

WOODHEAD PUBLISHING SERIES IN TEXTILES



# **Functional textiles for improved performance, protection and health**

Edited by N. Pan and G. Sun



The Textile Institute

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# Functional Textiles For Improved Performance Protection And Health Woodhead Publishing Series In Textiles

**Vladan Koncar**



## **Functional Textiles For Improved Performance Protection And Health Woodhead Publishing Series In Textiles:**

*Functional Textiles for Improved Performance, Protection and Health* N Pan, G. Sun, 2011-06-21 The textile industry is increasingly based on ongoing innovation and development of higher performance products and the field of functional textiles is no exception This book explores the development of textiles with a wide range of functions with the aim of improving the performance of the product in terms of the protection and health benefits that it can offer The book is split into two parts Part one focuses on functional textiles for improved performance and protection with chapters reviewing antistatic flame retardant and infrared functional textiles among many others Chapters in part two examine the uses of functional textiles in a medical context including superhydrophobic materials antibacterial textiles and insect repellent materials With its distinguished editors and contributions from some of the world's leading authorities *Functional textiles for improved performance protection and health* is invaluable for textile scientists technologists and engineers as well as those designing and manufacturing textiles It is also a suitable reference for the academic sector Examines the use of functional textiles in a medical context including superhydrophobic materials antibacterial textiles and insect repellent materials Topics range from textile chemicals and their interaction with skin to novel pesticide protective clothing Considers anti ultraviolet protection of clothing and flame retardant textiles

### **Biotextiles as Medical Implants** M W King, B S Gupta, R Guidoin, 2013-10-31

Textiles play a vital role in the manufacture of various medical devices including the replacement of diseased injured or non functioning organs within the body *Biotextiles as medical implants* provides an invaluable single source of information on the main types of textile materials and products used for medical implants The first part of the book focuses on polymers fibers and textile technologies and these chapters discuss the manufacture sterilization properties and types of biotextiles used for medical applications including nanofibers resorbable polymers and shaped biotextiles The chapters in part two provide a comprehensive discussion of a range of different clinical applications of biotextiles including surgical sutures arterial prostheses stent grafts percutaneous heart valves and drug delivery systems This book provides a concise review of the technologies properties and types of biotextiles used as medical devices In addition it addresses the biological dimension of how to design devices for different clinical applications providing an invaluable reference for biomedical engineers of medical textiles quality control and risk assessment specialists as well as managers of regulatory affairs The subject matter will also be of interest to professionals within the healthcare system including surgeons nurses therapists sourcing and purchasing agents researchers and students in different disciplines Provides an invaluable single source of information on the main types of textile materials and products used for medical implants Addresses the technologies used and discusses the manufacture properties and types of biotextiles Examines applications of biotextiles as medical implants including drug delivery systems and stent grafts and percutaneous heart valves

[Smart Textiles for Protection](#) R Chapman, 2012-12-10 Smart textiles are materials and structures that sense and react to environmental conditions or stimuli and their integration into protective

clothing has led to the development of products with greatly enhanced protective capabilities in hazardous situations Smart textiles for protection provides a comprehensive analysis of smart materials used in producing protective textiles and explores a wide range of end use protective applications Part one reviews smart materials and technologies Beginning with an overview of smart textiles for protection this section goes on to discuss types of materials surface treatments and the use of nanofibres and smart barrier membranes The application of sensors actuators and computer systems in smart protective textiles is explored followed by a review of biomimetic approaches to design Part two investigates specific applications of smart textiles for protection Smart technology for personal protective equipment and clothing smart protective textiles for older people and smart high performance textiles for protection in construction and geotechnical applications are all discussed in depth as is the use of smart textiles in the protection of armoured vehicles and in protective clothing for fire fighters and first responders The final chapter describes recent advances in chemical and biological protective clothing With its distinguished editor and international team of expert contributors Smart textiles for protection is an essential guide for all those involved in the design development and application of protective smart textiles Provides a comprehensive analysis of smart materials used in producing protective textiles and explores a wide range of end use protective applications Discusses types of materials surface treatments and the use of nanofibres and smart barrier membranes as well as the application of sensors actuators and computer systems in smart protective textiles Investigates specific applications of smart textiles for protection including smart high performance textiles for protection in construction and geotechnical applications *Smart Textiles and Their Applications* Vladan Koncar, 2016-04-22 Smart Textiles and Their Applications outlines the fundamental principles of applied smart textiles also reporting on recent trends and research developments Scientific issues and proposed solutions are presented in a rigorous and constructive way that fully presents the various results prototypes and case studies obtained from academic and industrial laboratories worldwide After an introduction to smart textiles and their applications from the editor Part One reviews smart textiles for medical purposes including their use in health monitoring treatment delivery and assistive technologies Part Two covers smart textiles for transportation and energy with chapters covering smart textiles for the monitoring of structures and processes as well as smart textiles for energy generation The final section considers smart textiles for protection security and communication and includes chapters covering electrochromic textile displays textile antennas and smart materials for personal protective equipment Scientific issues and proposed solutions are presented in a rigorous and constructive way regarding various results prototypes and case studies obtained from academic and industrial laboratories worldwide Useful for researchers and postgraduate students and also for existing companies and start ups that are developing products involving smart textiles Authored and edited by an international team who are experts in the field ensure comprehensive coverage and global relevance High-Performance Apparel John McLoughlin, Tasneem Sabir, 2017-09-18 High Performance Apparel Materials Development and Applications covers the materials and techniques

