ANTIMICROBIAL NANOPACKAGING MATERIALS

The incorporation of antimicrobial compounds into food packaging materials has received considerable attention. Films with antimicrobial activity could help control the growth of pathogenic and spoilage

Nanocomposites in active packaging

Some nanofillers, such as silver, zinc oxide, and magnesium oxide, have antimicrobial or antioxidant activities. Incorporation of these nanofillers in polymer or biopolymer matrices leads to an inhibiting or retarding effect on the growth of microorganisms, thereby reducing food spoilage . The main goal of active packaging systems is extending the product's shelf life. They can also be designed to improve food quality and safety and finally result in less food waste . Anti-microbial nanocomposite films are worthwhile because of their anti-microbial properties caused by natural anti-microbial agents and because of their suitable structural integrity, which results from the barrier properties created by the nanocomposite matrix . Nanoscale materials have a higher surface-to-volume ratio than their microscale counterparts, and, therefore, they are able to attach to a vast number of biological molecules, which enhances their efficiency . Previous reports have identified potential applications of nanocomposites as growth inhibitors , bacteriocides , and antibiotic carriers . In addition to the application of nanocomposites as packaging materials, they also can be used as delivery systems by helping the migration of functional additives, such as minerals, probiotics, and vitamins into the food . These controlled-released packagings are another example of a nanomaterial application in active packaging. Many anti-microbial nanocomposites used for food packaging are made from silver, which has an intense toxicity to a large variety of microorganisms . Authors have suggested different mechanisms for the anti-microbial activity of silver nanoparticles, such as increasing cell permeability through the attachment to the cell surface and making pits in the membranes , damaging DNA followed by nanoparticle penetration inside bacterial

cell , and the release of Ag+. Active nanocomposites are advanced alternatives to conventional active plastic technologies or active sachets for the extension of the quality and safety of packaged food products. The term ‘active nanocomposite’ generally refers to a plastic composite (i.e., a polymer blend) that contains an active, nanostructured material that confers an activity on the plastic matrix . At least one of the dimensions of the active nanostructured material must be less than 100 nm in size. Nanoclays can be used as carriers for the active agent. The efficacy of the active agent is enhanced because it is highly dispersed in the polymeric matrix and, hence, exposed more efficiently to the substance on which it is required to act.