Synthesis, antibacterial and thermal studies of cellulose nanocrystal stabilized ZnO-Ag heterostructure nanoparticles

ABSTRACT

Synthesis of ZnO-Ag heterostructure nanoparticles was carried out by a precipitation method with cellulose nanocrystals (CNCs) as a stabilizer for antimicrobial and thermal studies. ZnO-Ag nanoparticles were obtained from various weight percentages of added AgNO3 relative to Zn precursors for evaluating the best composition with enhanced functional properties. The ZnO-Ag/CNCs samples were characterized systematically by TEM, XRD, UV, TGA and DTG. From the TEM studies we observed that ZnO-Ag heterostructure nanoparticles have spherical shapes with size diameters in a 9–35 nm range. The antibacterial activities of samples were assessed against the bacterial species Salmonella choleraesuis and Staphylococcus aureus. The CNC-stabilized ZnO-Ag exhibited greater bactericidal activity compared to cellulose-free ZnO-Ag heterostructure nanoparticles of the same particle size. The incorporation of ZnO-Ag hetreostructure nanoparticles significantly increased the thermal stability of cellulose nanocrystals.

Keyword: Antibacterial; Cellulose nanocrystals; Thermal properties; ZnO-Ag nanoparticles.