New Book Announcement

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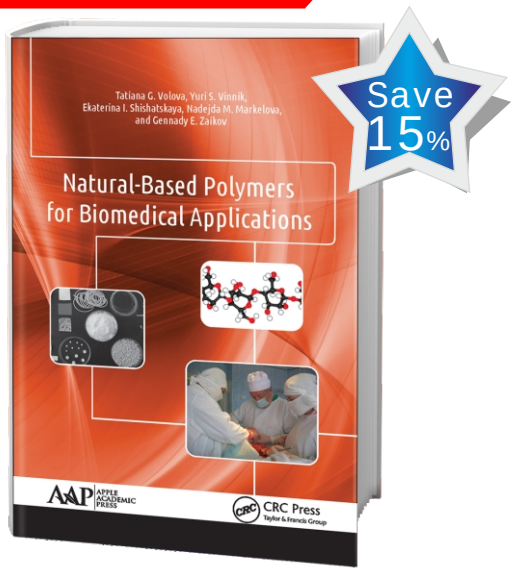
Natural-Based Polymers for Biomedical Applications



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This new book presents the authors' biomedical studies of natural degradable biopolymers (polyhydroxyalkanoates [PHAs]) and discusses the demand for medical-grade materials and modern trends, focusing on the present status and future potential of PHAs. The authors present and summarize their most important results and findings obtained during the last few years in experimental studies and clinical trials of PHAs at the Institute of Biophysics Siberian Branch of Russian Academy of Science.

Almost all developed countries are now engaged in manufacturing PHAs or have plans to commercialize them, but the major factor that would allow wide-scale manufacture and use of PHAs is reduction of their cost. In Russia, the authors' research team developed and tested the processes of high-yield production of polymers with different compositions on a variety of substrates (hydrogen, acetate, alcohols, and sugars) and prepared technological procedures for polymer production.

The book presents results of research in modern biotechnology aimed at the creation of sustained-release drug delivery systems and constructs for cellular and tissue engineering and for reconstructive medicine.

The polymers described and used in biomedical studies have been certified as suitable for medical use, including uses in contact with blood. Specifications of polymers with different chemical structure intended for use as a polymer basis for therapeutic systems, matrices of bio-artificial organs and implants, and packaging material have been developed and registered in Gosstandart of RF. Different types of PHAs were used to fabricate bio-inert films, membranes, and 3D constructs, which were tested as cell scaffolds for cellular and tissue engineering; microparticles, including those loaded with drugs; constructs and hybrid composites with hydroxyapatite for bone tissue repair. In cooperation with a number of medical clinics, the authors have been conducting clinical trials of polymer constructs as implants for bone tissue repair in orthopedics and oral surgery and have developed and are now testing biocompatible polymer-coated vascular stents. An approach to engineering and scale-up of polyhydroxyalkanoate synthesis facility has also been developed.

The book is intended for biotechnologists, material scientists, medical practitioners, and teachers and students of biological and medical departments of universities.

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ABOUT THE AUTHORS

Tatiana G. Volova, DSc, is a doctor of biological sciences in microbiology. She is a Professor and Head of the Department of Biotechnology at the Siberian Federal University, Krasnoyarsk, Russia. She is the creator and head of the Laboratory of Chemoautotrophic Biosynthesis in the Institute of Biophysics, Siberian Branch of Russian Academy of Sciences. Professor Volova is conducting research in the field of physico-chemical biology and biotechnology and is a well-known expert in the field of microbial physiology and biotechnology. She has created and developed a new and original branch in chemoautotrophic biosynthesis, in which the two main directions of the XXI century technologies are conjugate, hydrogen energy and biotechnology. The obtained fundamental results provided significant outputs and were developed by the unique biotechnical producing systems, based on hydrogen biosynthesis for single-cell protein, amino acids, and enzymes. The possibility of involvement of man-made sources of hydrogen into biotechnological processes as a substrate, including synthesis gas from brown coals and vegetable wastes, was demonstrated in the research of Professor Volova. She had initiated and deployed in Russia the comprehensive research on microbial degradable bioplastics; the results of this research cover various aspects of biosynthesis, metabolism, physiological role, structure, and properties of these biopolymers and polyhydroxyalkanoates (PHAs), and have made a scientific basis for their biomedical applications and allowed them to be used for biomedical research. Professor Tatiana Volova is the author of more than 300 scientific works, including 12 monographs, 16 inventions, and a series of textbooks for universities.

