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Chapter 13

Prospective Nanomaterials for Food Packaging and Safety

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Abstract

Nanotechnology is being explored widely to improve food packaging. The development of innovative packaging materials using nanotechnology has had remarkable growth in the last few years. For the last two decades, substantial scientific efforts have been placed into replacing bulk and conventional materials with eco-friendly and biodegradable nanotechnology products or, more specifically, nanostructured materials in the food packaging industry. The advantages of nanotechnology and applications of nanostructured materials in food packaging are overviewed in this chapter. The common, profitable, and marketable acceptance of nanomaterial based food packaging systems and future perspectives are discussed by providing a broad and improved understanding of implementing nanotechnology products in food packaging.

Keywords

Nanotechnology, Nanomaterials, Active Packaging, Intelligent Packaging, ZnO Nanoparticles, Carbon-Based Nanomaterials, Green Polymer Nanocomposites

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1. Introduction

With the invention of canning in the nineteenth century, modern food packaging has made significant advances due to universal trends, technological and scientific improvements, and buyer preferences. Food casing or packaging has always been a part of constant development and the manufacturing company is constantly under pressure to supply more. Recent food science and technology have broadened, expanded, and refined conventional food casing methods and added new ones. The materials used in food packaging acts as a barrier to external elements and allow reaching food to the customer in a healthy and safe way. In addition to the move toward globalization, safety, protection and longer shelf life are necessary, along with monitoring safety and quality based on global standards. Gradually, the conventional materials have been replaced by smart nanomaterials such as nanocomposite gels [1-3], polymer nanocomposite [4-6], structural colored nanomaterials [7-9], molecular machines [10], nanomaterial based biosensors [11], and so on.

The advent of nanotechnology has had a most important impact on food packaging applications due to unique physicochemical and biological properties of nanomaterials. It has become one of the most up-and-coming technologies to refashion conventional food science applications. The implementation of nanotechnology in the processing, packaging, and safety of food has proved its competence in food industries, illustrated in Fig. 1 [12]. Various preparation techniques could produce nanomaterials with desirable chemical and physical properties, which might be utilized in food trade.