Biopolymer Peptide Self-Assembly for Functional Coatings and Smart Textile Applications

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Abstract

Amino-terminated oligoglycine biopolymer peptide self-assemblies (known as tectomers) have a versatile surface chemistry that allows them to interact with a variety of nanomaterials and to act as supramolecular adhesives for surface functionalization. Here, we have exploited the strong hydrogen-bond based interaction between these biopolymer self-assemblies and graphene oxide (GO) to efficiently functionalize GO fiber surfaces with different carbon nanomaterials (carbon nanotubes, carbon nanohorns, carbon nanocones, and highly fluorescent nanodiamonds), metal (gold, platinum, iron) nanoparticles, acrylate-based polymer nanoparticles, fluorophores and drugs. The resulting ultrathin coatings exhibit remarkable water-resistant properties. We show that this strategy can be extended to other fibers and fabrics, such as polyurethane/PEDOT:PSS, strain responsive elastomeric composite fibers with high electrical conductivity which offer great potential for applications in motion sensing, biomedical monitoring and stretchable electronics, and also polyester (PES) fabrics, therefore making it very attractive for a variety of technological and smart textile applications.

Keywords

Biopolymers, peptide self-assemblies, coatings, fibres, smart textiles.