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Plasma-activated immobilization of biomolecules onto graphite-encapsulated magnetic nanoparticles

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Abstract

We describe the amino group surface functionalisation of graphite-encapsulated iron compound nanoparticles by radio frequency (RF) plasma processing followed by oxidized dextran immobilization. We have found that surface treatment using plasma represents an important step before biomolecules immobilization. After plasma treatment, the dispersion property of nanoparticles in dextran solution in water was significantly improved. The successful dextran immobilization was confirmed by X-ray photoelectron spectroscopy (XPS) and high resolution-transmission electron microscopy (HR-TEM) analyses followed by amino group derivatization using 4-(trifluoromethyl)-benzaldehyde (TFBA). As an evidence for covalent bonding between nanoparticles and dextran, the area percentage of deconvoluted C ═N peak at ~389.6 eV increased from 0% to 10.53 ± 1.30% with increasing the dextran concentration. The result is consistent with the evidenced decreasing of the free amino group percentage from 68.09 ± 5.10% to 14.73 ± 5.89% on the nanoparticle surface after dextran immobilization.

Figures and tables from this article: