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Development of functional antimicrobial papers using chitosan/starch-silver nanoparticles

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Abstract

In the present work, we report the synthesis of chitosan:starch-silver nanoparticle (Cht:St-AgNPs) coated papers for antimicrobial packaging applications. The starch-assisted synthesized St-AgNPs are spherical in shape with an average particle size of 7 nm. Chitosan was mixed into the synthesized St-AgNPs solution with different ratios of 9:1, 8:2, 7:3, and 5:5 by weight. Further, the influence of different ratios of Cht:St-AgNPs on the various paper properties such as mechanical properties, water and oil resistance, and antimicrobial activities was investigated. It was observed that the properties of the coated papers were strongly dependent on the composition of Cht:St-AgNPs. The Cht:St-AgNPs-coated paper prepared with the ratio of 9:1 showed excellent mechanical properties and good resistance properties against water and oil. The Cht:St-AgNPs coated papers showed a remarkable enhancement in mechanical strength, oil and water resistance, and antibacterial and antifungal activity, which can make them a potential candidate for functional antimicrobial packaging applications.

Keywords: Silver nanoparticles; Ultrasonication; Antimicrobial activity