Handbook of
Textile Coloration And Finishing

Mohammad Shahid
Guoqiang Chen
Ren-Cheng Tang

2018

Studium Press LLC, U.S.A.

Handbook of
Textile Coloration And Finishing

SERIES ISBN : 1-62699-106-5

Published by:

STUDIUM PRESS LLC
P.O. Box 722200, Houston, TX 77072 - U.S.A.
Tel: (281) 776-8950, Fax: (281) 776-8951
E-mail: studiumpress@gmail.com
Website: http: / /www.studiumpress.in

Printed at India

About the Editors

Dr Mohammad Shahid received the master's degree in Chemistry from Shibli National College, Azamgarh (India) in 2006 and Ph.D. in Organic Chemistry from the Jamia Millia Islamia, New Delhi (India) in 2014 under the supervision of Dr Faqeer Mohammad. He is now a postdoctoral researcher in Prof. Chen's research group at College of Textile and Clothing Engineering, Soochow University, China. Currently, his research focuses on the application of plant extracts and biotechnologies in textile dyeing and functional finishing. He also has research interests in the revival of historical dyeing techniques and development of analytical methods for textile cultural heritage studies.

Dr. Guoqiang Chen is a professor in College of Textile and Clothing Engineering at Soochow University (China). He received his PhD degree in textile chemistry and dyeing & finishing engineering from Donghua University (China). Since 1986, he taught textile chemistry at Soochow University, he pursues research and development on textile chemicals and functional textiles. He has published more than 250 papers. He has received several prizes (State Science and Technology Awards, Mulberry and Flax Prize of Hong Kong). He serves as Editor-In-Chief of Modern Silk Science and Technology as well as Vice President of the China Silk Association. His representative papers include: A hemicyanine fluorescent reactive cationic dye: synthesis and applications on wool fabrics, *Color. Technol.*, 2015ÿ131, 316; Novel transfer printing paper for silk printing with reactive dye, *Mater. Res. Innov.*, 2014, 18, 879; Preparation and properties of acryloyloxy carboxylic perfluorooctyl ester copolymer for liquid repellent finishing of cotton, *Fiber. Polym.*, 2014, 15, 908; Performance of flame retardant wool fabric grafted with vinyl phosphate, *J. Eng. Fibers and Fabr.*, 2014, 9, 32;Synthesis and application properties of fluorinated aromatic copolymers, *J. Appl. Polym. Sci.*, 2013, 130, 4410.

Dr. Ren-Cheng Tang is a professor in textile chemistry at College of Textile and Clothing Engineering of Soochow University (China). He received his bachelor's degree in textile chemistry at Soochow University in 1987. Afterwards he worked as an assistant engineer in Suzhou Silk Printing Factory for two years from 1987 to 1989. He received his MSc in textile chemistry at Soochow University in 1992, and his PhD in textile chemistry and dyeing & finishing engineering at Donghua University in 2005. Since 1992 he taught textile chemistry at Soochow University. From 1997 to 1998 he had studied at Faculty of Textile Science and Technology of Shinshu University (Japan) for one year. He received two State Science and Technology Awards. His research interests include the chemical processing

of textiles, the physical chemistry of dyeing, the functional application of plant extracts in textile processing, and the functional modification of textiles. He serves as an associate editor of Dyestuffs and Coloration. His representative papers include: Modification of curcumin with a reactive UV absorber and its dyeing and functional properties for silk, *Dyes Pigments*, 2016, 134, 203; Simultaneous coloration and functionalization of wool, silk and nylon with the tyrosinase-catalyzed oxidation products of caffeic acid, *Ind. Eng. Chem. Res.*, 2013, 52, 8953; Adsorption isotherms and mordant dyeing properties of tea polyphenols on wool, silk, and nylon, *Ind. Eng. Chem. Res.*, 2010, 49, 8894; The sorption of a syntan on nylon and its resist effectiveness towards reactive dyes. *Dyes Pigments*, 2008, 77, 665.

Preface

The challenge of textile production industry lies in the need to understand and implement the basic principles of textile coloration and finishing and provide solutions to most common technological problems. In this book, each chapter has been specially prepared by international experts to cover various aspects of textile wet processing stages of preparation, dyeing, printing and finishing.The first three chapters explore ideas and technologies for natural textile dyeing.

Next five chapters consider various aspects of synthetic dyes and dyeing - current innovations in synthetic dyes and dyeing, denim coloration, polyester dyeing, physico-chemical aspects of dyeing. Chapter 9 provides some insight to the nanotechnology and its innovations in the field of textile, in particular textile coloration. Chapter 10 and 11 exclusively focus on the most important textile printing technologies and related discussions. Functional finishing of textiles such as wrinkle resistance, antimicrobial finishing, UV-protection and finishes for dimensional stability are considered in four subsequent chapters. Enzyme usage in preparation of textile and biofinishing of cellulosic textiles are discussed in two separate chapters. Another chapter is especially devoted to application of artificial intelligence in dyeing and finishing process. This is followed by a description a chapter on basics of colour management in the textile industry to provide a better understanding for industrial management. As sustainability issues in textile production are becoming more and more important, the last chapter is focus on sustainable textile processing. Overall the *Handbook of Textile Coloration And Finishing* provides a good overview of dyeing, printing and finishing techniques for beginners, students, scientists, engineers as well as specialists.

Editors

Table of Contents

10

Textile Printing

NEMANJA KASIKOVIC[1]*, GOJKO VLADIC[1], RASTKO MILOSEVIC[1], DRAGOLJUB NOVAKOVIC[1] AND IVANA JURIC[1]

ABSTRACT

This chapter of the book will present the most important printing technologies for textile printing. A special emphasis will be put on the screen printing technique, as the most dominant conventional printing technique and on inkjet printing technology, which is on the other side, the most widespread digital textile printing method today. The material that follows will give better insight into the necessary elements and basic principles of the both mentioned printing processes, printing machine constructions with the examples, the way the impression can be generated, etc.

***Key words*:** Textile printing, Screen printing, Inkjet printing

1. INTRODUCTION

A printing process can be defined as the localized application of the colorant to the selected areas of the substrate. Besides printing, a dyeing of the textiles is often used in industrial applications. The difference between those two processes is that instead of uniformed coloring of the whole surface of the substrate in case of dying process, by printing, a color is applied only to the target areas, thus introducing various colors, patterns, and designs to the textile fabrics. Although today printing is almost synonymous to paper printing, first printing techniques were used for textile printing and only later adapted for more precise paper printing.

The oldest printed textiles which survived to these days are China's three color silk prints, dated back to 220 BCE, while, according to Brunello, the earliest dyed cotton were found in the Indus valley originating from around 3000 BCE (Brunello, 1973).

2. TEXTILE PRINTING TECHNIQUES - OVERVIEW

The textile printing methods can be divided into three basic methods:

- Direct printing method,
- Discharge printing method and
- Resist printing method.

[1]University of Novi Sad, Faculty of Technical Sciences, Department of Graphic Engineering and Design, Novi Sad, Serbia
*Corresponding author: E-mail: knemanja@uns.ac.rs