used in creating high performance apparel the technical aspects of developing high performance garments and an array of applications for high performance clothing and wearable technology Part One covers fabric construction for high performance garments from fiber types and spinning methods to weaving knitting finishing and joining techniques Development of high performance apparel is covered in Part Two with particular emphasis on design and product development for function and wearer comfort Part Three covers a range of applications and wearable technology that make use of high performance apparel including chapters on sportswear protective clothing and medical military and intelligent textiles The book provides an excellent resource for all those engaged in garment development and production and for academics engaged in research into apparel technology and textile science Offers a range of perspectives on high performance apparel from an international team of authors with diverse expertise Provides systematic and comprehensive coverage of the topic from fabric construction through apparel design and development to the range of current and potential applications Presents an excellent resource for all those engaged in garment development and production and for academics engaged in research

*Understanding and Improving the Durability of Textiles* Patricia A Annis, 2012-09-11 The ability of a fabric to resist wear is an essential aspect of its performance Understanding and improving the durability of textiles provides a comprehensive guide to the factors affecting the durability of a range of different textiles Part one addresses the different factors that affect textile durability including the influence of fabric construction and fibre type as well as properties affecting strength and dimensional stability Colour fastness and the effects of light are discussed along with methods for testing and improving wrinkle resistance and textile durability Part two goes on to explore the durability of particular types of textile including antimicrobial textiles protective clothing historic textiles silk and geotextiles With its distinguished editor and international team of expert contributors Understanding and improving the durability of textiles is an indispensable book for textile scientists technologists engineers and those designing testing and manufacturing textiles It also provides a comprehensive guide to textile durability for researchers and academics of all levels in this sector Provides a comprehensive guide to the factors affecting the durability of a range of different textiles Discusses colour fastness and the effects of light and methods for testing and improving wrinkle resistance and textile durability Explores the durability of particular types of textile

**Performance Testing of Textiles** Lijing Wang, 2016-06-17 Performance Testing of Textiles Methods Technology and Applications examines the developed and established methodology for testing performance textiles also summarizing the material properties for advanced applications This book emphasizes reproducible tests using commonly used experimental methods reported in scientific literature and internationally recognized testing standards to quantify textile material properties and performance After an introductory explanation of key fiber and textile properties and testing methods the book summarizes electronic testing theories technologies and instrumentation for performance textiles Also covered are aspects of military textile medical textile sportswear smart composites and wearable textiles which as examples present the

