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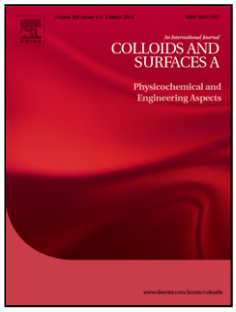

Title: Iron Oxide Nanoparticles (IONPs) with potential applications in plasmid DNA isolation

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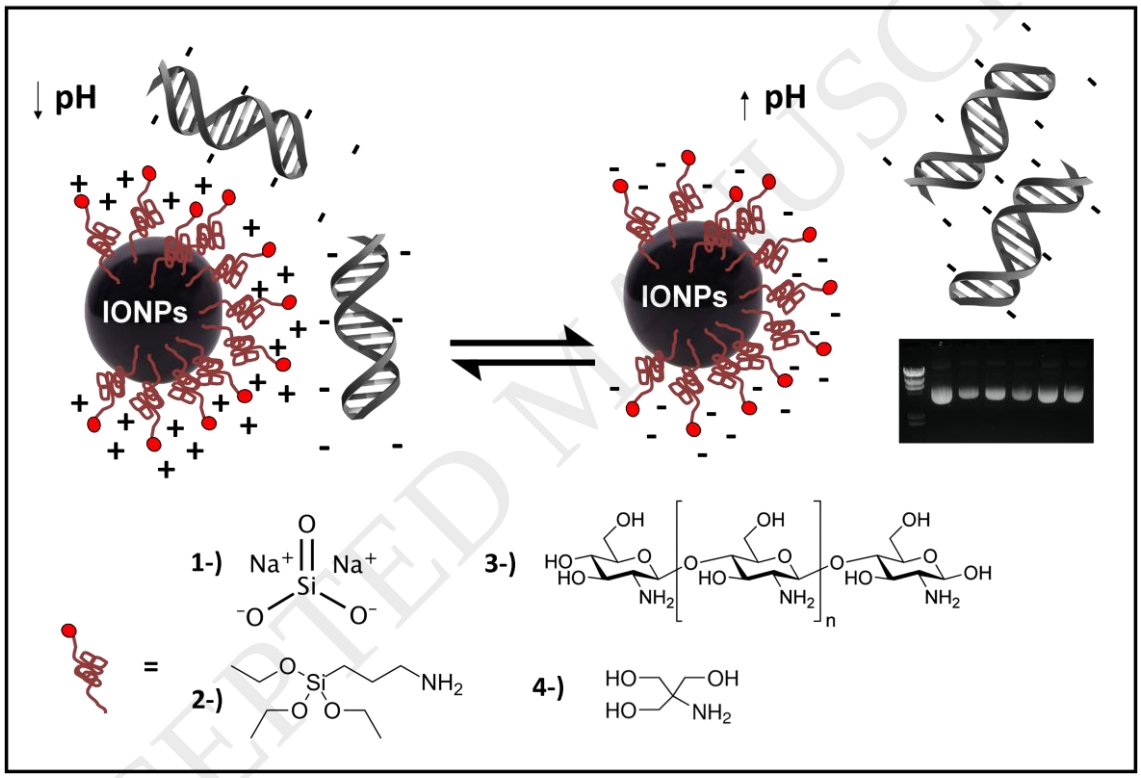
Graphical abstract



Abstract: DNA extraction and purification is considered a critical step in different biomedical applications such as genetic therapy and clinical diagnosis. This research describes the synthesis and characterization of functionalized IONPs with potential applications in plasmid DNA isolation. IONPs were synthesized by the chemical coprecipitation method followed by a post-synthesis functionalization using silica and (3-aminopropyl)triethoxysilane (APTES). A second functionalization strategy was carried out by an *in situ* coprecipitation of Fe(II) and Fe(III) ions in presence of chitosan and tris(hydroxymethyl)aminomethane (Tris). IONPs characterization by X-Ray diffraction (XRD) confirmed the synthesis of inverse-spinel magnetite like nanoparticles. In addition, infrared spectroscopy allowed to identify the hydroxyl, silanol and amino functional groups on the surface of the nanoparticles. Transmission electron microscopy measurements revealed IONPs with an average particle size under 13 nm. According to saturation and remanence magnetization values, all samples were suitable for bioseparation studies using magnetic manipulation. Preliminary separation assays with oligodeoxynucleotides (ODN) and plasmid DNA (pDNA) were carried out. Furthermore, biomolecular integrity of ODN and pDNA was verified using polyacrylamide and agarose gel electrophoresis, respectively. Synthesized IONPs and specially those functionalized with silica, chitosan and Tris