

---

# Contents

Foreword .....	xi
Preface.....	xiii
Acknowledgements .....	xv
Editor .....	xvii
Foreword Author .....	xix
Contributors .....	xxi

## ***PART I Introduction***

<b>Chapter 1</b> Structure and Magnetism in Magnetic Nanoparticles .....	3
<i>Daniel Ortega</i>	

## ***PART II Fabrication and Characterisation of MNPs***

<b>Chapter 2</b> Synthesis and Characterisation of Iron Oxide Ferrite Nanoparticles and Ferrite-Based Aqueous Fluids.....	47
<i>Etienne Duguet, Marie-Hélène Delville, and Stéphane Mornet</i>	
<b>Chapter 3</b> Protein Cage Magnetic Nanoparticles: Inspiration, Synthesis and Biomedical Utility .....	73
<i>Masaki Uchida, Lars O. Liepold, and Trevor Douglas</i>	
<b>Chapter 4</b> Next Generation Magnetic Nanoparticles for Biomedical Applications.....	99
<i>Trinh Thang Thuy, Shinya Maenosono, and Nguyễn Thị Kim Thanh</i>	

## ***PART III Biofunctionalisation of MNPs for Biomedical Application***

<b>Chapter 5</b> Strategies for Functionalisation of Magnetic Nanoparticles for Biological Targets.....	129
<i>Bettina Kozissnik, Luke A.W. Green, Kerry A. Chester, and Nguyễn Thị Kim Thanh</i>	
<b>Chapter 6</b> Functionalisation of Magnetic Iron Oxide Nanoparticles.....	151
<i>Sylvie Begin-Colin and Delphine Felder-Flesch</i>	

## **PART IV Ex Vivo Application of MNPs**

- Chapter 7** Removal of Blood-Borne Toxin in the Body Using Magnetic Nanospheres ..... 195  
*Michael D. Kaminski, Haitao Chen, Xianqiao Liu, Dietmar Rempfer,  
 and Axel J. Rosengart*
- Chapter 8** Magnetic Nanoparticles for *In Vitro* Biological and Medical Applications:  
 An Overview ..... 215  
*Ivo Safarik and Mirka Safarikova*
- Chapter 9** Magnetic Nanoparticles in Immunoassays ..... 243  
*Peter Hawkins and Richard Luxton*
- Chapter 10** Magnetic Nanoparticles in Lab-on-a-Chip Devices ..... 277  
*Nicole Pamme*
- Chapter 11** Separation and Characterisation of Magnetic Particulate Materials ..... 301  
*P. Stephen Williams*
- Chapter 12** Nanomagnetic Gene Transfection ..... 333  
*Angeliki Fouriki and Jon Dobson*

## **PART V In Vivo Application of MNPs**

- Chapter 13** Imaging and Manipulating Magnetically Labelled Cells ..... 353  
*Florence Gazeau and Claire Wilhelm*
- Chapter 14** Non-Invasive Magnetically Targeted tPA Delivery for Arterial Thrombolysis ..... 369  
*Haitao Chen, Michael D. Kaminski, Xianqiao Liu, Patricia Caviness Stepp,  
 Yumei Xie, and Axel J. Rosengart*
- Chapter 15** Blood Cells as Carriers for Magnetically Targeted Delivery of Drugs ..... 387  
*Nadine Sternberg, Kristin Andreas, Hans Bäumlér,  
 and Radostina Georgieva*
- Chapter 16** Putting Therapeutic Nanoparticles Where They Need to Go by Magnet  
 Systems Design and Control ..... 419  
*Arash Komae, Roger Lee, Aleksandar Nacev, Roland Probst,  
 Azeem Sarwar, Didier A. Depireux, Kenneth J. Dormer, Isaac Rutel,  
 and Benjamin Shapiro*

<b>Chapter 17</b>	Nanocrystalline Oxides in Magnetic Fluid Hyperthermia .....	449
	<i>Emil Pollert and Karel Závěta</i>	
<b>Chapter 18</b>	Magnetic Liposomes and Hydrogels towards Cancer Therapy.....	479
	<i>Manashjit Gogoi, Manish K. Jaiswal, Rinti Banerjee, and Dharendra Bahadur</i>	
<b>Chapter 19</b>	Magnetic Microbubbles.....	499
	<i>Eleanor Stride, Helen Mulvana, Robert Eckersley, Meng-Xing Tang, and Quentin Pankhurst</i>	
<b>Chapter 20</b>	Magnetic Particle Imaging for Angiography, Stem Cell Tracking, Cancer Imaging and Inflammation Imaging.....	523
	<i>Patrick Goodwill, Kannan M. Krishnan, and Steven M. Conolly</i>	
<b>Chapter 21</b>	Surgical Magnetic Systems and Tracers for Cancer Staging .....	541
	<i>Eric Mayes, Michael Douek, and Quentin Pankhurst</i>	
<b>Chapter 22</b>	Safety Considerations for Magnetic Nanoparticles.....	557
	<i>Taher A. Salah, Hazem M. Saleh, and Mahmoud H. Abdel Kader</i>	
<b>Index</b> .....		575