the physical and chemical examination of samples of sticky cotton and controls have not yielded a ready answer to the causes of the stickiness. Apparently in many cases the sticky sample was a new experimental variety.

It has been found that the content of reducing sugars is related to the stickiness of cotton[1,3], with levels of 0,3 *per cent* or more, using the potassium ferricyanide method, causing difficulties. Roberts *et al*[3] stated that, in general, sticky cottons had one or more of the following characteristics:

(1) high content of reducing components (≥ 0,3 *per cent*)
(2) high yields of aqueous extracts (≥ 2,0 *per cent*)
(3) high content of wax and/or lubricating oil contamination (≥ 0,8 *per cent*), as determined by benzene extraction.
(4) high content of non-cellulosic material (≥ 2,7 *per cent*) as determined by the 95 *per cent* ethanol extraction: and large absolute amounts of β-D-fructose, α-D-glucose, β-D-glucose and an unknown compound D, as determined by gas chromatography. Conversely, non-sticky cottons generally had lower amounts of these components.

Perkins[1] found a general relationship between sugar content and alcohol extract and concluded that cottons which lie to the right of the curve so derived, tend to behave poorly in processing, particularly in relation to stickiness.

Wyatt[2] mentions that problems of sticking were observed with new varieties, stripper harvesting (high trash content) compared to spindle harvesting (low trash content), poorly ginned cotton, seed coat fragments, plants having high moisture during growth and cotton containing dead cotton. The residues from fungal growth could also cause stickiness during processing[2]. He goes on to list the following as possible causes for cotton stickiness: honeydew, immature cotton, green cotton, excessive waxes, insufficient waxes, sugar at the base of the boll, bacteria, fungi, high moisture content in fibre, high concentration of night-time dew during growing season, soil make-up, variety, glandular versus non-glandular cotton, pectins, seedcoat fragments, oils from cut seeds, insecticides and herbicides (carrier), defoliants, liquids applied at the gin, liquids applied at textile mills, fertilizers, trash, liquids applied during mechanical picking or the method of harvesting. Sugar content and fineness may be related. Land condition and climatic conditions may also contribute towards stickiness.

The following solutions have been suggested for reducing problems associated with cotton stickiness[1, 2]:

(1) Age sticky cotton six to nine months prior to processing.
(2) Blend small amounts of sticky cotton with non-sticky cotton.
(3) Reduce the relative humidity, and temperature during processing.
(4) Avoid low micronaire cottons and also those containing large quantities of seedcoat fragments (particularly if crush rolls are to be used).

In view of the problems which may be encountered with cotton stickiness, and in the light of the work carried out overseas, it was decided to initiate a project at SAWTRI aimed at establishing levels of solvent extractable matters and sugars which can be regarded as normal for the cottons grown in Southern Africa. A further objective was to obtain samples of sticky cottons from industry and to compare the levels of extractable matter of these with the "norms" referred to earlier, in an attempt to establish which component (or solvent extract) is associated with stickiness. Some processing trials on sticky cottons are also envisaged.

This report deals with a preliminary investigation in which different solvents were used on a range of local cottons with the reducing sugar contents on the aqueous extracts also being determined.

EXPERIMENTAL

Samples of cotton lint from eleven cottons grown in Southern Africa were investigated. These cottons are listed in Table I. All the samples were passed through a Shirley Analyser before any tests were carried out. Soxhlet extractions were carried out on each sample using each of the following solvents in turn on a separate sample:

(1) 95 *per cent* ethyl alcohol
(2) Benzene
(3) Benzene-methanol (3:2 azeotropic mixture)
(4) Chloroform
(5) Dichloromethane

An extraction time of six hours was used in each case.

Perkins[1] has stated that wax is that material which is removed from the cotton fibre by benzene in a six hour soxhlet extraction. He also used six hours for alcohol extraction. For this reason extraction time was fixed at six hours throughout. The extractable matter levels for the different cottons and solvents are given in Table I.

The alcohol and benzene-methanol extracts were subsequently extracted with distilled water and the sugar content determined according to the potassium ferricyanide method[1]. In addition, samples of cotton were extracted with distilled water and the sugar content determined[1]. The values so obtained are given in Table II.

All the values for extractable matter are based on the dry mass of cotton.

