

Chapter 2

Biomedical Applications of Functionalized Magnetic Nanomaterials (FMNs)



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Abstract Over the past few decades, nanomaterials have been extensively used in various fields, especially in biomedicine and healthcare. Their unique physicochemical properties, such as high surface area and nanoscale size, make them highly desirable. Recently, there has been significant interest in developing therapies based on magnetic nanoparticles for biomedical applications, owing to their unique advantages. Magnetic particles, which respond to magnetic forces, are useful in drug targeting and bioseparation, including cell sorting. To be used in biomedicine, these magnetic nanomaterials often need to be modified or functionalized with other materials. This functionalization allows them to be used in various biomedical applications, such as biosensing, drug delivery, imaging, medical implants, cancer treatment, antibacterial and antiviral applications, and tissue engineering. Additionally, functionalized magnetic nanomaterials (FMNs) have applications in hyperthermic treatments. For instance, magnetite nanoparticles conjugated with antibodies, known as antibody-conjugated magneto-liposomes (AMLs), are used in hyperthermia and enhance tumor-specific contrast in MRI via systemic administration. This chapter provides a critical overview of recent research on functionalized magnetic nanomaterials in biomedical applications. It also discusses the role of the magnetic properties of these nanomaterials in targeted therapeutic approaches and improved diagnostic tools.

Keywords Biomedicine · Functionalized magnetic nanomaterials (FMNs) · Drug delivery · Tissue engineering · Hyperthermia · Applications

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