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Modification and characterization of cotton fibers with magnetic core-shell mesoporous silica nanoparticles

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Fabric materials have a wide diversity in nature in which cotton can be highlighted as one of those with the most abundant cellulose content (96%). The functionalization of cotton avoids facile degradation and damage by the environment, moisture, microorganisms, etc., and allows obtaining a desired material with applications in medical, construction and textile industries. Electrostatic assembly, better known as layer-by-layer (LbL) technique is an alternative option of cotton modification, consisted in depositing nanolayers by the adsorption of charged polyelectrolytes on the surface for further immobilization of nanoparticles. LbL technique is attractive for cotton modification due to its simplicity and its easy incorporation in just one coating in ambient conditions. Nanostructured materials have been investigated in the textile field because of their attracting characteristics and unique physicochemical properties. Recently, core-shell nanoparticles have been focused for the combination of a core and a shell made by different precursors, and which unique and useful functionalities are obtained depending on this interaction affording to expand their applications according to the shape, size and smart characteristics given by these core-shell nanostructures. In the present study, we have pretreated and modified cotton fibers using PDDA and PSS polymers in order to functionalize the surface with charged polyelectrolytes for further nanoparticles by electrostatic interaction. Magnetite and magnetic core-shell mesoporous suspension were prepared for coating the cotton fibers to compare and characterize the resulting material as a novel, innovative and promising product in different fields of application.