TABLE I

LEVELS OF EXTRACTABLE MATTER OBTAINED WITH THE VARIOUS SOLVENTS ON THE DIFFERENT COTTONS

COTTON SAMPLE	Sample No.	EXTRACTABLE MATTER (%)				
		Alcohol	Benzene	Benzene-Methanol (3:2)	Chloro-form	Dichloro-methane
68/4/21	1	1,11	0,52	1,26	0,51	0,59
Deltapine 5826/115	2	1,10	0,60	1,27	0,60	0,66
Del Cerro	3	0,97	0,55	1,27	0,49	0,56
Deltapine 5826 BSG	4	1,27	0,59	1,50	0,54	0,68
Deltapine	5	1,19	0,62	1,43	0,66	0,74
Albacala/Albar/CS2(A2) Duns	6	1,13	0,61	1,43	0,73	0,57
Albacala/Albar/CS2(A2) Duns	7	1,44	0,65	1,43	0,93	0,67
Albacala/Albar/CS2(A2) Deal	8	1,10	0,55	1,19	0,72	0,54
Albacala/Albar/CS2(A2) Doly	9	0,87	0,55	1,35	0,68	0,51
Albacala/Albar/CS2(B2) BS2	10	1,26	0,57	1,29	0,87	0,54
Albacala/Albar/CS2(B2) BS3	11	1,50	0,56	1,32	0,87	0,64
Average		1,18	0,58	1,34	0,69	0,61

RESULTS AND DISCUSSION

From Table I it is apparent that benzene-methanol gave the highest extractable matter levels (average of 1,34 *per cent*), followed closely by alcohol (1,18 *per cent*). The extractable matter levels obtained by means of the remaining three solvents were very similar and of the order of 0,6 *per cent*. If the benzene extractable matter content is taken as a measure of the wax content[1] then it appears that the levels of wax are very similar for the eleven different cottons and, furthermore, are very close to the average[1, 2] of 0,6 *per cent* for cotton generally. The alcohol extractable matter levels appear to be quite low if compared with the values obtained elsewhere[1]. According to Perkins[1] the alcohol extractable matter is a good measure of the total non-cellulosic components of cotton although, he adds, neither ethyl alcohol nor any other single component will remove all of the non-cellulosics from cotton. According to the British Standards Handbook (11:1974:5/23) three hours soxhlet extraction with dichloromethane gives a measure of oils, fats and waxes on cotton. It is mentioned, however, that this does not remove all naturally occurring fats and waxes and it could give values which are too low by about 0,2 g per 100 g of cotton (i.e. too low by about 0,2 *per cent* absolute). It is apparent that, if anything, it gives a slightly higher average value than that obtained with benzene which by definition[1] is a measure of the wax content. The longer extraction time (namely six hours) used in this study, however, may be the reason for this.

TABLE II

REDUCING SUGAR CONTENT AS DETERMINED ON THE AQUEOUS EXTRACT

SAMPLE NO.	PERCENTAGE REDUCING SUGAR
1	0,16
2	0,18
3	0,29
4	0,28
5	0,28
6	0,28
7	0,34
8	0,25
9	0,30
10	0,32
11	0,25
AVERAGE	0,27

In an attempt to explain the differences between the levels of alcohol and benzene-methanol extractable matter, the residues were extracted with water and the water soluble components compared (results not shown). In general the alcohol extract contained a greater proportion of water soluble matter (39 *per cent* on average) than the benzene-methanol extract (32 *per cent* on average) and this, therefore, could not explain the differences observed.

According to Table II the average level of reducing sugar for the eleven samples tested is 0,27 *per cent* which is below the level (0,3 *per cent*)[1,2,3] at which it could present processing difficulties. As a matter of interest the reducing sugar contents were also determined on the aqueous extracts of the benzene-methanol and alcohol extracts, respectively, and these were compared with the values obtained on the aqueous extract of the cotton samples using the method of Perkins[1]. It appeared, however, that a reliable measure of sugar content cannot be obtained by means of either the alcohol or benzene-methanol extracts since the values obtained were only about 10 *per cent* of those shown in Table II.

SUMMARY AND CONCLUSIONS

Some preliminary experiments were carried out on eleven cottons grown in Southern Africa, in which the levels of extractable matter were determined with five different solvents: ethyl alcohol, benzene, benzene-methanol, chloroform and dichloromethane. A six hour soxhlet extraction was used for all the solvents. Reducing sugar content was determined on the aqueous extracts.

It was found that benzene-methanol gave the highest level of extractable matter (average of 1,34 *per cent*) followed by alcohol (average of 1,18 *per cent*). If the benzene-extractable matter is taken to represent the wax then the values obtained here are in close agreement with the average of 0,6 *per cent* referred to in various publications.

Of the benzene-methanol and alcohol extracts roughly 35 *per cent* was water soluble although if the reducing sugar was determined on the latter, erroneous results were obtained.

Reducing sugars were determined on the aqueous extracts of the cotton and they varied from 0,16 to 0,34 *per cent*. Only two of the cottons studied here exceeded 0,30 *per cent,* the minimum level arrived at by other research workers for cottons to be considered sticky.

