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Green Synthesized Spions for Drug Delivery

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Green-synthesized superparamagnetic Iron Oxide Nanoparticles (SPIONs) are emerging as a promising and eco-friendly platform for biomedical and environmental applications. These nanomaterials possess unique magnetic properties and high biocompatibility, enabling efficient adsorption, absorption, and penetration at the nanoscale. The superparamagnetic behaviour of SPIONs is particularly valuable for targeted drug delivery, as it allows for precise, externally controlled manipulation. To enhance their performance, SPIONs can be modified with various surface functionalizations and polymer coatings to improve colloidal stability, biocompatibility, and specificity. These modifications also minimize aggregation and reduce toxicity by facilitating interactions with specific biomolecules. Beyond healthcare, SPIONs are also highly effective in environmental remediation, including wastewater treatment and biosensing. This review focuses on the significant potential of green synthesis methods as a safer, more accessible, and sustainable alternative to conventional chemical routes. We highlight the advantages of green-synthesized SPIONs, emphasizing their use as a powerful and effective strategy for advanced drug delivery systems.

Keywords: Biocompatibility, Green synthesis, Healthcare applications, SPIONs

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