

## Chapter 6

# Nanocomposites in the Food Packaging Industry: Recent Trends and Applications

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### ABSTRACT

*The recent innovations in nanomaterials for the food packaging industry over the conventional food packaging material have made for a better quality of food product. The use of biodegradable materials is environmentally friendly and suitable for maintaining the quality of food. The chapter focuses on nano-composite materials that enhance the antimicrobial, mechanical, thermal, as well as barrier properties against the migrating element in the food packaging system. Bio-composite derivatives such as PLA, PCL, starch and cellulose, protein derivatives of nanocomposite materials have also been discussed in the chapter along with nano-sensors. Aspects of safety for human and environments and need for regulations of hazard assessment for safety purpose for the food packaging have also been discussed in this chapter. The chapter concludes by discussing the use of nanomaterials applications in food packaging for developing countries, forming some conclusions and leaving readers with thoughts for future research directions.*

### INTRODUCTION TO FOOD PACKAGING

Packing has been an essential aspect for the human being for a thousand years. When people started going from one place to another place, they felt the need for packing of the food products. The packaging concept lacked almost a hundred years ago, and food packaging industries were quick to realize this and

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took the opportunity to fill the gap. Nowadays, the packaging is an essential need of the society, because it encompasses, and protects the goods. The importance of the packaging concept does not need to be justified, or it can be said that its values hardly needs stressing. The reason behind it is that no one can think of selling a product of food items without its packaging. However, knowing all about the importance of packaging and its role, it is quite common to observe, that people still have the mindset that the cost of the packing material is unnecessary and often the price of a product which is high just because of its packaging is taken as a negative aspect by the society. This is only due to the gap or lack of information about what a packaging performs. The people are not known for this information, or maybe because of misunderstanding and lack of information, consumers mostly concentrate on the end-product rather than the packaging of materials. At an earlier time, people were using skins, leaves, and bark materials for the packaging purpose of the food products (Driscoll et al., 1999).

The packaging concept holds a significant position in the food processing unit. Now in the present time, much progress, developments have been made in the food packaging industry. It can also be said that in the last three decades, the concept of packaging has been increased in a large volume and is also quite diversified (Coles et al., 2003). For extending the life of the food product, i.e., Shelf-life, too much innovative idea has been applied in the packaging materials. The packaging is a socio, logical, and scientific discipline of thought which guarantees delivery of products to a consumer who needs those merchandise in the best condition suitable for their utilization. This concept of packing includes a package of food products in the form of pouches, bags, cups, trays, cans, tubes, bottles, or it may contain any container to perform some specific task function to protect the food products. From a survey, which was conducted in the United States, it has been shown that approximately 72% peoples are there in the United States of America who can pay extra money for the freshness of the food products, which have the assured certification of healthy food products and will not harm anymore. So, the concept of food packaging is growing hugely, and a lot of research work is going on for its development and providing better shelf-life of food products for the satisfaction of consumers.

## **PACKAGING AND PRESERVATION**

It is a well-known fact that drying and freezing are the direct approaching techniques for the preservation of foods. Some other methods are there, which are quite necessary to be implemented for the packaging and preservation of food products. The indirect methods are also crucial factors to avoid the phenomenon of contamination or recontamination. These indirect tools are packaging concept and quality management which needs implementation.

Nevertheless, these techniques do not come in the category of food preservation techniques (Rahman et al., 1999). They are giving important consideration for maintaining the quality of the foods most securely and are also quite healthy. There are mainly five functions of the packaging concept. They are also known as (5Ps): and collectively called product containment, preservation, and quality, presentation and convenience, protection, and provide storage history (Figure 1).

### **Product Containment**

The capability of containment and its protection is the first and most important function of the packaging concept. It can be easily explained the reason why the liquids, semiliquid, and powders, etc. like products

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