Nanoclay Based Active food Packaging with Antibacterial, Ethylene Scavenging and Gas Barrier Properties

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Nanotechnology offers new approaches in the design of food packaging materials that can improve the quality and shelf life of food products. Active food packaging materials can interact with food through active agents that are incorporated into them and interfere with processes that lead to spoiling. Nanocomposite films prepared by incorporating clay nanoparticles into polyethylene matrices will be presented as active food packaging films with antibacterial, ethylene scavenging and gas barrier properties. Clay nanoparticles loaded with antibacterial agents are coated onto the surface of food packaging films as a nanocoating by Layer-by-Layer assembly. Resulting films reduced the viability of a food pathogen, *Aeromonas hydrophila* by 85% and the aerobic count on chicken surfaces by 48%.
When clay nanoparticles are homogeneously dispersed in the polyethylene matrix they acted as scavengers of ethylene gas, the gas responsible for spoiling of fruits and vegetables. Prepared films were shown to slow down the ripening process of bananas and retain the firmness of tomatoes due to their ethylene scavenging properties. Clay nanoparticles dispersed in the polyethylene matrix also reduced the oxygen and water vapor transmission rates of films. When packaged with prepared nanocomposite films strawberries presented slower weight loss than strawberries packaged with neat polyethylene films due to their water vapor barrier properties. Similarly, chicken surfaces packaged with nanocomposite films demonstrated less aerobic bacterial growth compared to chicken surfaces packaged with neat polyethylene films due to their oxygen barrier properties. Nanoclay/Polyethylene nanocomposite films demonstrated in this work can greatly contribute to food safety as active food packaging materials that can improve the quality and shelf life of food products.

Keywords: antibacterial food packaging, ethylene scavenging food packaging, barrier food packaging, nano clay, active food packaging