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Biological and Biomedical Materials Market Assessment, By Type [Biological, Biomedical], By Materials [Metals, Ceramics, Polymers, Others], By Application [Medical Implants, Ophthalmology, Tissues Engineering, Biosensors, Drug-delivery Systems, Others], By Region, Opportunities and Forecast, 2016-2030F

https://marketpublishers.com/r/B70151798943EN.html
Date: March 2025
Pages: 244
Price: US$ 4,500.00 (Single User License)
ID: B70151798943EN

Abstracts

Global biological and biomedical materials market size was valued at USD 40.2 billion in 2022, which is expected to reach USD 90.7 billion in 2030, with a CAGR of 10.7% for the forecast period between 2023 and 2030. The discovery of biomedical materials has revolutionized modern medicinal treatment by restoring normal functioning and achieving healing for patients after undergoing complex surgeries. Living cells, tissues, metals, ceramics, plastics can be reengineered into desired mold and parts, fibers, and films that are progressively used in biomedical products and devices. Sealants and patches made from biomedical materials allow damaged tissue to regenerate and heal faster. Patients with diabetic ulcers are prone to severe infections, which can be treated with biomaterials, leading to healing while reducing unnecessary dressing replacements.

Biologically derived materials are generally produced from biological organisms like animals, bacteria, plants, fungi where such materials are extensively used for injury treatment proliferating biological cells. A recent report published by the World Health Organization (WHO) in July 2022 stated that approximately 1.91 billion people are suffering from musculoskeletal disorders. The rising problems led to huge requirements for biomaterials incorporated into surgical treatments. A recent development is progressively moving towards producing microfabricated chips using biomaterials,

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organs-on-chip.

Innovative Biomedical Material on Drug Delivery Systems Augments the Market

Biomaterials are considered a prominent asset, significantly driving the advanced drug delivery systems to facilitate surgery, implantation, and treatment of serious oral diseases such as periodontitis, peri-implantitis, and severe dental problems. Natural polymeric substances such as calcium phosphate, chitosan, and gelatin are substantially used to prepare various drug delivery systems. Biomedical materials have significant characteristics like antibacterial and anti-inflammatory effects and are potentially active in enhancing antibiotic activities in oral infections. In addition to oral delivery, biomedical materials are successively creating avenues for drug delivery through transdermal, pulmonary, ocular, and nasal routes where specific designing of biomaterials accomplishes the desired delivery actions.

In November 2022, LTS Lohmann invested USD 14 million with the Global Health Investment Corporation. Along with the successive investment in June 2022, Evonik has partnered with the United States Government by investing USD 220 million to build innovative drug delivery system for new lipid production facility for mRNA-based therapies. The huge potential of Biological and Biomedical Materials in the drug delivery systems has impeccable market opportunities to expand with the rising health sector exponentially.

Regulations Adoption with Biological and Biomedical Materials Implementation

Numerous international and country-specific standards and guidelines have been framed to regulate utilizing biological and biomedical materials. Assuring effectiveness and enabling execution, some of the recognized institutions are International Organizations for Standard guidelines, ASTM International, United States Pharmacopeial Convention, and European Conformity Marking. Several standard tests and practices are being incorporated like testing of polymeric biological materials that are extensively used in surgical implants, assessment of selected tissue effects of absorbable biomaterials for implant with respect to muscle and bones.

Polymeric Biomedical Materials are Successively Incorporated in Medical Implants and Devices

Polymeric materials are recognized as remarkable due to their important characteristics such as flexibility, ease of fabrication, as well as biocompatible nature. Combined with

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other materials, composites of polymeric biomaterials deliver a wide range of electrical, mechanical, chemical, and thermal behaviors. Polyvinylidene fluoride (PVDF), which is a piezoelectric polymer material, is extensively used in biomedical applications as a pressure and flow sensors.

Solvay is one of the leading providers of biological materials with different specialty polymers for implantable medical devices. Numerous implantable fields like cardiovascular, spine, and orthopedics are progressively incorporating their proprietary Solviva biomaterials, including polysulfone, polyetheretherketone, etc., and Victrex Invibio's biocompatible PEEK-OPTIMA polymers are growing alternatives for spinal fusion devices. In May 2022, Solvay launched a new growth platform focusing on renewable materials and biotechnology.

Varied Applications in Medical Implants

The advancement in medical technology has consequently led to innovative medical implant materials varying from conventional silicone to 3D-printed biomaterials. Ultra-high molecular-weight polyethylene (UHMWPE) is progressively used in all kinds of knee replacements, along with hip replacement implants. Cross-linked polyethylene (XLPE) can successfully accomplish hip implants, removing the revision surgery requirement. 3D-printed implantable materials are gaining interest with a microfluidic approach that has prominently led to leaps in the vascularization of engineering tissues. In Australia, researchers have significantly developed a 3D printing Biopen device called Biosphere that essentially enable surgeons to repair damaged bones and cartilage by generating new cells directly.

A published report estimated that biomedical materials in cardiovascular devices are worth an annual USD 37.9 billion. FDA-approved vacuum plasma spray equipment for enhancing orthopedic implant capabilities Viant, a medical device design company in April 2021, has invested around USD 8 million. In September 2022, the State Council of China invested around USD 29 billion in advanced medical facilities to incorporate new biomedical materials.

Impact of COVID-19

The outbreak of COVID-19 had a devastating impact on mankind. Some developed countries, like the United States and the United Kingdom, with advanced-equipped healthcare systems, found it difficult to combat the virus. Biomaterials, an essential element for drug delivery systems emerged to develop antivirals. With diverse

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applications, the biomedical materials help in enhancing COVID-19 immunotherapeutics in developing preventive vaccines, treatments for infections, and healing and regeneration of damaged tissues. Moderna announced the investment of more capital in April 2021 to increase the global supply for COVID-19 vaccine to nearly about to 3 billion doses.

Impact of Russia-Ukraine War

The invasion of Russia on Ukraine has led to unprecedented impact on various sectors witnessing deterioration of global economy, including healthcare. A project named KOROVAI, was designed for the international community to aid Ukraine with the coordination of medical material gifting. The financial sanctions on Russia by the Western countries has led to severe outcomes on Russian health care facilities as Russia imports massive number of medical devices from the United States and European countries. These imperative factors severely impacted the applications of biomedical materials in treatments. The measures adopted by significant government agencies are expected to overcome the disaster of aggression and retain the economic instability.

Key Players Landscape and Outlook

The biomedical materials market is successfully growing due to various factors, like increasing healthcare expenditure, requiring numerous healthcare facilities, technological advancements, etc. Medtronic, a leading forefront of the medical industry, has developed excellent biomedical materials for treating various serious operations. Incorporating chitogel, which is a dissolvable biomaterial comprising a unique combination of natural ingredients, as a part of chitogel endoscopic sinus surgery kit. To optimize wound healing after sinus surgery, chitogel kit assists in minimizing adhesions, preserves structural integrity, and imperatively take care after surgery. In May 2023, Medtronic acquired EOFlow Co. Ltd., which manufactures tubeless, wearable, and completely disposable insulin delivery devices registered by EOPatch. The proprietary Medtronic’s Meal Detection Technology algorithm will be utilized in the EOFlow diabatic device to enhance the treatment technology for diabetic patients.

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Contents

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8. GLOBAL BIOLOGICAL AND BIOMEDICAL MATERIALS MARKET OUTLOOK, BY REGION, 2016-2030F

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