Development of hybrid nanostructured platforms for chemical sensor applications

Rafaela Silveira André[1,2], Adriana Pavinatto[2], Luiza Amim Mercante[2], Elaine Cristina Paris[2], Luiz Henrique Capparelli Mattoso[2], Daniel Souza Corrêa[2]

[1]Universidade Federal de São Carlos, [2]Embrapa Instrumentação Agropecuária

e-mail: rafaela.s.a@outlook.com

Polyaniline (PANI) is a conductive polymer that has received much attention due to its simple synthesis route, good chemical stability and relatively high electrical conductivity, leading to potential applications as gas sensors. PANI dissolution capacity enables it to be processed with other polymers that can be obtained by the electrospinning process [1]. Recently, composite production based on polyamide 6/polyaniline (PA6/PANI) nanofibers has been reported [2] in the literature, with a great potential for technological application. The obtained nanofibers have a high surface area, as well as great flexibility and allow the precise control of fiber morphology. The incorporation of inorganic and hybrid materials in the polymeric matrix can yield to outstanding results due to the synergetic behavior and/or complementary properties. In this work were produced nanofibers of polyamide6/polyaniline (PA6/PANI) decorated with ZnO nanoparticles and also nanofibers of pure polyamide 6 for comparison. The pure PA6 nanofibers were obtained from a PA6 solution (20% (w/v)) in formic acid and PA6/PANI nanofibers were obtained from the same solution with the addition of 1%(w/w) PANI. ZnO nanoparticles impregnation was attained by immersion of the polymeric nanofibers into the ZnO solution for 24 hours. The obtained hybrid material was characterized by scanning electron microscope (MEV-EDS), thermal gravimetric analysis (TGA) and electrical measurements. The physical-chemical characterizations confirmed the successfully decoration of nanofibers with ZnO nanoparticles in a percentage of 4% (w/w) by TGA, while scanning electron microscope images showed the uniform distribution of nanoparticles onto the nanofibers. The developed material is intended to be applied in sensor applications aiming at gas detection.

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