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Editorial

Scope of Polyurethanes in Biomedical Applications

Archana Solanki*

Research and Development Centre, Gujarat Narmada Valley Fertilizers and Chemicals Ltd, Bharuch, Gujarat, India

***Corresponding Author:** Archana Solanki, Research and Development Centre, Gujarat Narmada Valley Fertilizers and Chemicals Ltd, Bharuch, Gujarat, India.

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Biocompatible polymers have emerged as biomaterials in contemporary times. The research in the field is approaching to most challenging level as they can transform the living standard of human beings a step forward. The popularity of polymers is due to their special structural design leading to flexibility, adaptability and lower manufacturing cost. The widespread applications of such biopolymers in biomedical field involves artificial organs, transdermal patches, implantable devices, wound dressings, tissue engineering, prostheses, ophthalmology, vaginal rings, dentistry and drug delivery systems. The prerequisite for a polymeric material to be applicable as an ideal biomaterial is biocompatibility which in turn depends on several other factors, including the mechanical properties, morphology, thermal properties, magnetic properties, biodegradability as well as toxicity.

Polyurethanes (PUs) are one of the most versatile families of polymers. PUs pave a way to create the prospective for high performance materials due to their significant physical and mechanical properties and good biocompatibility. PUs are characterized with the properties like high tensile strength, elasticity, durability, fatigue resistance, compliance, and acceptance or tolerance in the body during the drug release or healing,. Furthermore, preference for bulk and surface modification via hard/soft segment balance or by attachments of biologically active species such as anticoagulants or bio-recognizable groups are possible via chemical groups typical for polyurethane structure. This possibility of variation in structure makes PUs adaptable for biomedical applications as well as enhances the acceptance of the device or implant.

One of the main advantages of polyurethanes in biomedical applications is their flexible chemical structure. A simple modification in stoichiometry and/or raw materials used for synthesis of PU can result in a considerable change in the final polymer properties in order to produce polymers with a broad spectrum of properties ranging from thermoplastic elastic material to rigid thermoset polymer. In addition to that, PUs possess advantages such as adaptability to many different processing conditions, excellent mechanical properties, bio-stability, biocompatibility and biodegradability. Polyurethanes (PU) are considered one of the most promising materials in biomedical applications due to their structure/property diversity. The PUs are characterized with unique combination of diverse mechanical properties and flexibility. PU's properties such as abrasion resistance, affordable manufacturing, chemical stability, durability, elasticity and haemocompatibility are fundamental for their extended applications in the biomedical field. Owing these properties, PUs have been successfully utilized for constructing variety of biomedical materials like blood bags, bladders, artificial heart, vascular grafts, neural conduits and bone cement for fracture. Thus, PUs are envisioned to get a wide scope of applications in the field of biomedicine.

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