

轻化工程专业  
双语教材

Chemical finishing of textiles

# 纺织品化学整理

W.D. 辛德勒 P.J. 豪瑟 编著  
王 强 范雪荣 译

**Woodhead Publishing Ltd.**

W. D. Schindler P. J. Hauser



中国纺织出版社  
China Textile & Apparel Press

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## 内 容 提 要

本书是配合高等院校轻化工程专业及相关专业实施双语教学而引进的英文原版著作。全书系统介绍了国外纺织品化学整理,特别是功能整理方面的内容,包括柔软整理、免烫和耐久压烫整理、拒水拒油整理、易去污整理、阻燃整理、防滑整理、抗静电整理、抗起球整理、弹性整理、防紫外线整理、抗微生物整理、生物整理等。

本书可作为高等院校轻化工程及相关专业的双语教学用书,也可供从事印染、纺织等相关行业的生产、管理和产品开发的技术人员阅读参考。

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## Preface 序言

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In final chemical finishing, with its great range of desired and undesired effects, the task of a textile finisher can become demanding. He or she has to consider the compatibility of the different types of finishing products and treatments, in particular their mutual influence on the desired effects. With about 20 different types of chemical finishes and several thousand finishing agents, most of which are combined to give one-bath multipurpose finishes, chemical finishing needs a solid basis of textile chemical knowledge and technical understanding as well as some practical experience. This book aims to fulfil some of these requirements.

It is anticipated that this book on the chemical finishing of textiles will appeal particularly to finishing plant management, process engineers, technologists, qualified practitioners and foremen; representatives and co-workers of the textile chemical industry, textile research and testing institutes, quality inspectors, textile machinery makers; chemist colourists, clothing manufacturers, textile designers, dry cleaners, buyers, sales personnel, wholesalers and last but not least students, lecturers and teaching staff of textile chemistry and finishing as well as of related subjects. The presentation of this compact description of all important types of chemical finishing might be especially useful for advanced undergraduates. This book stresses fundamentals rather than specific recipe and procedure proposals, which are often provided by the finish producers. The interplay between chemical structures and the effects of finishing products is a central concern of this book. Readers without a deeper chemical interest may especially profit from the discussions of typical advantages and disadvantages, application conditions, compatibility and combinability, testing methods and practical tips about every important type of chemical finish.

The idea for this book started with a comprehensive lecture script on chemical finishing from the University of Applied Sciences Hof/Münchberg, that was translated into English during the stay of Professor Schindler as a guest at the College of Textiles of the North Carolina State University. There the authors met and planned to fill a gap in the market with an actual, compact and clearly understandable survey on chemical finishing of textiles in the form of a small

textbook focusing on the interaction of the underlying chemistry and technology with the textile fabric.

The authors want to thank their colleague Professor Gary N. Mock for constant support and encouragement and Woodhead Publishing Limited, especially Ms Emma Starr, for very friendly and inspiring cooperation. We also thank the *International Textile Bulletin*, for leaving us the copyright for two corresponding publications on softening and hand building finishes in issues 2 and 4 in 2003.

We welcome suggestions and comments and hope that this book might be useful for all those who enjoy the charm and the demanding challenge of chemical finishing for textiles.

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## 出版前言

进入 21 世纪,各高校纷纷在提高教育素质、与国际接轨方面进行了积极的探索。其中“双语教学”成为推进素质教育的又一着陆点。教育部于 2001 年 8 月发布文件,针对本科教学工作提出 12 项措施,其中明确要求各高校在三年内开设 5% ~ 10% 的双语课程,并引进原版教材和提高师资水平。这使得高校双语教学势在必行。双语教学既是教育自身对课程设置的调整,也是社会发展对教育改革的必然要求。实施双语教学不仅可提高学生的英语水平,适应未来的发展,更重要的是提高我国综合国力和国际竞争力的需要。

通过问卷调查、座谈等方式,我们了解到双语教材的缺乏是高校实施双语教学的一大难点。作为科技出版社,我们拥有纺织、染化、服装、工美等专业人才,并和英、美等国家的专业出版社、院校、协会保持着良好的合作,因此,我们希望利用自身专业优势,与高校合作出版双语教材,使之成为高校实施双语教学的先行兵。

