

## Preface

The goal of this special issue is to provide material scientists and orthopedic surgeons with an appreciation of the fundamental aspects of orthopedic biomaterials from materials science point of view, as well as their clinical applications in orthopedic surgery.

There is a wide range of biomaterials used for different implants and prostheses used in orthopedic surgery, from metallic alloys to ceramics and from polymers to hybrid composites. Functional properties play an important role in discussions about their clinical applications and have a significant role in the evaluation of the clinical performance for different orthopedic implants and articular prostheses.

This special issue is focused also on the current strategies and advanced biomaterials for bone repair and regeneration. Based on the requirements of the modern biomedical technology, the novel research strategies in orthopedic biomaterials field are nowadays directed toward biomaterials endowed with surface properties, controlled adhesion, and for the controlled release of active principles, especially against infections.

In this view, several research groups and clinicians have been invited to contribute to this special issue with their original research papers that could stimulate efforts of comprehensive knowledge of orthopedic biomaterials-from materials science to clinical applications.

This special issue is divided into two categories based on the following keywords: advanced orthopedic biomaterials and clinical performance for different orthopedic methods and implants.

In the category of orthopedic biomaterials, metallic biomaterials have attracted a significant attention being widely used in manufacturing orthopedic implants. Biodegradable metals like magnesium-based alloys appear to be a new paradigm in orthopedic materials and this subject are discussed into a very interesting paper about the in vivo testing of these novel metallic biomaterials. Also, fractographic evaluation of the metallic materials for medical applications was a theme discussed into a paper from the first part of this special issue. Advanced microstructural characterizations of some biomaterials and scaffolds for regenerative orthopaedics represent another new hot topic for development new biomaterials and applications for orthopedic surgery. Different biomaterials are used now for manufacturing the scaffolds for bone tissue regeneration. According to this hot topic worldwide, this issue presents not just a general view about scaffolds requirements but also some experimental results about the magnetic nanoparticles inclusion into scaffolds based on calcium phosphates and biopolymers for bone regeneration. New insight and future perspective about acrylic bone cements are still interesting topic both for clinicians and for material scientists because new challenges appear today resulted from clinical evaluation of these materials. And specialists in materials science must develop and propose new bone cements, with improved properties like antibacterial effect.

In the part dedicated to the evaluation of the clinical performance for different orthopedic implants, different authors present their perspective and clinical results for a large variety of the orthopedic implants from total hip prosthesis and modular radial head prosthesis, to the bioresorbable anchor for medial patellofemoral ligament reconstruction and Ligament Augmentation and Reconstruction System in clinical practice. Also, the surgical treatment of hand fractures or the systems used for surgical treatment of hallux valgus was evaluated. Anyway, the continuous analysis and monitoring of the clinical results obtained after the use of the orthopedic implants and prosthesis represent clearly a good way to establish new research directions and develop new solutions for the future orthopedic biomaterials.

Authors prove that the orthopedic biomaterials play not just an important role in the functionality of the orthopedic implants and prostheses but also in their effects on the human tissues. By collecting these papers, we hope to enrich our readers and researchers in the field of

orthopedic biomaterials and their clinical applications. We believe that novel orthopedic biomaterials and scaffolds for bone tissue regeneration, together with the improved understanding of the interface between biomaterials and adjacent tissue, will be an important part of future orthopedic biomaterials and implants with better functionality in orthopedic surgery.

### **Acknowledgment**

I would like to thank all the authors participating in the present Special Issue: Orthopedic Biomaterials: from Materials Science to Clinical Applications.

Iulian Antoniac

Materials Science and Engineering Faculty, Biomaterials Group,

University Politehnica of Bucharest, Bucharest, Romania

antoniac.iulian@gmail.com