Yuri S. Vinnik, DSc, is a doctor of medicine and Professor and Head of the Department of General Surgery at Krasnoyarsk State Medical School (named after Professor V. F. Voyno-Yasenetsky), from 2006 to the present. He is an Honored Scientist of Russia, Honored Doctor of the Russian Federation, member of the International Academy of Ecology and Life Safety, and corresponding member of the New York Academy of Sciences. His research interests include hepato-biliary-pancreatic surgery, including treatment of acute pancreatitis, biliary reconstructive surgery, trauma of pancreas; cholelithiasis and its complications; jaundice; surgery of stomach and duodenum; herniology with the use of mesh implants; surgery of the colon (endovascular surgery); purulent surgery; diabetic foot syndrome; frostbite (the study of the pathogenesis of cold injury and treatment of its complications); questions of immunodeficiency; cytokine therapy; metabolic immunotherapy of surgical diseases; peritonitis; systemic inflammatory response syndrome; the use in surgery of the new biopolymers (polyhydroxyalkanoates); and medical devices for these various issues. Professor Vinnik is the founder of the scientific school and abdominal purulent surgery in Russia. He is the author of over 800 publications, 32 patents copyright in Russia, and 36 monographs.

Ekaterina I. Shishatskaya, DSc, is a doctor of medicine and doctor of sciences in biotechnology. She is Head of the Department of Medical Biology at Siberian Federal University, Krasnoyarsk, Russia, and a leading researcher at the Institute of Biophysics, Siberian Branch of Russian Academy of Sciences, in Krasnoyarsk, where she supervises the direction of biomedical research of new materials. Dr. Shishatskaya's work includes an investigation of interaction mechanisms between biomaterials and biological objects and development of high-tech biomedical devices. This actual science direction is oriented to the development of new reconstructive biomedical technologies, which includes cell biology and tissue engineering and biodegradable polymers of carbon acids $\frac{1}{M}$ polyhydroxyalkanoates (PHAs), a new class of materials for medicine. Dr. Shishatskaya is Russian leader in comprehensive medical and biological studies of this class of polymers. Her professional activity is focused on the implementation of the obtained results in practice, and she maintains communication with clinical centers and top specialists in regenerative medicine. Dr. Shishatskaya is author of about 150 research works, including five monographs and eight patents. She is the winner of the President of Russian Federation for youth in the field of science and innovations and holds a State Prize of the Krasnoyarsk Region in the area of high education and science. She is also a laureate of L'Oréal-UNESCO for young women in science.

Nadejda M. Markelova, MD, is Associate Professor in the General Surgery Department at the Krasnoyarsk State Medical School (named after Professor V. F. Voyno-Yasenetsky), Krasnoyarsk, Russia. Her major research interests are reconstructive surgery, hepatobiliary, purulent surgery, experimental surgery, and development, implementation, and clinical testing of new biomaterials and medical devices based on them. Dr. Markelova has published 202 publications, including four monographs and four patents in Russia for inventions in the area of surgical treatment. Dr. Markelova graduated from Krasnoyarsk State Medical School in 2001 and passed her clinical internship at the Department of General Surgery. She defended her thesis on the topic “Prevention and treatment of infected pancreatic necrosis” in 2005 and her doctoral dissertation in surgery on “Justification of the application of high-tech medical products of biodegradable polymers in reconstructive surgery (experimentally-clinical research)” in 2013.

Gennady E. Zaikov, DSc, is Head of the Polymer Division at the N. M. Emanuel Institute of Biochemical Physics, Russian Academy of Sciences, Moscow, Russia, and Professor at Moscow State Academy of Fine Chemical Technology, Russia, as well as Professor at Kazan National Research Technological University, Kazan, Russia. He is also a prolific author, researcher, and lecturer. He has received several awards for his work, including the Russian Federation Scholarship for Outstanding Scientists. He has been a member of many professional organizations and is on the editorial boards of many international science journals. Dr. Zaikov has recently been honored with tributes in several journals and books on the occasion of his 80th birthday for his long and distinguished career and for his mentorship to many scientists over the years.

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