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Silica-coated Magnetic Nanoparticles

An Insight into Targeted Drug Delivery
and Toxicology

 Springer

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Preface

Nanotechnology applied to biomedicine represents one of the most important challenges currently facing science. The new properties that arise from a system reduced to the nano-scale make this discipline a novel tool to promote a revolution in terms of therapeutics in medicine. There are diverse fields where nanotechnology may contribute novel strategies to improve conventional therapeutics, with Nanomedicine emerging as a growing field of scientific research. Among the different strategies devoted to medical treatments, drug targeting is one where the convergence of different disciplines intends to give another approach to the current treatment of diverse diseases. Among different types of drug targeting, magnetic targeting presents the advantage related to nanosystems that may be easily guided by the aid of an external magnetic field. This property improves the targeting capability and increases their potential applications as target drug delivery systems or magnetic resonance image agents for diagnostic. However, in terms of medicine and in the application of new technologies for therapeutics, biocompatibility arises as one of the most important issues. So when a nanosystem intended for targeted drug delivery is designed and developed, the first topic a researcher should consider is not only the proper features of the biomaterial, but also the safety in terms of compatibility with the organism.

There are diverse types of biocompatible materials suitable for magnetic drug targeting at nanoscale, magnetite being the one of election. Coating of magnetic nanoparticles is another important topic when the nanosystems are intended for biomedical applications. The election of silica as coating material is a very proper choice in terms of its inert properties and in relation to the improvement of the stability and the physicochemical properties of the magnetic nanosystems. Anyway, solid silica-coated magnetic nanoparticles have not been explored extensively although the associated proper features make these systems suitable as drug targeting agents.

This book has been conceived as a means of disclosure of the remarkable properties related to solid-silica magnetic nanoparticles in biomedicine aiming to encompass from the synthesis to the biomedical applications of these nanosystems. In addition, the main aim of this book is to bring researchers detailed information about biomedical topics such as biocompatibility, bioavailability, biodistribution,

and toxicity. The goal is to join physicochemical properties with biological insights to better understand the relation between these approaches and the impact that they have in biomedicine.

We hope that readers may find here a specific site designed to cover all aspects related to the synthesis, physico-chemical, and biological properties of solid silica-coated magnetic nanoparticles. And that the reading of this book may open a new path in terms of developing more research devoted to these versatile and suitable systems for the treatment and diagnosis of various specific localized diseases. On the other hand, we hope that this work will serve as a stimulus not only for the development of new magnetic nanosystems based on solid silica but also to continue the study of their properties of biocompatibility. This is necessary for their effective application and implementation as commercially available medical treatments in the not too distant future.

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