经过广泛的调研、深入的讨论,我们在双语教材的内容、出版形式等方面形成了较完整的思路。目前,我社出版的双语教材按专业分为四个系列:纺织工程专业双语教材、轻化工程专业双语教材、高分子材料专业双语教材、服装专业双语教材。所选图书均为国外的经典教材,其内容与国内相关专业课程相近,便于学生在掌握专业基础知识的同时,开阔视野,提高语言应用能力。我们将力求出版形式多样化,既有原汁原味的影印本,又有中译本和中文注释版本。部分教材将配有多媒体光盘,更加丰富了教材的表现手段,有助于提高学生的英语听说能力。

可以说,这是我们在双语教材出版方面所进行的一次有意义的尝试,希望能对高校的双语教学的开展起到抛砖引玉之用,也希望读者对双语教材的出版提出建议、意见,以便我们在今后的工作中逐步改进、完善。

出版者

2007 年 1 月

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## Introduction to chemical finishing

## 化学整理导论

## 1.1 Wet and dry or chemical and mechanical finishing

## 湿整理与干整理或化学整理与机械整理

Textile wet processing can be thought of having three stages, pretreatment (or preparation), coloration (dyeing or printing) and finishing. Finishing in the narrow sense is the final step in the fabric manufacturing process, the last chance to provide the properties that customers will value. Finishing completes the fabric's performance and gives it special functional properties including the final 'touch'.

湿加工/前处理  
前处理/染色  
织物  
触感

But the term finishing is also used in its broad sense: 'Any operation for improving the appearance or usefulness of a fabric after it leaves the loom or knitting machine can be considered a finishing step'.<sup>1</sup> This broad definition includes pretreatments such as washing, bleaching and coloration. In this book the term finishing is used in the narrow definition to include all those processes that usually follow coloration and that add useful qualities to the fabric, ranging from interesting appearance and fashion aspects to high performance properties for industrial needs. This definition may be applied to similar finishing processes for grey fabrics (without coloration). Bleaching and carbonisation are chemical treatments that also improve the quality of fabrics. They are not treated in this book because they belong typically in pretreatment, although there are rare exceptions.

织机  
漂白

Most finishes are applied to fabrics such as wovens, knitwear or nonwovens. But there are also other finishing processes, such as yarn finishing, for example sewing yarn with silicones and garment finishing (see Chapter 2.2.5). Textile finishing can be subdivided into two distinctly different areas, chemical finishing and mechanical finishing. Chemical finishing or 'wet finishing' involves the addition of chemicals to textiles to achieve a desired result (see Chapter 2). Physical properties such as dimensional stability and chemical properties such as flame retardancy can both be improved with chemical finishing. Typically, the appearance of the textile is unchanged after chemical finishing. Mechanical finishing or 'dry finishing' uses mainly physical (especially mechanical) means to change fabric properties and usually alters the fabric appearance as well. Mechanical finishing also encompasses thermal processes such as heat setting (thermal finishing). Typical

坯布/炭化  
机织物/针织物/非织造  
织物  
纱(线)/有机硅  
尺寸稳定性/阻燃性  
热处理/热定形

轧光/仿鹿皮整理/机械  
预缩

起绒/刷毛/剪毛/剪毛/缩呢  
压呢/定形/煮呢/蒸呢

缩绒

单面处理  
涂层

mechanical finishes include calendering, emerising, compressive shrinkage, raising, brushing and shearing or cropping, and especially for wool fabrics milling, pressing and setting with crabbing and decating. A summary of mechanical finishing has recently appeared.<sup>2</sup>

Often mechanical and chemical finishing overlap. Some mechanical finishes need chemicals, for example milling agents for the fulling process or reductive and fixation agents for the decating of wool fabrics. On the other hand chemical finishing is impossible without mechanical assistance, such as fabric transport and product application. The assignment to mechanical or chemical finishing depends on the circumstance, if the major component of the fabric's improvement step is more mechanical- or chemical-based.

