

The Microwave Processing Of Foods Woodhead Publishing Series In Food Science Technology And Nutrition

Food process engineering, a branch of both food science and chemical engineering, has evolved over the years since its inception and still is a rapidly changing discipline. While traditionally the main objective of food process engineering was preservation and stabilization, the focus today has shifted to enhance health aspects, flavour and taste, nutrition, sustainable production, food security and also to ensure more diversity for the increasing demand of consumers. The food industry is becoming increasingly competitive and dynamic, and strives to develop high quality, freshly prepared food products. To achieve this objective, food manufacturers are today presented with a growing array of new technologies that have the potential to improve, or replace, conventional processing technologies, to deliver higher quality and better consumer targeted food products, which meet many, if not all, of the demands of the modern consumer. These new, or innovative, technologies are in various stages of development, including some still at the R&D stage, and others that have been commercialised as alternatives to conventional processing technologies. Food process engineering comprises a series of unit operations traditionally applied in the food industry. One major component of these operations relates to the application of heat, directly or indirectly, to provide foods free from pathogenic microorganisms, but also to enhance or intensify other processes, such as extraction, separation or modification of components. The last three decades have also witnessed the advent and adaptation of several operations, processes, and techniques aimed at producing high quality foods, with minimum alteration of sensory and nutritive properties. Some of these innovative technologies have significantly reduced the thermal component in food processing, offering alternative nonthermal methods. Food Processing Technologies: A Comprehensive Review covers the latest advances in innovative and nonthermal processing, such as high pressure, pulsed electric fields, radiofrequency, high intensity pulsed light, ultrasound, irradiation and new hurdle technology. Each section will have an introductory article covering the basic principles and applications of each technology, and in-depth articles covering the currently available equipment (and/or the current state of development), food quality and safety, application to various sectors, food laws and regulations, consumer acceptance, advancements and future scope. It will also contain case studies and examples to illustrate state-of-the-art applications. Each section will serve as an excellent reference to food industry professionals involved in the processing of a wide range of food categories, e.g., meat, seafood, beverage, dairy, eggs, fruits and vegetable products, spices, herbs among others.

Ohmic heating provides rapid and uniform heating, resulting in less thermal damage than conventional heating and allowing manufacturers to obtain high-quality products with minimum sensorial, nutritional, and structural changes. Ohmic Heating in Food Processing covers several aspects of Ohmic heating: science and engineering, chemistry and physics, biochemistry and nutrition, quality and safety, and development and technology, both basic and applied. It describes the importance of Ohmic technology and how to implement it in practice, addressing basic theory, principles, and applications. Divided into nine sections, this volume covers the basics of Ohmic heating, including a historic overview and fundamental principles; electrical conductivity, its importance, factors that influence it, and data modeling; biological effects of electricity on foods and food components, including microorganisms, enzymes, proteins, carbohydrates, and fats; and Ohmic heating behavior and design parameters. The book also deals with issues in Ohmic heating equipment, Ohmic heating modeling issues, and process validation issues. The authors discuss various applications of Ohmic heating applied to different classes of foods, such as muscle foods (meat, poultry, and fish), dairy products, fruits, and vegetables. They also examine commercially successful applications of food products processed by Ohmic heating and considers applications of Ohmic heating where preservation is not the main focus, for example, blanching, Ohmic thawing, and the potential for Ohmic heating for long-duration space missions.

Microwave heating has found many applications ranging from the microwave ovens in kitchen to heat food, to a sterilization apparatus for medical treatment, to materials processing in the various fields. In those applications, microwave heating demonstrates significant advantages over conventional methods in reduced processing time and less environmental impacts. This book is comprised of eight chapters within three parts highlighting different aspects covering both the basic understandings and the advanced applications. The included discussion on the application of microwave heating in the field of food-, chemical engineering-, agricultural-, forestry- and mineral processing industry will provide a passage for future research. As a monograph, it is designed to be a fundamental reference book, aiming to help the readers to concentrate on the key aspects behind the success in microwave heating.

