Electrospun nanomaterials for ultrasensitive sensors

Increasing demands for ever more sensitive sensors for global environmental monitoring, food inspection and medical diagnostics have led to an upsurge of interests in nanostructured materials such as nanofibers and nanowebs. Electrospinning exhibits the unique ability to produce diverse forms of fibrous assemblies. The remarkable specific surface area and high porosity bring electrospun nanomaterials highly attractive to ultrasensitive sensors and increasing importance in other nanotechnological applications. In this review, we summarize recent progress in developments of the electrospun nanomaterials with applications in some predominant sensing approaches such as acoustic wave, resistive, photoelectric, optical, amperometric, and so on, illustrate with examples how they work, and discuss their intrinsic fundamentals and optimization designs. We are expecting the review to pave the way for developing more sensitive and selective nanosensors.

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Compared with other methods of fiber preparation like drawing, template synthesis, self-assembly, phase separation, etc., electrospinning has emerged as a versatile and cost-effective method for producing long continuous fibers with diameters ranging from several micrometers down to a few nanometers by applying a high voltage on a polymer solution or melt[1]. In 1934, Formhals[2] described the operation of electrospinning in a US patent for the first time; but only since 1990s it has gained substantial attention. The process attracted rapidly growing interests in the past two decades triggered by potential

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