This book will focus on the chemical finishing of textiles, the application of relatively minor amounts of chemicals (often  $< 5 \text{ g m}^{-2}$ ) to, in most cases, both sides of the fabric. Subsequent chapters will discuss the importance of each specific finish, the chemical mechanism for the effect, the chemicals used to provide the desired properties, the application and fixation procedures, the relevant evaluation methods and trouble shooting tips. Processes that employ high levels of chemical application ( $15\text{--}50 \text{ g m}^{-2}$  and more), primarily as one-sided treatments, such as coating are addressed only briefly in Chapter 2.

## 化学整理的挑战与魅力

## 1.2 The challenge and charm of chemical finishing

处方  
结构  
耐久性

The proper formulation of chemical finishes requires consideration of several important factors: the type of textile being treated (fibre and construction); the performance requirements of the finish (extent of effect and durability); the cost to benefit ratio; restrictions imposed on the process by availability of machinery, procedure requirements, environmental considerations; and compatibility of different formula components as well as the interaction of the finishing effects.

To bring all these parameters to an acceptable compromise is not easy, even for a single purpose finish. But usually several types of finishes are combined for economical reasons mostly in one bath (only one application and drying process). This is often the hardest challenge of chemical finishing. First, all components of the finish bath must be compatible. Precipitations of anionic with cationic products have to be avoided. The emulsion stability of different products may be reduced by product interactions. More difficult is often the second hurdle, the compatibility of the primary and secondary effects of the different types of finishes that are being combined:

沉淀/阴离子性的/阳离  
子性的  
乳液稳定性

有机硅弹性体  
拒水性/柔软剂/抗静电

疏水的,憎水的  
亲水的/硬挺整理和弹性  
整理

- Some effects are similar or assist each other, for example silicone elastomers cause water repellency, softeners bring about antistatic effects and antistatic finishes can be softening.
- Some effects are obviously contradictory, for example hydrophobic finishes and hydrophilic antistatic finishes, or stiffening and elastomeric finishes, or stiffening and softening finishes.

Table 1.1 General requirements of chemical finishes

Primary effects of finishes	<ul style="list-style-type: none"> <li>• High effect level at low cost for products and application</li> <li>• Possible effect design, adaptation to customer wishes, article demands and favoured use</li> </ul>	
Desired secondary effects	<ul style="list-style-type: none"> <li>• Usable for all kind of fibres and all textile forms, as yarn, woven or knit fabric, garment, nonwovens</li> <li>• High permanence for washing and <u>dry cleaning</u> for garments and most <u>household textiles</u></li> <li>• No loss of important textile qualities such as <u>tear strength</u> and <u>abrasion resistance</u>, comfort, appearance, hand</li> <li>• No <u>yellowing</u> of undyed fabrics, no <u>shade change</u> of coloured ones, no <u>reduced colour fastness</u></li> <li>• Easy and safe handling, non-flammable</li> <li>• Simple application, preferably with several standard methods and equipment at low cost</li> <li>• High stability under storage and application conditions (temperature, pH, mechanical stress)</li> <li>• Even distribution, either on the fibre or fabric surface or inside the fabric</li> <li>• <u>Compatibility</u> with other finishes</li> <li>• <u>Synergistic effects</u>, no reduction of effect of other finishes</li> <li>• Easy correction of finishing faults such as removal of finish or stains</li> <li>• No environmental problems, non-toxic, biodegradable, no volatile organic compounds</li> </ul>	干洗 家用纺织品 撕破强力 耐摩擦牢度 泛黄/色变 染色牢度 相容性 协同效应

- Other types of finishes typically reduce the main effect of a finish type, for example the flame retardant effect is decreased by nearly all other types of chemical finishes as they add flammable components to the fabric.
- Fortunately true antagonistic effects are rare, but true synergistic effects are also rare, where the resulting effect of a combination is greater than the sum of the single effects of the combined products. Examples of both cases are different types of flame retardants.

Thus the finisher is glad when the combined products do not interfere, neither in the finishing bath nor on the fabric, with all their different effects, but this usually is the exception rather than the rule.

