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Polymer-based composites by electrospinning: preparation & functionalization with nanocarbons

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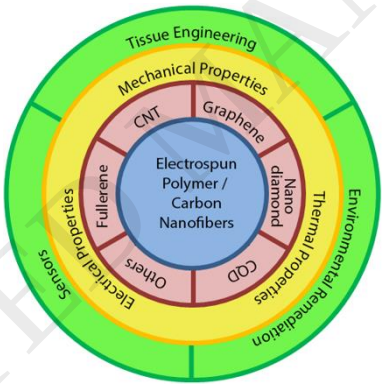
Graphical Abstract



Abstract

Electrospinning is a straightforward yet versatile technique for the preparation of polymeric nanofibers with diameters in the range of nanometers to micrometers, and has been rapidly developed in the last two decades. Nanocarbon materials, usually referring to carbon nanotubes, graphene, and fullerenes with their derivatives including quantum dots, nanofibers, and nanoribbons, have received increasing attention due to their unique structural characteristics and outstanding physico-chemical properties. Incorporation of nanocarbons in electrospun polymeric fibers has been used to increase the functionality of fibers, for example, to improve the mechanical, electrical, and thermal properties, as well as confer biofunctionality as scaffolds in tissue engineering and sensors, when the advantageous properties given by the encapsulated materials are transferred to the fibers. In this review, we provide an overview of polymer-based composites reinforced with nanocarbons via the electrospinning technique. After a brief introduction of various types of nanocarbons, we summarize the latest progress of the design and fabrication of electrospun polymeric nanofibers with nanocarbon fillers. With regard to the preparation of composites, we focus on functionalization