latest research and results related to performance textile testing and applications Offers up to date coverage of new and advanced performance testing techniques for the fiber and textile industries Explores key fiber and textile properties Summarizes electronic testing theories technologies and instrumentation for performance textiles Includes contributions from an international team of authors edited by an expert in the field     High Performance Textiles and Their Applications C. Lawrence,2014-08-21 High performance textiles represent one of the most dynamic sectors of the international textile and clothing industry With contributions from leading experts in the field this book provides an important overview of key developments in the field Chapters cover the use of high performance textiles in such areas as protective clothing heat and fire protection medicine civil engineering and the energy sector Reviews various approaches to modelling the geometry structure and mechanical and physical properties of advanced textile materials Evaluates novel surface treatments involving plasma and laser technologies for a range of high performance textiles Focuses on textiles for specific purposes with chapters devoted to textiles for heat and fire protection wound care industrial filtration geotextiles civil engineering and sustainable energy applications     Structure and Properties of High-Performance Fibers Gajanan Bhat,2016-08-21 Structure and Properties of High Performance Fibers explores the relationship between the structure and properties of a wide range of high performance fibers Part I covers high performance inorganic fibers including glasses and ceramics plus carbon fibers of various types In Part II high performance synthetic polymer fibers are discussed while Part III reviews those natural fibers that can be used to create advanced textiles The high performance properties of these fibers are related to their chemistry and morphology as well as the ways in which they are synthesized and spun High performance fibers form the basis of textile materials with applications in protection medicine and composite reinforcement Fibers are selected for these technical applications due to their advanced physical mechanical and chemical properties Offers up to date coverage of new and advanced materials for the fiber and textile industries Reviews structure property relationships of high performance inorganic carbon synthetic polymer and natural fibers Includes contributions from an international team of authors edited by an expert in the field Reviews those natural fibers that can be used to create advanced textiles     *Thermal Protective Clothing for Firefighters* Guowen Song,Sumit Mandal,René Rossi,2016-08-27 Thermal Protective Clothing for Firefighters explores the materials design and usage of thermal protective clothing The characteristics of fire hazards are discussed in detail and the thermal environments faced by firefighters in these fire hazards are also examined The different types of potential burn injuries and the heat stress that occurs to firefighters bodies when exposed to such thermal environments are analyzed Furthermore the development of various high performance fibers and fabrics for thermal protective clothing is discussed The test methods and existing standards to evaluate the thermal protective and physiological comfort performances of the fabrics and clothing are critically reviewed Recent developments in the field of fire and heat resistant materials have led to significant improvements in thermal protective clothing In parallel with this the complexity and risk

levels of fires especially in industrial storage facilities and developments in health and safety cultures have increased the demand for high performance heat and flame resistant clothing and equipment designed to mitigate skin burn injuries and reduce risk of death from fire hazards Throughout the work the gaps and limitations in existing test methods and standards are identified and approaches are recommended for the development of enhanced test methods Scenario modeling and its implications for firefighters protective clothing is discussed and various factors affecting performance are established Finally various key issues related to thermal protective clothing are addressed to guide the future research in the field of thermal protective clothing for firefighters This book will help materials textile engineers to develop high performance thermal protective clothing that can enhance the protection safety and comfort of firefighters Offers a helpful guide to the successful specification and design of high performance protective clothing to meet the high standards of today s regulatory framework Introduces the new materials technical innovations that are transforming fire protective clothing Explores the role of clothing from the operational perspective including technical innovations Offers a critical review of the test methods and existing standards to evaluate the thermal protective and physiological comfort performances of the fabrics and clothing

Protective Clothing F. Wang, Chuansi Gao, 2014-08-04 Protective clothing protects wearers from hostile environments including extremes of heat and cold Whilst some types of protective clothing may be designed primarily for non thermal hazards e g biological hazards a key challenge in all protective clothing remains wearer comfort and the management of thermal stress i e excessive heat or cold This book reviews key types of protective clothing technologies for heating and cooling and finally modeling aspects of thermal stress and strain Explores different types of protective clothing their uses and their requirements with an emphasis on full scale or prototype clothing including immersion suits body armour and space suits Considers novel and commercial technologies for regulating temperature in protective clothing including phase change materials shape memory alloys electrically heated clothing and air and water perfusion based cooling systems Reviews the human thermoregulatory system and the methods of modelling of thermal stress in protective clothing through various conditions including cold water survival and firefighting

**Improving Comfort in Clothing** Guowen Song, 2011-01-20 Wear comfort has been listed as the most important property of clothing demanded by users and consumers according to recent studies A fundamental understanding of human comfort and a knowledge of how to design textiles and garments to maximise comfort for the wearer is therefore essential in the clothing industry Improving comfort in clothing reviews the latest developments in the manufacturing of comfortable apparel and discusses methods of improving it in various articles of clothing The book begins by outlining the fundamentals of human comfort in clothing from the human perception of comfort in apparel and factors which affect it such as the properties of fibres and fabrics to laboratory testing analysing and predicting of the comfort properties of textiles Part two discusses methods of improving comfort in apparel from controlling thermal comfort and managing moisture to enhancing body movement comfort in various garments Part three reviews

