Nanoparticles from wood residues as reinforcement in polymer-matrix composites

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In recent decades, there has been extensive research in cellulose, cellulose-based particles and cellulose-based composites [1–2]. Among the available biopolymer resources – lignocellulose and wood residues – are the most abundant polymers in nature, making them natural candidates as renewable and sustainable feedstocks for biomaterials [3] and eco-products [4]. In this study, we investigated the properties of wood-based nanoparticles in order to improve the physical and mechanical properties of the nanoparticles-doped chitosan films.

Nanoparticles were produced using four different methods – acid hydrolysis, thermocatalytic destruction, TEMPO oxidation, and oxidation with peroxide group. The particle shape and size were examined using atomic force microscopy and dynamic light scattering. These films were assessed against *Staphylococcus aureus* (*S. aureus*, gram-positive) and *Escherichia coli* (*E. coli*, gram-negative) as model bacteria by inhibition zone formation.

Films were obtained with a smooth surface morphology and homogenous distribution of wood residues nanoparticles within the chitosan matrix, adding 1–2 wt% nanoparticles can improve the tensile strength. The chitosan films were transparent and colorless compared to nanoparticles-doped chitosan films. The results of antibacterial tests confirmed that nanoparticles-doped chitosan films inhibited the growth and development of *S. aureus* and *E. coli*.

References:

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