



# Nanotechnology Applications in Food

Flavor, Stability, Nutrition and Safety

Alexandra Elena Oprea

Alexandru Mihai Grumezescu



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# Foreword

Nanoscience and nanotechnology are concerned with the design, fabrication, characterization, and exploitation of the newly occurred properties of materials at nanoscale level (i.e., less than 100 nm in size) to make them suitable for different practical applications. Nanotechnology is emerging today in all fields of human activity, including food industry. Nanotechnology brings an essential contribution in different steps of the food chain: (1) ensuring food quality through contributions to the development of new pesticides; agrichemical delivery and evaluation of soil quality; identity preservation; design of different food ingredients with improved activity at minimal concentration; development of advanced formulation, transport, release, and stabilization nanosystems for different food components or additives that could influence the product shelf life, texture, flavor, and nutrient composition; manipulating the food content at nanoscale levels to modify its organoleptic properties or nutritive composition to meet consumers' preferences; and development of novel methods for eliminating contaminants (e.g., filter membranes) without affecting the nutrient content of the food; (2) improving the food production yield by offering nanostructured supports for different enzymes used in food technology; (3) evaluating food quality and safety by the development of advanced microscopic methods and other tools to study the food nanostructure; development of sampling systems and nanosensors to detect different types of biological or chemical contaminants in food; and development of self-cleaning materials to be used in food industry; and (4) in food processing and packaging by developing fully biodegradable and nontoxic materials to control gas diffusion and extend the lifetime of various food products by preventing microbial contamination of food during processing, storage, and transport or to disinfect food processing surfaces and by developing novel encapsulation and packaging nanomaterials.

However, the rapid progress of nanotechnology applications in the food industry requires the simultaneous development of appropriate regulations and methods for testing the safety of nanomaterials and evaluating the potential risks of exposure in relation with human health and with the environmental quality and reexamination of generally recognized as safe (GRAS) list of nanoscaled food components. This will also contribute to the consumers' trust in such novel products.

Through the careful selection of the chapters included in this volume, it will bring an important contribution to the understanding of the importance of nanotechnology for the agro-food sector; to improve the knowledge of the present results and applications already developed, particularly in the food packaging and food safety fields; and for highlighting emerging advancements in the food industry.

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