

# Medical Textiles: Application of Implantable Medical Textiles

Shah Md. Masud Hasan <sup>1</sup>, Md. Shahjalal <sup>2</sup>, Jaglal Hoque Mridha <sup>3</sup> & A. M. Rezaul Alam <sup>1\*</sup>

**Abstract:** The use of textiles in the medical sector is increasing day by day. An important and emerging part of the textile industry is medical, hygiene and health care sector. Textiles are a compelling solution for implantable medical devices, primarily due to the versatility they offer in product design. Textiles are in 2D and 3D implantable forms, with configurations limited only by the imagination. The number of applications is enormous and diverse, ranging from a single thread suture to the complex composite structures for bone replacement and from the simple cleaning wipe to advanced barrier fabrics used in Operation Theater. The main object of this work is to study the types of implantable textiles used in the medical sector such as surgical suture, artificial skin, artificial ligament, and artificial cartilage. In this study, we have included different types of raw materials used and the manufacturing process of these implantable medical textiles.

**Keywords:** implantable materials, non-implantable materials, chitin, collagen, ECM, ACE, heparinase.

## I. INTRODUCTION

Medical textiles are also known as healthcare textiles. The medical textile industry has diversified with new materials and innovative designs. Evolving polymer technology has yielded a wide range of applications of implantable medical textile devices. The Medical textile products are obtainable in woven, knitted and non-woven structure based on the area of application. Increasingly, synthetic fiber is being utilized in the manufacturing of these products.

Medical Textiles are defined in various ways, according to David Rigby Associates.

"The Medical Textile or Meditech application area embraces all those technical textiles used in health and hygiene products"

"Textile Terms & Definitions" defines Medical Textiles as - "A general term which describes a textile structure which has been designed and produced for use in any of a variety of medical applications, including implantable applications."

## II. CLASSIFICATION OF MEDICAL TEXTILES

### a) Non-implantable materials

These materials use in external application on the body and may or may not make contact with the skin.

### b) Implantable materials

These materials used in effecting a repair to the body whether it be wound closure (sutures) or replacement surgery (vascular grafts, artificial ligaments, artificial cartilage, etc.)

### c) Extracorporeal devices

These are extra corporeally mounted devices used to support the function of vital organs, such as kidney, liver, lung, heart, pancreas, etc. The extracorporeal devices are mechanical organs that are used for blood purification and include the artificial kidney (dialysis), the artificial liver, and the mechanical lung. The function and performance of these devices benefit from fiber and textile technology.

### d) Healthcare/hygiene products

Healthcare and hygiene products are a rising sector in the field of medicine and surgery. The range of products available is vast, but typically they are used either in the operating theatre or on the hospital ward for the hygiene, care, and safety of staff and patients.

<sup>1</sup> Lecturer, Department of Textile Engineering, Northern University Bangladesh, e-mail: masudhasan@nu.ac.bd, ms\_masud@hotmail.com, jaglal\_mridha@nu.ac.bd, rezaulalam@gmail.com

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**Holly Morris, Richard Murray**



## **An Introduction To Healthcare And Medical Textiles Pdf:**

**An Introduction to Healthcare and Medical Textiles** Wen Zhong, 2013 This textbook is a scientific introduction to the study engineering and applications of medical textiles It moves systematically from the fundamentals of textile materials and their fabrication through biocompatibility and biodegradability to the applications of textiles in healthcare ranging from hygiene to wound care grafts and implantables The book analyzes how the internal structures of various types of textiles wovens knits and nonwovens are related to specific medical biomedical end uses While carefully explaining the basics the book aims to show the connection between textile properties and the design and development of medical and healthcare textile products This text is designed for advanced students and industry based textile researchers engineers and product developers

*Medical and Healthcare Textiles* Subhash C. Anand, J F Kennedy, M Mirafteb, S. Rajendran, 2010-07-15 Medical textiles remain one of the most dynamic areas of research in textiles Medical and healthcare textiles is the fourth in a series of conferences held at the University of Bolton Like its predecessors it has attracted papers from some of the leading international centres of expertise in the field Contributors cover a range of topics including emerging textile based biomaterials hygienic textiles the use of textiles in infection control and as barrier materials bandaging and pressure garments for managing chronic infections such as ulcers the role of textiles in the management of burns and wounds textile based implantable devices such as tissue scaffolds and sutures and intelligent textiles Provides a comprehensive overview of medical textiles from the risk of infection control and barrier materials through to directives regulations and standards shaping the medical device industry Explores developments in healthcare and hygiene products including odor and pH control as well as protective and disposable fabrics Reviews development in the area of implantable materials featuring vascular grafts knee implants and scaffolds

