



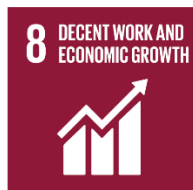
**Ministry of Higher Education, Science and Innovation
of the Republic of Uzbekistan
Tashkent Institute of Chemical Technology**

“WOMEN IN STEM”

**XALQARO FORUM ILMIY ISHLAR TO'PLAMI
TOSHKENT, 2023-yil, 10-14-FEVRAL**

**RESEARCH PROCEEDINGS OF INTERNATIONAL FORUM
TASHKENT, FEBRUARY 10 – 14, 2023**

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“WOMEN IN STEM” at Tashkent Institute of Chemical Technology



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APPLICATION OF NANOTECHNOLOGY IN FOOD PROCESSING AND PACKAGING

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Abstract: Nanotechnology comprises the wide-ranging application in food industries, such as packaging, and processing of food materials at the nanometer scale. The exploration of nanostructured materials in food industries are continue for processing and packaging purposes. Existing finding methods for food processing and packaging are expensive and time-taking and needs innovative technologies. Novelties in, nano-processing, and nano-packaging, are the current developments in the food sector. The amalgamation of nanotechnology with the food engineering industries and food packing industries now improved the excellence of foodstuff. The newest noteworthy investigation and improvement in the application of nanostructured-dependent packing of food items and processing is an antimicrobial application to detect spoilage and prevent food. Nanostructured materials are now striking findings in food packing systems as their enhanced useful properties like mechanical strength and barricading properties even own antimicrobic and antioxidant actions to preserve the excellence and range the shelf life in numerous food applications. Numerous nanostructured materials (silicate nano clay, metal oxide nanostructures, and polymer-based nanocomposites) are now involved in food packing systems. This Article will highlight the current nanostructured material in packaging and food processing applications together with food safety.

Keywords: Nanostructured materials; food preservations; active packing; smart packing.

1. Introduction

Nanotechnology comprises the manufacture and processing of materials at the nanometer scale. Nanotechnology permits the expansion of novel techniques to fabricate novel products and processes for miscellaneous industries together with manufacturing, microelectronics, manufacturing, broadcastings, drug, farming, makeup industries, and foodstuff [1]. Although, In the food industry, the reimbursements of nanotechnology grasp new ideas and promises for the progress of innovative useful materials, novel product development tactics, and innovative instrumentation for foodstuff protection and biosecurity as depicted in **Fig. 1**. Food technology is one of the developing sectors where nanotechnology plays a significant role. Nanotechnology describes generally two forms of nanofood applications: the first one is food processing (nano inside) and the second one is food packaging (nano outside) [2]. Additionally, for food packaging, the key role of nanotechnologies is to specify spoilt ingredients or usually upsurge foodstuff quality, by stopping gas flow in foodstuff wrapping. Nanotechniques can be used in the food industries and processing technologies as an innovative pathogen recognition gadget, illness treatment, novel food transport approaches food wrapping systems [3]. The review encompasses a literature assessment from indexing databases like SCOPUS, Web of Science, and PubMed and concluded different applications of nanostructured materials in food packaging and processing.

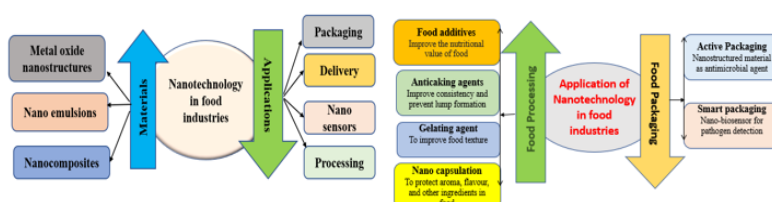


Fig.1 Incorporation of nanotechnology with food industries

2. Scope of the nanostructured materials in food industries

The scope of Nanotechnology in the extent of food packing and processing holds new probabilities for enhancing its functionality and efficiency [4]. A few points are mentioned in favor of the scope of nanotechnology for food processing and packaging;

- Nanostructured materials such as organic and Inorganic nano additives are used in food materials.
- Antimicrobial hygiene coatings were also done with nanostructured materials for foodstuffs.
- Nanostructured materials also can detect pathogens in food, drinks, and Sweets.

3. Applications of nanotechnology in food industries

At present, nanotechnology in the food industry supports and improves the protection of foodstuffs via pathogens and contaminant detection, and by providing information on nutritional status. Nanotechnology in food packaging can potentially describe how food is packaged and processed. A few points in favor are discussed below;

3.1 Nanostructured materials for food packaging applications

Food packaging expertise is the most auspicious advantage of nanotechnology in the food manufacturing business [5-6]. Mainly 2 tactics used namely smart packaging and active packing are discussed below;

3.1.1 Smart Packaging

Packaging that integrates nanostructured materials can be “smart,” stats that it can respond to ecological circumstances or, self-repair or aware a customer of infectious foodstuff and/or the occurrence of bacterial contaminants. Main ly nano clay is distributed all over the plastic and is capable to block O₂, CO₂, and humidity from fresh non-vegies or some other foods materials [5].

3.1.2 Active packaging

Using nano techniques to progress antimicrobial packaging and “Active Packaging” Kodak, the company uses nanotechnology to produce antimicrobial packaging and generate rooted sensors in food packaging called “Electronic Tongue”. These sensors can detect contaminants in foodstuffs and aware the customer, if food has become contaminated or if it has started to spoil [6].

3.2 Nanostructured materials for food processing applications

In food processing, nanostructured materials are now utilized as nano-additives, anti-caking agents, antimicrobial negotiators, and also enhancing the mechanical strength and sturdiness of the packing material]. Nanomaterials in food processing are discussed below;

3.2.1 As Nano additives

These nano additives improve the flavors, nutritious value, and preoccupation of components in the body due to their large surface area. Food additives containing nanoparticles include metal oxide nanostructures such as ZnO, TiO₂, Ag₂O, CuO, etc [7].

3.2.2 As an Anticaking agent

Nano-structured anti-caking agents are vigorous in increasing the storage life of foodstuff because they enhance the surface area, and consequently, are added to foods present in powder form such as; salt, vegetable powder, egg powder, creamer, coffee powder, etc. [8].

3.2.3 As a Gelating agent

Food processing methodologies that have the involvement of nanostructured materials as viscosifying agents and nanostructured gelating agents are used as edibles covering to retain fresh foods fresh for a long period [9].

3.2.4 Nanoencapsulation

The nanoencapsulation includes the microdispersion of nanostructured materials on food surfaces. The encapsulation coating is made up of nanostructured materials and acts as a defensive layer on the foodstuffs; such as liposomes being delivery vectors for hydrophobic molecules [10].

4. Conclusion

The profits of nanotechnology used by the food manufacturing industries are numerous in numbers and are predictable to boom. These new, speedily emerging nano tactics influence every single part of the food organization from manufacture to processing, packaging, and even increasing shelf life and bioavailability. Public acceptance of foodstuffs and food-related items containing nanostructured materials will depend on their safety and quality. A uniform international regulatory framework for nanotechnology in food is a must such as Fssai registration.

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