The efficient design of microwave food products and associated packaging materials for optimum food quality and safety requires knowledge of product dielectric properties and associated heating mechanisms, careful consideration of product geometry, knowledge of modern packaging and ingredient technologies, and application of computer simulation, statistics and experimental design. Integrated knowledge and efficient application of these tools is essential for those developing food products in this demanding field. Development of packaging and products for use in microwave ovens provides a focused and comprehensive review for developers. Part one discusses the principles of microwave heating and ovens, with an emphasis on the effect of food dielectric properties and geometry on heating uniformity and optimising the flavours and colours of microwave foods. Microwave packaging materials and design are discussed in Part two; chapters cover rigid packaging, susceptors and shielding. Product development, food, packaging and oven safety is the topic of Part three. Computer modelling of microwave products and active packaging is discussed in Part four. Written by a distinguished team of international contributors, Development of packaging and products for use in microwave ovens is a valuable resource for those in the food and packaging industries. Comprehensively reviews the principles of microwave heating and ovens assessing the effect of food dielectric properties on heating uniformity Thoroughly reviews

microwave packaging materials and design including testing and regulatory issues Features a seven page section of colour diagrams to show heat distributions

Development and Validation of Processes for Continuous Flow Microwave Processing of Foods Containing Sweetpotato Particulates

An Annotated Bibliography on Microwaves

Electromagnetic Technologies in Food Science

Heat Transfer in Food Processing

Food Safety, Quality, and Manufacturing Processes

Handbook of Microwave Technology for Food Application

"Integrates principles of electromagnetics, dielectrics, heat and moisture transfer, packaging, solid mechanics, fluid flow, food chemistry, and microbiology to provide a comprehensive overview of microwave processing in a single accessible source."

The food industry has utilized automated control systems for over a quarter of a century. However, the past decade has seen an increase in the use of more sophisticated software-driven, on-line control systems, especially in thermal processing unit operations. As these software-driven control systems have become more complex, the need to validate their operation has become more important. In addition to validating new control systems, some food companies have undertaken the more difficult task of validating legacy control systems that have been operating for a number of years on retorts or aseptic systems. Thermal Processing: Control and Automation presents an overview of various facets of thermal processing and packaging from industry, academic, and government representatives. The book contains information that will be valuable not only to a person interested in understanding the fundamental aspects of thermal processing (eg graduate students), but also to those involved in designing the processes (eg process specialists based in food manufacturing) and those who are involved in process filing with USDA or FDA. The book focuses on technical aspects, both from a thermal processing standpoint and from an automation and process control standpoint. Coverage includes established technologies such as retorting as well as emerging technologies such as continuous flow microwave processing. The book addresses both the theoretical and applied aspects of thermal processing, concluding with speculations on future trends and directions.

Thermal processing remains one of the most important processes in the food industry. Now in its second edition, Thermal Food Processing: New Technologies and Quality Issues continues to explore the latest developments in the field. Assembling the work of a worldwide panel of experts, this volume highlights topics vital to the food industry today and Heat Transfer is important in food processing. This edited book presents a review of ongoing activities in a broad perspective.

Engineering Fundamentals for the Food Scientist

Electromagnetic and Thermal Studies of Microwave Processing of Foods

Radio-Frequency Heating in Food Processing

Food Properties and Computer-Aided Engineering of Food Processing Systems

Continuous Flow Processing of Foods Using Cylindrical Applicator Microwave Systems Operating at 915 MHZ.

New Technologies and Quality Issues, Second Edition

Food processing technologies are an essential link in the food chain. These technologies are many and varied, changing in popularity with changing consumption patterns and product popularity. Newer process technologies are also being evolved to provide the added advantages. Conventional and Advanced Food Processing Technologies fuses the practical (application, machinery), theoretical (model, equation) and cutting-edge (recent trends), making it ideal for industrial, academic and reference use. It consists of two sections, one covering conventional or well-established existing processes and the other covering emerging or novel process technologies that are expected to be employed in the near future for the processing of foods in the commercial sector. All are examined in great detail, considering their current and future applications with added examples and the very latest data. Conventional and Advanced Food Processing Technologies is a comprehensive treatment of the current state of knowledge on food processing technology. In its extensive coverage, and the selection of reputed research scientists who have contributed to each topic, this book will be a definitive text in this field for students, food professionals and researchers.

