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Composites Based on Biopolymers and Ag Nanoparticles as Potential Wound Dressing Materials

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Abstract

Nanotechnology is an emergent, rapidly growing field with numerous technical and biomedical applications. With antibacterial properties, silver nanoparticles have been tested in various medical domains, including the treatments of the skin. The paper presents the preparation of negatively charged silver nanoparticles (NP) in presence of olive leaf extracts and the nanoparticles application in formulations as wound dressings (films and porous scaffolds). Nanoparticles were obtained with high stability, negative zeta potential and antioxidant properties. Xanthan/methacrylated xanthan and methacrylated gelatin have been used to prepare films (by drying) and porous scaffolds (by freeze-drying) with inclusions of silver nanoparticles. FT-IR data confirmed the structure and composition of the NPs and prepared scaffolds. Scanning electron microscopy data indicated a homogeneous mixing of polymers and nanoparticles resulting microporous architecture and uniformly distributed pores at low content of NP or some clustering phenomena at increased content of NP. The volume of fluids retained in the prepared materials is highly influenced by the ratio between polymers, respectively by the NP concentration; the swelling degree values varied over a wide range (1000%–6000%). The materials are bioadhesive and the adhesive properties to substrate are strongly dependent by the polymers structuring and their interaction with silver nanoparticles. In vitro cytotoxicity tests (MTT method and calcein assisted fluorescence microscopy) showed that porous materials are cytocompatible.

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Keywords: silver nanoparticles, xanthan, methacrylated gelatin, films,·porous scaffolds, wound dressings

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