

Thermal and morphological behavior of chitosan-PEO blends containing gold nanoparticles. Experimental and theoretical studies

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Abstract

Using solution-casting method, binary blends of chitosan (CS) and poly (ethylene oxide) (PEO 100,000) containing Au nanoparticles (AuNPs) were prepared. Shifts in the melting temperature (T_m) and crystallization temperature (T_c) values for CS/PEO and CS/PEO/AuNPs blends were observed by calorimetric analysis. In general, CS/PEO/AuNPs blends tended to decompose at higher temperatures than neat polymers. From the FT-IR spectra, shifts in the main signals, such as $-NH_2$, $-OH$ and $C_{single\ bond}O_{single\ bond}C$, were detected in the blends and were attributed to the polymer interactions and the incorporation of gold nanoparticles. In addition, the analysis of the blend topographies by atomic force microscopy (AFM) showed that at a higher CS content, more homogenous surfaces were observed. This behavior was attributed to the interactions present in the CS/PEO/AuNPs blends. Finally, theoretical analyses helped to confirm that the gold nanoparticles would be preferentially adsorbed onto the chitosan microdomains due to the interactions between acetyl and hydroxyl groups and Au atoms..

Keywords

Chitosan blends, Nanocomposites, Gold nanoparticles.