This discussion of the interaction of the primary effects of the combined products can be expanded to their secondary effects, the desired and the undesired ones. Obviously this task quickly approaches confusion. It is not surprising that successful chemical finishing is sometimes thought of as being nearly magical. As Rouette wrote in *Fundamentals of Textile Finishing*:

Nowhere in textile finishing does the formulation of recipes need such a

special knowledge, almost comparable to a secret science, than in chemical finishing.<sup>3</sup>

Table 1.1 gives some of the general requirements expected of a chemical finish. As can be seen, they can be quite daunting. One future challenge for chemical finishing is the ever increasing concern over environmental and ecological issues. Traditional chemistries and manufacturing methods must be changed and modified to meet the new realities of our modern world.

Thus it is not surprising that an expert system was developed (TEXPERTO from Clariant), where the experience of many finishing experts is combined in a software program that enables less experienced finishers to create successful finishing recipes interactively with a computer. This computer-aided generation of recipes starts with detailed questions about the textile article to be finished, followed by a profile of requirements for the chemical finish. Included are questions concerning restrictions, for example cost limits, available machinery, process steps and environmental limitations. This expert system incorporates most of the different requirements and factors that have to be considered when formulating a demanding finishing recipe.

This recipe formulation is not only a challenge but also a charming task. For those finishers who have the knowledge and some experience, chemical finishing is an inspiring and fascinating job, where the interaction of chemical understanding, technical grasp, textile feeling and an instinct for market trends leads to considerable success and increased value (both in the worth of the finished fabric and in the esteem of the finish designer).

## 化学整理的重要性

### 1.3 Importance of chemical finishing

高技术,高科技

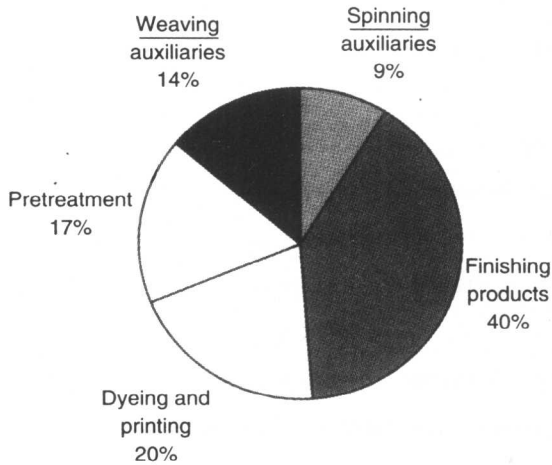
Chemical finishing has always been an important component of textile processing, but in recent years the trend to 'high tech' products has increased the interest and use of chemical finishes. As the use of high performance textiles has grown, the need for chemical finishes to provide the fabric properties required in these special applications has grown accordingly.

助剂

The amount of textile chemical auxiliaries sold and used globally in one year is estimated to be about one-tenth of the world's fibre production. With fibre production currently at 60 million tonnes, about 6 million tonnes of chemical auxiliaries are consumed. The percentage of market share of textile auxiliaries is shown in Fig. 1.1. About 40 % of textile auxiliaries are used in finishing, the largest percentage usage of all textile chemicals, followed by dyeing and printing auxiliaries and pretreatment chemicals. Within the textile finishing group, the product breakdown, based on TEGEWA,<sup>4</sup> is given as a survey in Fig. 1.2 and given in more detail in Table 1.2. Softeners are clearly the most important individual product group. In terms of value, the repellent group is the leader with the highest ratio of cost per amount. This reflects the relatively high cost of the fluorochemical subgroup of repellents.

