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Nanoindentation of Chitosan Doped with Silver Nanoparticles
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Imaging and spectroscopic analysis via nanoindentation was performed with the Nanosurf EasyScan2 AFM on the pure and silver doped chitosan samples allowing for a more localized determination of their stiffness, hardness, and reduced Young's modulus. The pure chitosan sample was tested to have a stiffness of 0.367 N/m, a hardness of 1.12 GPa, and a reduced Young's modulus of 30.5 MPa. The film with 5mg Ag nanoparticle per gram of chitosan was tested on the boundaries between the chitosan and Ag nanoparticles to show an increase in stiffness of about 4.6% at 0.384 N/m, an increase in hardness of about 5.4% at 1.18 GPa, and an increase in the reduced Young's modulus of about 5.0% at 3.2 MPa in comparison to the pure chitosan sample. On the other hand, upon increasing the doping to 10mg Ag nanoparticle per gram of chitosan showed a decrease in stiffness of about 6.3% at 0.344 N/m, a decrease in hardness of about 27.0% at 0.820 GPa, and a decrease in the reduced Young's modulus of about 6.0% at 28.7 MPa in comparison to the pure chitosan sample. Obviously, films doped with 5mg Ag nanoparicle per gram of chitosan provided the composites with improved mechanical strength compared to chitosan alone.

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