**Medical Textiles** Holly Morris, Richard Murray, 2021-12-21 This textbook aims to ensure that advances in medical textiles are addressed and that recent developments are able to be appreciated and understood not only by medical practitioners and healthcare personnel but also by textile scientists and technologists The idea is to stimulate collaborative research and development in the field of medical textiles and to equip researchers with an understanding of the steps they need to take to ensure that their efforts be they to develop new devices for implantation or items for external application are carried out in such a way as to improve their effectiveness and enhance the prospects for their implementation Attention is drawn to the need to improve outcomes in the practical setting and to guidance on the detailed planning required prior to engaging in experimental work Standard tests can help researchers to monitor performance but for some important applications such as those required to demonstrate antimicrobial and fluid repellent performance in most items of protective wear standard tests consistently fall seriously short in terms of predicting how well they might work in the practical setting Guidance is therefore given for their further development Chapters within the textbook cover The history of innovation within medical textiles with particular attention given to key concepts of the latter

part of the 19th Century and subsequent associated developments Textile and polymer science underpinning fibres fabrics nano fibre technology and the functional finishes that can be applied to enhance the performance of medical textile products Woven knitted nonwoven and braided fabrics and the key performance characteristics of each fabric type which make them particularly suited to specific medical textile roles such as mesh grafts filtration and scaffolds for tissue engineering Implantable medical textiles non implantable medical textiles health and hygiene products and extracorporeal devices that use textile products Legislative requirements for medical devices The design of experiments and suitability for purpose of textile test methods Case studies to illustrate how medical textiles are applied in practice The book provides essential reading for textile professionals biomedical engineers and others involved in the research design and engineering of medical and healthcare appliances and for those employed in the medical profession wishing to gain new insights into the wealth of materials at their disposal

*Waterproof and Water Repellent Textiles and Clothing* John T Williams,2017-11-21 *Waterproof and Water Repellent Textiles and Clothing* provides systematic coverage of the key types of finishes and high performance materials from conventional wax and silicone through controversial but widely used fluoropolymers and advanced techniques such as atmospheric plasma deposition and sol gel technology The book is an essential resource for all those engaged in garment development production and finishing and for academics engaged in research into apparel technology and textile science Rapid innovation in this field is driving new performance demands in many areas including the sporting and military sectors However another innovation driver is the regulatory framework in the USA Europe and globally addressing both health concerns e g with PFOS PFOA and environmental impacts e g C8 fluorocarbon finishes Both of these aspects are fully covered along with the replacement materials technologies currently available and under development In addition oleophobic and multifunctional coatings are discussed as are aspects of performance testing and applications in sportswear protective clothing and footwear Introduces innovative materials and technologies exploring their current and potential use across different sectors Provides expert guidance on the health and environmental aspects of key waterproof materials and coatings and their associated regulations Demystifies testing processes and design principles

**Medical Textiles from Natural Resources** Md. Ibrahim H. Mondal,2022-06-15 *Medical Textiles from Natural Resources* provides systematic and comprehensive coverage of the fundamentals production methods processing techniques characterization techniques properties and applications of medical textile materials from natural resources Medical textiles offer a variety of technical and functional properties valued in medical and healthcare sectors often relating to hygiene As medical textile products remain in close contact with the human body the fibre must have characteristics such as biological compatibility biological degradability permeability and nontoxicity Only materials from natural renewable sources have such characteristics This book provides the latest information on a wide range of medical applications from single suture and wound dressings to implants and tissue scaffolds It also offers a systematic review of the manufacture properties and applications of technical

textiles for medical use Explains the latest technologies related to fibre extraction from natural sources chemical treatments weave constructions fabric finishes and coatings Describes innovative applications of nanomaterials in the treatment of textile fabric and the utilization of carbohydrate polymers in the preparation of nanoparticles deposited in nonwoven fabrics Helps product designers to find appropriate materials from natural resources with the characteristics of biodegradability renewability biocompatibility and nontoxicity

*Functional and Technical Textiles* Subhankar Maity,Kunal Singha,Pintu Pandit,2023-01-30 *Functional and Technical Textiles* covers recent advances in technology properties and performance of high tech yarns and structures and their applications in different sectors of the smart and technical textile fields Applications including many that go beyond apparel where high tech and functional structural fabrics are used as reinforcements for composites medical implants and geotextiles are covered The book also describes the latest technologies for producing versatile products for these diversified applications Finally the book makes a survey of the latest research in technical textiles and its various structures properties and applications in composites medical textiles geotextiles industrial textiles and more Draws on the latest industry innovations for the production of new smart and technical textile functionality Explains best practice for testing and for the quality control of technical textiles Provides definitions of key terminologies used in the field and explains the differences between smart and technical textiles