含氟化合物  
防护(整理)剂

织造/纺丝

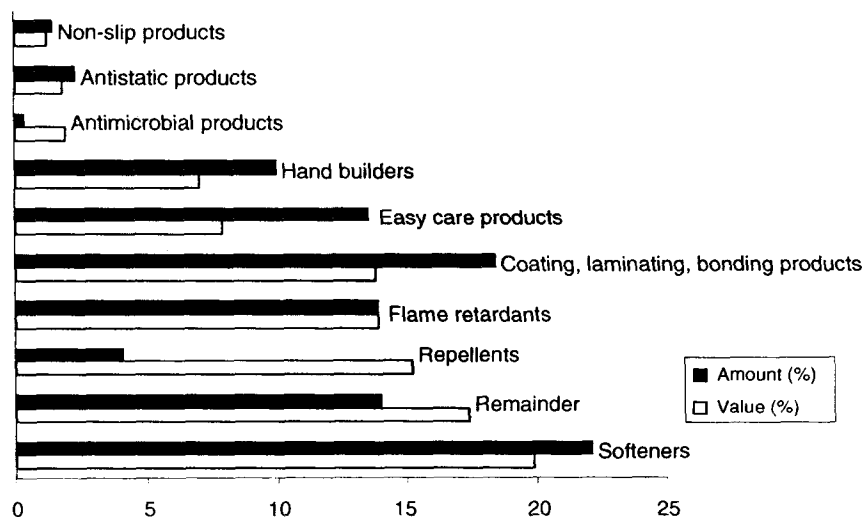


1.1 Distribution of textile auxiliaries by market share.

Table 1.2 Importance of the finishing product groups in order

Value importance	Finishing product group	Value (%)	Amount (%)	Euro/kg	
1	Soft handle products based on:	19.9	22.1	2.10	
	silicones, including elastomeric	8.9	5.4	3.80	
	cationics	5.3	8.0	1.50	
	non-ionics, without silicones	5.0	8.1	1.40	非离子
	anionics	0.7	0.7	2.10	
2	Repellents based on:	15.2	4.1	8.50	
	fluorocarbons	13.8	2.4	13.00	
	paraffins	1.1	1.6	1.60	石蜡
	silicones	0.4	0.1	6.30	
3	Flame retardants	13.9	13.9	2.30	
4	Products for coating, laminating, fibre and thread bonding	13.8	18.4	1.70	层压
5	Products for easy-care and permanent press finishes	7.9	13.5	1.30	免烫和耐久压烫整理
6	Hand builders	7.0	10.0	1.60	手感改善剂
7	Antimicrobial products, including protection from insects	1.9	0.3	14.20	抗微生物的
8	Antistatic agents, including carpet finishing	1.8	2.3	1.80	
9	Non-slip agents	1.2	1.4	2.00	防滑(移)剂
10	Products for soil-release/anti-soiling (without fluorocarbons)	0.04	0.01	6.70	易去污/防污
	Remainder, including brighteners, products for sewing thread preparation, anti-felting of wool, carpet back-coating, hydrophilation, delustering and brightening, foaming of finishes	17.4	14.0		氟碳化合物 增白剂 缝纫线 防毡缩 背面涂层/亲水化 消光/增白/起泡





1.2 Distribution of finishing product groups by amount and value.

The textile chemical sector is serviced by a multitude of suppliers. A 2003 buyers' guide,<sup>5</sup> lists over 100 companies offering textile chemicals. The *International Textile Auxiliaries Buyers' Guide*<sup>6</sup> contains over 7000 trade names, of which about 40 % are finishing products.

## 参考文献 References

- 1 Tomasino C, *Chemistry and Technology of Fabric Preparation and Finishing*, Raleigh NC, North Carolina State University, College of Textiles, 1992.
- 2 Lockett A P, 'Mechanical finishing – traditional and modern', in *Textile Finishing*, Heywood D (ed.), Bradford, Society of Dyers and Colourists, 2003, 114–134.
- 3 Rouette H-K, *Grundlagen der Textilveredlung*, Frankfurt/Main, Deutscher Fachverlag, 1989.
- 4 TEGEWA statistics for 2001. TEGEWA = Verband der Textilhilfsmittel-, Lederhilfsmittel-, Gerbstoff- und Waschrohstoff-Industrie, Frankfurt/Main, Germany (Association of German Textile Auxiliary Producers).
- 5 Anonymous, 'Buyers guide', *AATCC Review*, 2003, 3(7), 17–143.
- 6 *International Textile Auxiliaries Buyers' Guide*, 2000, Melliand and TEGEWA, Frankfurt/Main, Deutscher Fachverlag, 2000.