

Gelatin-clay nanocomposites of improved properties

Abstract: Transparent gelatin-clay nanocomposite films were made through solution processing. These films exhibit enhanced physical performance. The Young's modulus of the composite film was 8.3 GPa, almost three times that of gelatin alone, by dispersing only 10 wt% of one type of montmorillonite clay into the nanosized phase in the gelatin. With the addition of the clay nanoparticles, the crystallinity of gelatin decreases and the melting point increases slightly. X-ray diffraction (XRD) and transmission electron microscopy (TEM) disclosed that the clay nanoplatelets are well exfoliated and dispersed, and are parallel to the plane of film in the nanocomposite film. The property enhancements of gelatin are affected by the dispersion of particles (i.e. intercalation and exfoliation), particle properties (i.e. particle aspect ratio), and particle-matrix interaction, as studied by XRD and TEM. The property enhancement can be well modeled using the Halpin-Tsai equation.

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