*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

**Encyclopedia of Renewable and Sustainable Materials** ,2020-01-09 *Encyclopedia of Renewable and Sustainable Materials* Five Volume Set provides a comprehensive overview covering research and development on all aspects of renewable recyclable and sustainable materials The use of renewable and

sustainable materials in building construction the automotive sector energy textiles and others can create markets for agricultural products and additional revenue streams for farmers as well as significantly reduce carbon dioxide CO2 emissions manufacturing energy requirements manufacturing costs and waste This book provides researchers students and professionals in materials science and engineering with tactics and information as they face increasingly complex challenges around the development selection and use of construction and manufacturing materials Covers a broad range of topics not available elsewhere in one resource Arranged thematically for ease of navigation Discusses key features on processing use application and the environmental benefits of renewable and sustainable materials Contains a special focus on sustainability that will lead to the reduction of carbon emissions and enhance protection of the natural environment with regard to sustainable materials

Smart Textiles for Medicine and Healthcare Lieva Van Langenhove,2007-02-21 Smart or intelligent textiles are a relatively novel area of research within the textile industry with enormous potential within the healthcare industry This book provides a unique insight into recent developments in how smart textiles are being used in the medical field The first part of the book assesses trends in smart medical textiles Chapters cover topics such as wound care materials drug based release systems and electronic sensors for health care The second part of the book discusses the role of smart textile in monitoring the health of particular groups such as pregnant women children the elderly and those with particular physical disabilities With its distinguished editor and team of international contributors this book provides a unique and essential reference to those concerned with intelligent textiles in healthcare Unlocks the significant potential of smart textiles within the healthcare industry Provides a unique insight into recent developments in this exciting field

Medical Textiles 2004 Industrial Fabrics Association International,2004-11-01 *Medical Textiles* Subhash C. Anand,2001-02-28 Medical textiles is one of the major growth areas within technical textiles and the use of textile materials for medical and healthcare products ranges from simple gauze or bandage materials to scaffolds for tissue culturing and a large variety of prostheses for permanent body implants Recent advances include The development of polylactic acid and polyglycolic acid fibres as structures for cell growth Temporary bioresorbable textile supports for growing human organic tissue The development of smart fibres based on naturally occurring polymers and also on non animal based protein fibres and structures for the treatment of wounds and ulcers These are a few examples of the wide range of textile based non implantable and implantable products used in medicine and surgery and covered in this cutting edge collection of the latest research in this fascinating area

**Healthcare and Hygiene Textiles and Products** G. Thilagavathi,M. Parthiban,S. Viju,2015-03 Healthcare and Hygiene Textiles and Products remains one of the most dynamic areas in textile technology research

**Library & Information Science Abstracts** ,2002 **Biomedical Textiles** Mohd Yusuf,Shumaila Kiran,2025-08-06 For millennia textiles have been an integral part of human civilization evolving from basic clothing to advanced applications catering to modern societal needs The intersection of textiles and medical science has given rise to

biomedical textiles which are defined as fibrous textile structures prepared from synthetic or natural materials that are used internally or externally in a biological environment inside or outside the body as a medical or care device to improve health hygiene and medical conditions The book discusses the need for flexibility and shape transformation capabilities in today s textiles such as being engineered for insertion through a small catheter or expanded within the vessels to allow minimally invasive delivery methods without sacrificing mechanical integrity and healthcare capabilities It presents the recent research and developments that will benefit academicians scientists researchers and post graduate students in the field of textile science and technology The book will prove to be a useful instrument in the rapid and efficient entry of new researchers into the emerging field of textile engineering and technology

**Nelson Information's Directory of Investment Research**,2004 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

**Introduction to Medical Textile** ,2007 Textile Materials for Good Health and Wellbeing Subramanian Sundaramoorthy,S. Kubera Sampath Kumar,Md. Vaseem Chavhan,2024-10-07 This book explores the application of latest technologies such as nanotechnology composite technology biotechnology in textile materials for health related applications It further discusses different types of textiles and their application in the areas of health safety and well being Various topics covered in this book are medical textiles filtration textiles protective textiles thermal protective wear intelligent textiles and many more The book also deals with air and water filtration textiles and textile based personal protective equipments This book will be of interest for students researchers and professionals working in the area of textile engineering materials biomedical engineering defense healthcare and other allied fields *Development of Medical Garments and Apparel for the Elderly and the Disabled* Ng Sau-Fun,Hui Chi-Leung,Wong Lai-Fan,2020-03-25 Although the main theme of this book is products for the elderly and the disabled it also contains major sections on medical garments which include personal protective equipment PPE hip protectors HP pressure garments PG compression stockings CS wet dressings products for wound dressing adult incontinence products sanitary napkins disposable diapers vital signs monitoring garments motion

aware clothing wearable sensors and smart diapers and so on The development of apparel for the elderly and the disabled is a challenge for the healthcare and clothing industries The developed apparel products are not only based on various design fashion and comfort concepts but also considered in terms of particular medical problems restorative care functions and appropriate solutions for healthcare purposes **Textiles for Health Care Facilities and Institutions, Part 6** Standards Association of Australia. Committee TX/15, Textiles for Health Care Facilities and Institutions,1996

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