This work is to be continued with the aim of establishing the levels of extractable matter and sugar which can be regarded as normal for cottons grown in Southern Africa. Ways of identifying sticky cotton will be investigated and processing trials will be used to confirm such identification.

ACKNOWLEDGEMENTS

The authors are indebted to the Director, Dr D. P. Veldsman, for advice and to Mrs H. Grabherr for determining the sugar contents of the cottons.

REFERENCES

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2. Wyatt, B. G., Sticky Cottons, *Text. Ind.* **140**, 144 (Oct. 1976).
3. Roberts, C. W., Koening, H. S., Merrill, R. G., Cheung, P. S. R. and Perkins, H. H., Implications of Monosaccharides in Sticky Cotton Processing, *Text. Res. J.*, **46**, 374 (May 1976).

A MICROCALORIMETRIC STUDY OF THE REACTION BETWEEN WOOL AND POLYMERS
A PRELIMINARY REPORT

by A. SCHEFFER and N. J. J. VAN RENSBURG

ABSTRACT

The heat effect of the interaction between wool and the acid colloid of an aminoplast resin was determined with a microcalorimeter. The heat of adsorption increased when the level of chlorination of wool increased.

INTRODUCTION

Over the last decade significant progress has been made towards the development of shrink-resist treatments of wool. As a result of extensive research carried out in this field, the shrink-resist treatment of wool has become a commercially and technologically viable process and currently a large quantity of wool is being shrink-resist treated. Most of the methods used at present involve an oxidative pretreatment of the fibre, followed by the application of a polymer coating. Despite the fact that there are many polymers available, only a few are effective in reducing the felting shrinkage of wool.

In an attempt to gain some further information about the interactions between the wool fibre and polymers, a microcalorimeter can be used. The use of microcalorimetric techniques in fundamental gas adsorption studies is well-established. Microcalorimeters designed for the study of biological systems have also recently been developed[1, 2]. SAWTRI has acquired such a microcalorimeter and in this preliminary report a study of the interaction between the acid colloid of an aminoplast resin and untreated as well as chlorinated wool is described.

EXPERIMENTAL

A 64's quality merino wool with a dichloromethane extractable matter content of 0,3 *per cent* was used. The wool was treated in sliver form with various concentrations of active chlorine according to the method described by Hanekom *et al*[3] (DCCA in aqueous acetic acid). The acid colloid was prepared[3] from ® Aerotex M-3, a methylated methylolmelamine derivative.

The wool was cut into short pieces, each about two mm long, and an accurately weighed sample (60 to 200 mg) was then placed in the flow cell of an LKB 2107 sorption microcalorimeter. The acid colloid solution was diluted with water to a concentration of 0,1 *per cent* aminoplast resin (mass/volume) and a reference solution, of similar pH to this acid colloid solution but containing no aminoplast resin, was prepared.

The reference solution was pumped through the flow cell at a rate of 15 mℓ/hour until equilibrium was attained. The acid colloid solution was then pumped through the cell, while continuously recording the flow cell temperature. After completion of the adsorption reaction the reference solution was once again pumped through the cell to follow the desorption reaction. Calibration experiments were then carried out according to the method recommended by the manufacturers of the apparatus.

The apparatus was used under standard atmospheric conditions (65% RH and 20°C) and its thermostat was set at a temperature of 35°C. The solutions pumped into the microcalorimeter were preheated to 35°C in a heat exchanger set up next to the inlet panel.

RESULTS AND DISCUSSION

Some typical thermograms obtained during this investigation are shown in Figure 1. Curve A shows the heat effect when the acid colloid solution was pumped through the cell containing wool, and curve B shows the heat effect when the reference solution was subsequently pumped through. Figure 1 shows that the

