

Preface

Hydrogels are among the most important and used biomaterials for tissue engineering and regenerative medicine (TERM) strategies. This is mostly due to their similarities to the native extracellular matrix of tissues. Their hydration capacity and suitable porosity are crucial for the process of exchanging of nutrients/metabolites and gases that is required for maintaining functions and growth of normal cells. By means of functionalization, blending strategies, and playing with type of polymer (e.g., natural and synthetic) and polymerization method, properties of hydrogels may be tuned and enlarge their application for engineering different tissues and controlled delivery of drugs. Despite the remarkable process in hydrogel research, scientists still cannot fully address the growing demand for novel solutions based on hydrogels.

This book provides an overview on the recent advances catapulted by the successful application of hydrogels in TERM. It comprises three main sections that include contributions by leading experts in engineering, materials and life sciences, microbiology, and clinical medicine.

Section 1 discusses the fundamentals, open issues, and challenges involving the design, development, and sterilization of hydrogels. It also discusses other transversal topics such as intellectual property management and regulatory issues, which are critical for the successful translation of hydrogels into the market.

Section 2 overviews the latest and most important contributions from world experts on the processing of hydrogels. It presents the state-of-the-art methodologies for the synthesis and processing of functionalized and stimuli-responsive hydrogels.

Section 3 focuses on the relevant applications of hydrogels as injectable scaffolds and bioinks for TERM applications. Their biological activities and structural and physicochemical properties are discussed in depth, including the combination with emerging technologies.

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