

Polyurethanes In Medicine

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Polyurethanes for Medical Use Poliuretani za medicinsko uporabo

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Abstract

Polyurethanes are synthetic copolymers containing urethane linkages in their complex chemical structure. They consist of three monomers: a diisocyanate, a polyol and a chain extender, which enables the synthesis of an endless number of polyurethanes with different physicochemical and mechanical properties. The physicochemical properties of various polyurethanes are largely dependent on the conformation of polyols, which may contain two or more different polyols, stabilisers, catalysts, liquids or solid additives and, in the case of foams, foaming agents. Depending on the structure of the polyols, i.e. the length of the chain, structure of the units (aliphatic or aromatic), ester or ether groups, or functionalisation by hydroxyl groups, polyurethanes may be flexible or rigid, and therefore suitable for various applications. In addition to the physical and chemical structure of polyurethanes, this review paper specifically addresses their use in medicine, particularly in wound dressings, tissue engineering scaffolds and drug delivery with nanoparticles and nanocapsules, and provides guidelines for the development of new biodegradable polyurethane materials.

Keywords: segmented polyurethanes, chemical structure, reactants, medical applications

Povzetek

Poliuretani so v svoji kompleksni kemijski zgradbi sintetični kopolimeri z uretansko vezjo. Njihova sestava iz treh različnih monomernih enot: diizocianatov, poliolov in podaljševalcev verig, omogoča sintezo neomejenega števila poliuretanov z različnimi fizikalno-kemijskimi in mehanskimi lastnostmi. Fizikalno-kemijske lastnosti različnih poliuretanov so odvisne predvsem od konformacije poliolov, ki lahko vsebujejo dva ali več različnih poliolov, stabilizatorjev, katalizatorjev, tekočin ali trdnih tudi perlicev. Poliuretani so lahko fleksibilni ali togji in tako uporabni za različne namembnosti, kar je odvisno od dolžine molekul, alifatske ali aromatske strukture poliolov, prisotnosti esterskih ali eterskih skupin in funkcionalizacije poliolov s hidroksilnimi skupinami. Pregledni znanstveni članek poleg fizikalne in kemijske strukture poliuretanov posebej obravnava njihovo uporabo v medicini, zlasti pri oblikih za rane, tekstilih za tkivo inženjstvo, materialih s kontroliranim sproščanjem zdravilnih učinkovin, nanodelcih ali nanokapsulah, in podaja smernice za razvoj novih biološko razgradljivih poliuretanskih materialov.

Ključne besede: segmentirani poliuretani, kemijska struktura, reaktanti, medicinska uporaba

1 Introduction

For the most part, synthetic polymers have a relatively simple chemical structure, as they are synthesised from one or two monomers, which leads to the formation of homopolymers or copolymers, e.g. polyethylene terephthalate (PET), polytetrafluoroethylene (PTFE), polystyrene (PS), polyethylene

(PE), polypropylene (PP), polybutadiene (PBA), etc. [1]. Polyurethanes (PU) differ from the aforementioned substances in that they have a more complex chemical structure, i.e. they contain three monomers: a diisocyanate, polyol and chain extender, which facilitates the synthesis of an infinite number of polyurethanes with different physicochemical and mechanical properties [2]. The density of polyurethanes

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Polyurethanes are commonly used in a number of medical applications including catheter and general purpose tubing, hospital bedding, surgical drapes, wound dressings, as well as in a variety of injection molded devices. Their most common use is in short-term implants. Melt-processable, or thermoplastic, polyurethanes are used extensively in medical devices. Thermoplastic polyurethanes are long-chain linear polymers without cross-links. Their linear construction allows the polyurethane to be melted to form parts; the parts then resolidify. Title, Polyurethanes in medicine. Authors, Michael D. Lelah, Stuart L. Cooper. Publisher, CRC Press, Original from, the University of Michigan. Digitized. Since then, polyurethane, as a biomaterial, has been widely used in medical devices, and a series of biomedical grade polyurethanes were designed and. Polyurethanes in medical devices. This article describes several of the better-known polyurethanes and discusses their suitability for use in medical applications such as artificial heart systems, catheters, mammary implants, semioclusive dressings, and drug delivery systems. ical and chemical structure of polyurethanes, this review paper specifically addresses their use in medicine, particularly in wound dressings, tissue engineering. Request PDF on ResearchGate Polyurethane Based Materials with Applications in Medical Devices Polyurethane materials have a huge role in everyday. polyurethanes play a vital role in medicine and are involved at all scales, have the potential to be used both for permanent medical implants and to be used. ing from waste management to food processing and medicine because of its Keywords: biomedical polyurethanes, chitosan, collagen, wound dressings. The use of polyurethane materials in the construction of medical devices is growing. Characteristics of polyurethane that make it ideal for use in. The polyurethane samples were also checked for medical application. After the extraction in hexane and sterilization their influence on blood parameters and on . Polyurethanes in Medicine [Michael Lelah and Stuart Cooper] on saclamenco.com * FREE* shipping on qualifying offers. Medical Device Manufacture encompasses a wide range of health care products that are used to diagnose, monitor or treat a disease or condition that affects. Thermoplastic polyurethane (TPU) is well known and specified in the medical industry for advanced medical and healthcare products, due to its. reviews the history of polyurethane in medicine, polyurethane nomenclature, the Without these materials, many vital medical devices, such as compliant poly-

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