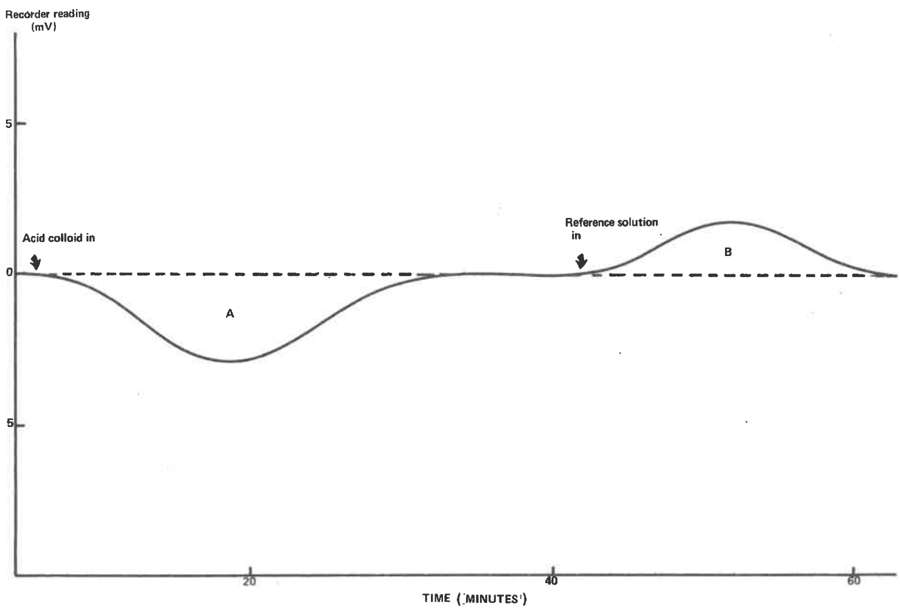

FIGURE 1

Thermogram of the wool/acid colloid interactions

adsorption heat effect was significantly higher than the desorption heat effect.

From the calibration experiments the heat effect (joule/g wool) was calculated for the untreated wool as well as for the samples treated with various concentrations of chlorine. The results are given in Table I and Figure 2. It can be seen that the adsorption heat effect gradually increased as the level of chlorination increased, up to the highest level of chlorination studied, namely 3,5 *per cent* chlorine. The desorption heat effect appeared to go through a maximum at about 1,0 to 1,5 *per cent* chlorine.

The interpretation of the results in terms of the actual quantity of acid colloid adsorbed onto and desorbed from the fibres will be carried out at a later stage. These preliminary results do indicate, however, that microcalorimetric techniques could be used in obtaining more information about wool/polymer

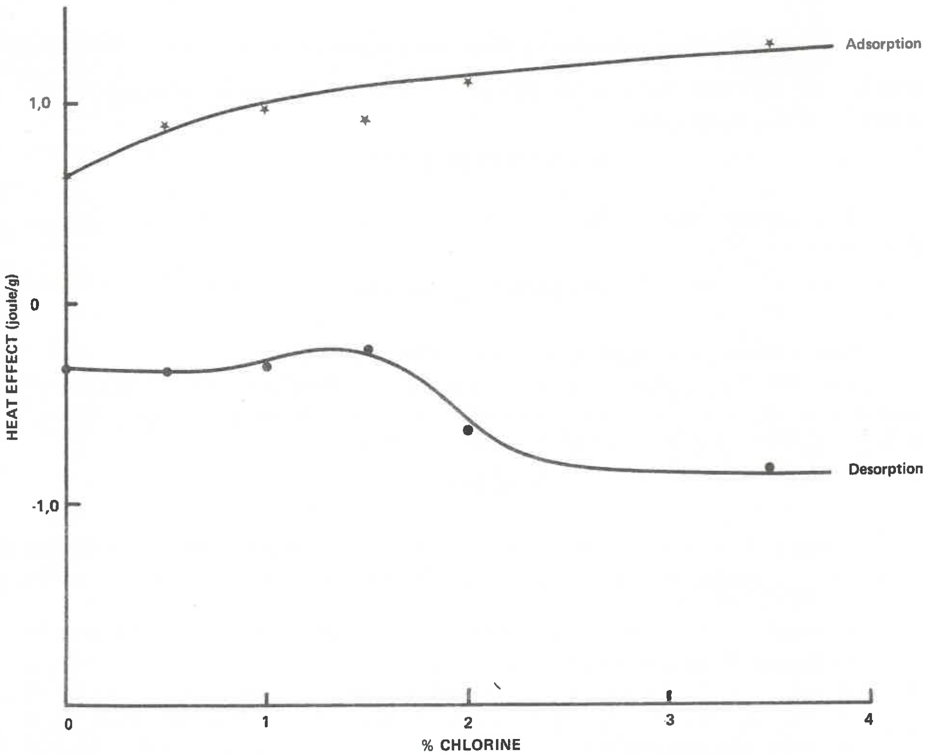

FIGURE 2

The effect of chlorination on the heat effect between wool and an aminoplast resin acid colloid

TABLE I

THE HEAT EFFECT OF THE WOOL/ACID COLLOID INTERACTION

DEGREE OF CHLORINATION (% $C\ell_2$)	MEAN HEAT EFFECT (joule/g)	
	Adsorption	Desorption
0	0,629	- 0,338
0,5	0,885	- 0,306
1,0	0,984	- 0,275
1,5	0,881	- 0,239
2,0	1,108	- 0,699
3,5	1,278	- 0,841

interactions and may help in determining the requirements for polymers to be effective shrink-resist agents.

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PROPRIETARY NAMES

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