

Nanotech for food packaging to increase 15% as a result of developments.

The last decade has observed an exponential growth in packaging and food sector in both developed and developing countries. Food is an edible substance which we usually get from animal or plant and contains necessary nutrients including proteins, carbohydrates, minerals, fats, and vitamins to assist life, energy and growth.

Food is a perishable commodity and hence contamination and degradation of food can occur at any stage of the food chain. It can be chemical, physical or biological.

The presence of infectious organisms in food can result in food poisoning, which can be fatal, particularly for children, pregnant women, and elderly persons. Hence, it is highly crucial that the food must be protected at all levels by using good quality of packaging material, which is safe, cost-effective and non-toxic.

Nanotechnology: A Boon to the Food Packaging Industry

The concept of nanotechnology was first introduced by Richard Feynman in 1959, and the term was later coined by Norio Taniguchi in 1974. Nanotechnology comprises of fabrication, characterisation, and manipulation of molecules of nano-range (1-100 nm).

This technology deals with nano-systems and nanomaterials. Nanomaterials are defined as materials with some dimension on the nanoscale, and these are classified into three categories – nanofibers, nanoparticles, and nano-plates. Nanotechnology has multiple application areas such as packaging, nano-electronics, biomedical, security sensors, paints, textile, cosmetics, medical and healthcare, paper, construction, explosives & weapons and lubricants among others.

Active packaging is designed to stop the growth of microbes once the packaging is opened by the customer and rewrapped with an active portion of the package. In the food industry, nanotechnology can be used to detect the presence of bacteria and microbes in packaging or to increase barrier properties.

Nanotechnology Applications in Food Industry

Nanotechnology is the science of tiny particles that have a great impact on food packaging industry. There are various nanomaterials available in the market including titanium nitride nanoparticle, silver nanoparticle and nano-zinc oxide, nano-clay and nano-titanium dioxide are presented as functional additives for the food packaging industry. Nanotechnology driven food packaging market has been divided as follows:

- **Active packaging** - The use of nanomaterials is beneficial to interact directly with food to provide better protection to the product. Some nanomaterials such as nano-silver, nano-titanium dioxide, nano-copper oxide, carbon nanotubes and nano-magnesium oxide can provide antimicrobial properties.
- **Improved packaging** - To improve humidity resistance of packaging, temperature, and gas barrier, nanoparticles are combined with polymer chain as well as, temperature, humidity resistance of packaging. The United States Food and Drug Administration has approved the use of nanocomposite in contact with food.
- **Smart/Intelligent packaging** - This is designed for sensing microbial or biochemical changes in the food. It can detect the development of pathogens in the food. Some smart packaging has been developed to use as a tracing device for food safety. Currently, British Airways, MonoPrix supermarket, and Nestle are using chemical sensors, which can quickly detect colour change.

Benefits

Nano-sensors which are used in food packaging industries include electronic noses,

nanoparticles-based sensors, nano-cantilevers, array biosensors, nano-test strips and nanoparticle in solution.

Packaging with nano-sensors is helpful to identify internal and external conditions of food, and containers throughout the supply chain. Also, in plastic packaging, nano-sensors can detect gases in food when it spoils and as a result packaging changes the colour to alert the consumer.

Films, which are packed with silicate nano-particles can lessen the flow of oxygen into the pack and leaking of moisture out of the pack. As a result, it protects the package from spoilage. Packaging waste associated with processed food can be reduced by nanotechnology and hence assist the preservation of fresh food.

Nanotechnology is used to produce smart packaging for extending the shelf life of a product and the product can be transported further.

The antimicrobials and nano-sensors are developed in smart packaging to detect spoilage of food and release nano antimicrobials to extend shelf life. It helps supermarkets and hypermarkets to keep food fresh for longer period.

Reference : <http://www.fbnnews.com/Technology/nanotech-for-food-packaging-to-increase-15-as-a-result-of-developments-71764>