

Application of nanotechnology in food packaging system

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Abstract

In recent years, nanotechnology is widely used in food packaging area such as Nano barcodes for tracking and sensing, Nano scale pigments for inks, nanomaterial for colour without use of dyes or conventional pigments, and nanomaterial electronic displays with quality paper. We diversely applied Nano-clay to biodegradable poly(lactic acid) (PLA) films, which are used instead of plastic films to reduce the growing serious environment problem, for the purpose of improvement in mechanical or barrier properties of the films. The poor moisture barrier property of a PLA film was improved by chitosan or/and clay coating. Tensile strength and elongation at break of a PLA film were improved by coating with Cloister 30B-containing ink. Oxygen permeability of a PLA film decreased significantly upon addition of clay levels up to 1%, and water vapour permeability also decreased depending on the increase of clay (0%-20%). We also used halloysite nanotubes (HNTs) in an active packaging system. Thyme essential oil (TO) as an antioxidant agent was encapsulated into HNTs, and the TO/HNT capsules were coated with the Eudragit. EPO polymer to avoid burst release as well as to prolong the release time in the packaging system. Encapsulation efficiency and payload of the capsules prepared using 26.7% (w/v) TO solution were 14.94% and 14.58%, respectively. The encapsulation eventually enables TO release in a sustained manner for 96 h. In our studies, Nano materials were successfully applied to food packaging system for which the results proved the high potential of nanotechnology.

The applications of nanotechnology in food sector can be summarized in two main groups that are food nanostructured ingredients and food Nano sensing. Food nanostructured ingredients encompass a wide area from food processing to food packaging. In food processing, these nanostructures can be used as food additives, carriers for smart delivery of nutrients, anti-caking agents, antimicrobial agents, fillers for improving mechanical strength and durability of the packaging material, etc. whereas food Nano sensing can be applied to achieve better food quality and safety evaluation (Ezhilarasi et al., 2013). In this review, we have summarized the role of nanotechnology in food science and food microbiology and also discussed some negative facts associated with this technology. The nanostructured food ingredients are being developed with the claims that they offer improved taste, texture, and consistency (Cientifica Report, 2006). Nanotechnology increasing the shelf-life of different kinds of food materials and also help brought down the extent of wastage of food due to microbial infestation (Pradhan et al., 2015). Nowadays Nano carriers are being utilized as delivery systems to carry food additives in food products without disturbing their basic morphology. Particle size may directly affect the delivery of any bioactive compound to various sites within the body as it was noticed that in some cell lines, only submicron nanoparticles can be absorbed efficiently but not the larger size micro-particles

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