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Abstract

Conductive Electrospun Nanofibers for Multifunctional Portable Devices †

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Abstract: The need to perform in situ sensing measurements lead to the development of innovative and smart field-portable devices. The advantages of such systems are remarkable since they are mainly battery-powered, lightweight and easy to carry and keep. Moreover, field-portable devices are easy to use and are able to give fast sensing responses. In the last few years, many efforts have been made in the development of new performing systems and the advantageous use of nanofibrous materials was assessed. To this purpose, the electrospinning has been recognized as the most powerful and facile technique for generating uniform nanofibers with controlled dimension and morphology. When conductive polymers are electrospun, very interesting electrical properties can be obtained along with the well-known ones that are typical of nanofibers. Among these polymers, polyaniline has been extensively used. In this work, an innovative hybrid material based on polyaniline/polyvinyl acetate/graphene oxide nanofibers was developed and tested as a sensor toward the detection of contaminants in aqueous media. Nanofibers, in the form of a compact mat, were deposited onto a support with suitable electrical contacts. Measurements were performed exploiting the excellent electrical properties of the realized nanofibers in both direct and alternating currents. When a direct current was used, the change in the nanofibers' resistance value was registered upon exposure to contaminated aqueous solutions and used to determine the presence or absence of contaminants, whereas when tests were performed with an alternating current, the quantitative determination of single species in contaminated solutions was also possible. In this way, by integrating the two different measurement methodologies, an opportunely designed multifunctional portable device will be developed for both qualitative and quantitative contaminants determinations.

Keywords: polyaniline; electrospinning; sensors; portable devices

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