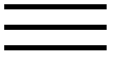


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## Colloids and Surfaces B: Biointerfaces

Volume 76, Issue 1, 1 March 2010, Pages 248-258

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# Fabrication of porous chitosan films impregnated with silver nanoparticles: A facile approach for superior antibacterial application

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<https://doi.org/10.1016/j.colsurfb.2009.10.044>

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### Abstract

The present investigation involves the synthesis of porous chitosan–silver nanocomposite films in view of their increasing areas of application in wound dressing, antibacterial application, and water purification. The entire process consists of three-steps including silver ion-poly(ethylene glycol) matrix preparation, addition of chitosan matrix, and removal of poly(ethylene glycol) from the film matrix. Uniform porous and brown colour chitosan films impregnated with silver nanoparticles (AgNPs) were successfully fabricated by this facile approach. Both, poly(ethylene glycol) (PEG) and chitosan (CS) played vital roles in the reduction of metal ions into nanoparticles (NPs) as

well as provided good stability to the formed nanoparticles. The developed porous chitosan-silver nanocomposite (PCSSNC) films were characterized by UV-vis and FTIR spectroscopy, and thermogravimetric analysis for the confirmation of nanoparticles formation. The morphology of silver nanoparticles in nanocomposite films was tested by optical microscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM). The embedded AgNPs were clearly observed throughout the film in SEM and the extracted AgNPs from the porous chitosan-silver nanocomposite showed  $12 \text{ nm}$  in TEM. Improved mechanical properties were observed for porous chitosan-silver nanocomposite than for chitosan blend (CSB) and chitosan-silver nanocomposite (CSSNC) films. Further, the examined antibacterial activity results of these films revealed that porous chitosan-silver nanocomposite films exhibited superior inhibition.



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## Keywords

Chitosan; Silver nanoparticles; Antibacterial activity; Wound dressing; Poly(ethylene glycol); Hydrogels

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