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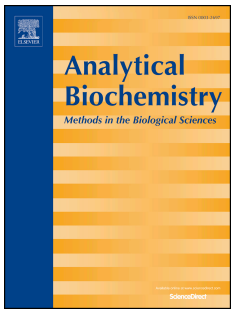

Comparative study of three magnetic nano-particles ($FeSO_4$, $FeSO_4/SiO_2$, $FeSO_4/SiO_2/TiO_2$) in plasmid DNA extraction

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Comparative study of three magnetic nano-particles ($FeSO_4$, $FeSO_4/SiO_2$, $FeSO_4/SiO_2/TiO_2$) in plasmid DNA extraction

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Abstract

Recent updates on Magnetic Nano-Particles (MNPs) based separation of nucleic acids have received more attention due to their easy manipulation, simplicity, ease of automation and cost-effectiveness. It has been indicated that DNA molecules absorb on solid surfaces via hydrogen-bonding, and hydrophobic and electrostatic interactions. These properties highly depend on the surface condition of the solid support. Therefore, surface modification of MNPs may enhance their functionality and specification. In the present study, we functionalized Fe_3O_4 nano-particle surface utilizing SiO_2 and TiO_2 layer as Fe_3O_4/SiO_2 and $Fe_3O_4/SiO_2/TiO_2$ and then compare their functionality in the adsorption of plasmid DNA molecules with the naked Fe_3O_4 nano-particles. The result obtained showed that the purity and amount of DNA extracted by Fe_3O_4 coated by SiO_2 or SiO_2/TiO_2 were higher than the naked Fe_3O_4 nano-particles. Furthermore, we obtained pH 8 and 1.5 M NaCl as an optimal condition for desorption of DNA from MNPs. The result further showed that, 0.2 mg nano-particle and 10 min at 55 °C are the optimal conditions for DNA desorption from nano-particles. In conclusion, we recommended $Fe_3O_4/SiO_2/TiO_2$ as a new MNP for separation of DNA molecules from biological sources.