Controlled Anchoring of Iron-Oxide Nanoparticles on Polymeric Nanofibers: Easy Access to Core@Shell Organic-Inorganic Nanocomposites for Magneto-Scaffolds

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Résumé en anglais	Composites combining superparamagnetic iron oxide nanoparticles (SPIONs) and polymers are largely present in modern (bio)materials. However, while SPIONs embedded in polymer matrices are classically reported, the mechanical and degradation properties of the polymer scaffold are impacted by the SPIONs. Therefore, the controlled anchoring of SPIONs onto polymer surfaces is still a major challenge. Herein, we propose an efficient strategy for the direct and uniform anchoring of SPIONs on the surface of functionalized-polylactide (PLA) nanofibers via a simple free ligand exchange procedure to design PLA@SPIONs [16] core@shell [17] nanocomposites. The resulting PLA@SPIONs [16] hybrid biomaterials are characterized by electron microscopy (SEM and TEM) and EDXS analysis, to probe the morphology and detect elements present at the organic/inorganic interface, respectively. A monolayer of SPIONs with a complete and homogeneous coverage is observed on the surface of PLA nanofibers. Magnetization experiments show that magnetic properties of the nanoparticles are well-preserved after their grafting on the PLA fibers and that the size of the nanoparticles does not change. The absence of cytotoxicity, combined with a high sensitivity of detection in MRI both in vitro and in vivo make these hybrid nanocomposites attractive for the development of magnetic biomaterials for biomedical applications.
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