methods of improving comfort whilst maintaining function in specific types of clothing such as protective garments sports wear and cold weather clothing The international team of contributors to Improving comfort in clothing has produced a unique overview of numerous aspects of clothing comfort provides an excellent resource for researchers and designers in the clothing industry It will also be beneficial for academics researching wear comfort Reviews the latest developments in the manufacturing of comfortable apparel and discusses methods of improving fit in various articles of clothing An overview of how to design textiles and garments to maximise comfort begins with factors affecting comfort and properties of fibres and fabrics that contribute to human comfort Improvements in thermal and tactile comfort and moisture management are explored featuring developments in textile surfaces Textiles for Sportswear Roshan Shishoo, 2015-05-28 Textiles for Sportswear is an important book that systematically covers key trends in design and materials the use of novel and smart fabrics and a range of specific applications The book begins by surveying the principles of textile applications in sport including design materials and production technology The uses of smart textiles in sportswear are then examined from intelligent materials to wearable technology Final sections of the text explore comfort in sportswear sportswear for protection and recent advances in sportswear technology that are currently being applied to particular sports Reviews the principles of textile applications in sport including design materials and production technology Examines the uses of smart textiles in sportswear Discusses how recent advances in sportswear technology are being applied to particular sports

**Assessing the Environmental Impact of Textiles and the Clothing Supply Chain**, 2014-03-13 The textile industry impacts the environment in a number of ways including its use of resources its impact on global warming and the amount of pollution and waste it generates Assessing the Environmental Impact of Textiles and the Clothing Supply Chain reviews methods used to calculate this environmental impact including product carbon footprints PCFs ecological footprints EFs and life cycle assessment LCA The first chapters provide an introduction to the textile supply chain and its environmental impact and an overview of the methods used to measure this impact The book goes on to consider different environmental impacts of the industry including greenhouse gas emissions the water and energy footprints of the industry and depletion of resources as well as the use of LCA to assess the overall environmental impact of the textile industry It then deals with the practice of measuring these impacts before forming a conclusion about the environmental impact of the industry Assessing the Environmental Impact of Textiles and the Clothing Supply Chain provides a standard reference for R D managers in the textile industry and academic researchers in textile science Reviews the main methods used to calculate the textile industry s use of resources its impact on global warming and the pollution and waste it generates Reviews the key methods their principles and how they can be applied in practice to measure and reduce the environmental impact of textile products Includes the following calculation methods product carbon footprints PCFs ecological footprints EFs and life cycle assessment LCA *Handbook of Medical Textiles* V Bartels, 2011-08-19 With a rising population and the increasing range of



textiles for medical products the need to understand and improve medical textiles is gaining in importance The Handbook of medical textiles provides an overview of the different types of medical textiles currently available as well as specific information on more specialised topics and applications In part one the types and properties of medical textiles are discussed with chapters covering topics including reusable textiles textiles for implants and textiles with cosmetic effects Part two focuses on the interaction of textiles with the skin examining key issues such as contact sensations allergies and mechanical irritation Chapters in part three provide information on the latest developments in textiles for hygiene and infection control while part four provides a range of applications and case studies including improvements in medical occupational clothing medical filters and superabsorbent fibres With its expert editor and contributions from some of the world's leading authorities the Handbook of medical textiles is a standard reference for designers and manufacturers of medical textile products as well as for biomaterials scientists and medical professionals Explores the different types of medical textiles currently available as well as specific information on more specialised areas and applications Chapters cover topics such as reusable textiles textiles for implants and interaction of textiles with the skin Is a standard reference for designers and manufacturers of medical textile products as well as for biomaterials scientists and medical professionals

Multidisciplinary Know-How for Smart-Textiles Developers Tünde Kirstein, 2013-04-04 Smart textiles developers draw on diverse fields of knowledge to produce unique materials with enhanced properties and vast potential Several disciplines outside the traditional textile area are involved in the construction of these smart textiles and each individual field has its own language specific terms and approaches Multidisciplinary know how for smart textiles developers provides a filtered knowledge of these areas of expertise explaining key expressions and demonstrating their relevance to the smart textiles field Following an introduction to the new enabling technologies commercialisation and market trends that make up the future of smart textiles development part one reviews materials employed in the production of smart textiles Types and processing of electro conductive and semiconducting materials optical fibres for smart photonic textiles conductive nanofibres and nanocoatings polymer based resistive sensors and soft capacitance fibres for touch sensitive smart textiles are all discussed Part two then investigates such technologies as the embedding of electronic functions the integration of thin film electronics and the development of organic and large area electronic OLAE technologies for smart textiles Joining technologies are also discussed alongside kinetic thermoelectric and solar energy harvesting technologies and signal processing technologies for activity aware smart textiles Finally product development and applications are the focus of part three which investigates strategies for technology management innovation and improved sustainability before the book concludes by exploring medical automotive and architectural applications of smart textiles With its distinguished editor and international team of expert contributors Multidisciplinary know how for smart textiles developers is a key tool for readers working in industries including design fashion textiles through to electronics computing and material science It also provides

a useful guide to the subject for academics working across a wide range of fields Reviews materials used in the production of smart textiles Examines the technologies used in smart textiles such as optical fibres and polymer based resistive sensors Investigates strategies for technology management innovation and improved development **Handbook of Life Cycle**

**Assessment (LCA) of Textiles and Clothing** Subramanian Senthilkannan Muthu, 2015-07-25 Life cycle assessment LCA is used to evaluate the environmental impacts of textile products from raw material extraction through fibre processing textile manufacture distribution and use to disposal or recycling LCA is an important tool for the research and development process product and process design and labelling of textiles and clothing Handbook of Life Cycle Assessment LCA of Textiles and Clothing systematically covers the LCA process with comprehensive examples and case studies Part one of the book covers key indicators and processes in LCA from carbon and ecological footprints to disposal re use and recycling Part two then discusses a broad range of LCA applications in the textiles and clothing industry Covers the LCA process and its key indicators including carbon and ecological footprints disposal re use and recycling Examines the key developments of LCA in the textile and clothing industries Provides a wide range of case studies and examples of LCA applications in the textile and clothing industries

**Medical Textile Materials** Yimin Qin, 2015-11-21 Medical Textile Materials provides the latest information on technical textiles and how they have found a wide range of medical applications from wound dressings and sutures to implants and tissue scaffolds This book offers a systematic review of the manufacture properties and applications of these technical textiles After a brief introduction to the human body the book gives an overview of medical textile products and the processes used to manufacture them Subsequent chapters cover superabsorbent textiles functional wound dressings bandages sutures implants and other important medical textile technologies Biocompatibility testing and regulatory control are then addressed and the book finishes with a review of research and development strategy for medical textile products Provides systematic and comprehensive coverage of the manufacture properties and applications of medical textile materials Covers recent developments in medical textiles including antimicrobial dressings drug releasing materials and superabsorbent textiles Written by a highly knowledgeable author with extensive experience in industry and academia

**Active Coatings for Smart Textiles** Jinlian Hu, 2016-04-06 Active Coatings for Smart Textiles presents the latest information on active materials and their application to textiles in the form of coatings and finishes for the purpose of improving performance and creating active functional effects This important book provides detailed coverage of smart coating types processes and applications After an introduction to the topic Part One introduces various types of smart and active coatings including memory polymer coatings durable and self cleaning coatings and breathable coatings Technologies and related processes for the application of coatings to textiles is the focus of Part Two with chapters devoted to microencapsulation technology plasma surface treatments and nanotechnology based treatments The book ends with a section on applications of smart textiles with responsive coatings which are increasingly finding commercial niches in

sportswear protective clothing medical textiles and architecture Introduces various types of smart and active coatings for textiles Covers technologies and application processes for the coating and finishing of textiles Reviews commercial applications of such coatings including in sportswear protective clothing medical textiles and architecture     **Geotextiles**  
Robert Koerner, 2016-02-11 Geotextiles From Design to Applications presents valuable information on the high performance fabrics used in soil separation drainage filtration reinforcement and cushioning These polymeric materials offer solutions for geoengineering and other civil engineering specialties due to their advanced physical mechanical hydraulic and endurance properties This important book offers comprehensive coverage of the manufacture functions properties designs and applications of geotextiles Part One begins with a chapter on the history of geotextiles followed by chapters giving detailed reviews of the types of fabrics and their manufacturing processes from resin type to fiber extrusion to textile fabrication Part Two covers the properties behavior and testing of geotextiles with Part Three focusing on applications dealing with the specific primary functions of geotextiles In Part Four chapters offer numerous general applications of geotextiles including those in waste containment marine engineering walls slopes agriculture and erosion control Finally the chapters of Part Five address quality control and assurance for geotextiles and the increasingly important topic of sustainability Reviews the types of fabrics used for geotextiles and their manufacturing processes Covers the properties behavior and testing of geotextiles Contains detailed discussions of the primary functions of geotextiles and their wide range of applications

## The Enigmatic Realm of **Functional Textiles For Improved Performance Protection And Health Woodhead Publishing Series In Textiles**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing lacking extraordinary. Within the captivating pages of **Functional Textiles For Improved Performance Protection And Health Woodhead Publishing Series In Textiles** a literary masterpiece penned by way of a renowned author, readers embark on a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of those that partake in its reading experience.

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