



## Fundamental Approaches to Food Processing Nanotechnology

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### DESCRIPTION

Nanotechnology is one of the promising areas to increase the availability of food and to develop new products for beneficial purposes in agriculture, food, water, the environment, medicine, energy, and electronics. Growing productivity and decreasing post-harvest expenditures may be the greatest answers, with the help of new technical investigations using nanotechnology and biotechnology in foodstuffs. Nano materials in agriculture are being used to reduce the quantity of dispersed pesticides, limit nutrient losses in fertilization, and boost yield through pest and nutrient management, to a few emerging fields. Food nanotechnology comprises the application of Nano carrier methodologies to strengthen the bioactive ingredients to modify their biological accessibility and barrier against several chemical or environmental variations. It induces better sensory characteristics like color, flavor, and texture and enhances reliability in food. It also improved the biological convenience of nutraceuticals.

### Fundamentals of nanotechnology

Nanotechnology means the “synthesis, designing, characterizing, and utilization of assemblies, tools, and systems directing the morphology and size variation at nanometer level from 1-100 nm”. For your reference, one nanometer scale means one-billion ( $10^9$ ) of part of one meter which implies that the application of the technology at this size. Nano science and nanotechnologies considered as innovative attitudes in developmental research related to the learning of marvels and operation of substance at atomic, molecular, or macromolecular levels, at which stage their characteristics differ significantly from those at the bulk level. The biological, chemical, and physical properties of the resultant products differ significantly from those of the bulk material. The research of qualities at the Nano scale results in changing properties that can be exploited to create innovative materials with modified structures, better tools, and more efficient products.

At the Nano scale, the diverse revealed features of materials supplied new properties such as increased strength, enhanced

optical capabilities, modified antibacterial potential, and exceptional superconductive nature. Nanotubes, nanoparticles, Nano fibers, fullerenes, Nano sheets, and Nano whiskers are some of the shapes they can take. A nanomaterial is defined as “natural, accidental, or industrial material having particles, in an unbound condition or in the shape of aggregate,” according to a published European Commission (EC) guideline.

### Approaches of nanotechnology

Nanotechnology can be applied two opposite approaches that are “bottom-up” or “top-down” approach even in food technology. The top-down approach can be employed the physical method undertaken for food and agriculturally based materials. Nano scale materials are created size reduction of bulk precursors, milling method, nanolithography, precision engineering on a commercial scale at the moment. The antioxidant capabilities of green tea can be improved by using top-down approaches. According to a study, powdered green tea with a particle size of 1000 nm has a stronger ability to digest nutrients, resulting in an increased ability for the dismutase enzyme to remove oxygen and hence increased antioxidant activity. The top-down approach can enhance the antioxidant properties of green tea size decreasing.

### Nano technology in food processing

The food corporations are searching to improve food competency, safety, value, and nutritional characteristics. New technologies are required for food industries to enhance productivity, market price, and quality. Plentiful uses of nanotechnology regarding food production and processing are developed including Nano based food additives, Nano sensors, nanoparticles-based smart distribution systems, Nano-packing, plus medicines, and health care. Its applications are also for encapsulation formation, biopolymer matrices, emulsions, simple solutions, and associated colloids offer effective delivery systems. Industrial food processing by nanotechnology is gaining momentum particularly, for flavor encapsulation or odor enhancement, modification of food texture or value improvement, newer gelation or viscosity increasing agents. Food

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nanotechnology emphasizes the synthesis of nanometer-scale structures with exclusive properties be used for different purposes, such as delivery arrangements, food interaction

surfaces having exclusive superficial properties, devices for food characterization, microfluidic instruments, sensor technology, and Nano technology.