Reflecting current trends in alternative food processing and preservation, this reference explores the most recent applications in pulsed electric field (PEF) and high-pressure technologies, food microbiology, and modern thermal and nonthermal operations to prevent the occurrence of food-borne pathogens, extend the shelf-life of foods, and improve

The development of radar and concomitant observations on the heating effects of microwaves on biological materials have resulted in research programs directed toward developing sources of microwave energy and applying it to food processing. Numerous articles have appeared on the basic properties, modes of action, and applications of microwaves to food processing since about 1944; however, the development of continuous tunnels for processing around 1962 has generated more extensive and definitive articles in the field. This annotated bibliography covers more than 600 articles (including patents), which have been previously scattered throughout the food science literature. The abstracts are cross-indexed by author and by subject and are arranged alphabetically under the following categories: Books, Review Articles, and Announcements; Biological Effects of Microwaves, Personnel Safety, Measurement of Low Doses, Etc.; Dielectric Properties of Foods and Biological Materials and Their Measurement; Microwave Equipment—Power Sources, Ovens, Wave Guides, Tunnels, Etc.; and Applications, which include cooking and catering, general processing, sterilization and pasteurization, blanching and enzyme inactivation, packaging for microwave processing, baking, defrosting of frozen foods, freeze dehydration, dehydration, insect control, and special techniques for processing poultry, potato chips, and precooked bacon.

Authored by world experts, the Handbook of Food Processing, Two-Volume Set discusses the basic principles and applications of major commercial food processing technologies. The handbook discusses food preservation processes, including blanching, pasteurization, chilling, freezing, aseptic packaging, and non-thermal food processing. It describes com

A Tutorial

Ohmic Heating in Food Processing

Advantages and Challenges

Advances in Bioprocessing Engineering
Microwave Chemical and Materials Processing
Control and Automation

This is the latest and most authoritative documentation of current scientific knowledge regarding the health effects of thermal food processing. Authors from all over Europe and the USA provide an international perspective, weighing up the risks and benefits. In addition, the contributors outline those areas where further research is necessary. Power absorption in materials showed strong dependence on its volume and properties. When two materials of different properties are heated simultaneously, their relative power absorption follows the same trend as when heated separately.

This text comprehensively covers novel, innovative technologies used in the food and beverage industries in order to provide safe and healthy foods for consumers. The research provided in these chapters aims to show that the traditional pasteurization and commercial sterilization of foods result in unacceptable quality and nutrient retention, creating an important need for alternative methods used to minimize undesirable reactions such as thermal decomposition or degradation. Emerging processing methods to minimize heat induced alterations in foods and their applications are covered in-depth, demonstrating that these methods are useful not only for the inactivation of microorganisms and enzymes but also for improving the yield and development of ingredients and marketable foods with higher quality and better nutritional characteristics. Effect of Emerging Processing Methods on the Food Quality: Advantages and Challenges not only covers the advantages of using innovative processing methods, but also the disadvantages and challenges of using these techniques on food quality. Each chapter focuses on a different emerging processing technique, breaking down the sensory, textural and nutritional aspects for different food products in addition to the advantages and challenges for each method. New technologies and advanced theories are a major focus, pointing to innovative new paths for the quality and safety assurance in food products. From pulsed electric fields to ultrasounds, this work covers all aspects of emerging processing techniques for fruits and vegetables, foods and dairy products. A comprehensive review of the many new developments in the growing food processing and packaging field Revised and updated for the first time in a decade, this book discusses packaging implications for recent nonthermal processing technologies and mild food preservation such as high pressure processing, irradiation, pulsed electric fields, microwave sterilization, and other hurdle technologies. It reviews typical nonthermal processes, the characteristics of food products after nonthermal treatments, and packaging parameters to preserve the quality and enhance the safety of the products. In addition, the critical role played by packaging materials during the development of a new nonthermal processed product, and how the package is used to make the product attractive to consumers, is discussed. Packaging for Nonthermal Processing of Food, Second Edition provides up to date assessments of consumer attitudes to nonthermal processes and novel packaging (both in the U.S. and Europe). It offers a brand new chapter covering smart packaging, including thermal, microbial, chemical, and light sensing biosensors, radio frequency identification systems, and self-heating and cooling packaging. There is also a new chapter providing an overview of packaging laws and regulations in the United States and Europe. Covers the packaging types required for all major nonthermal technologies, including high pressure processing, pulsed electric field, irradiation, ohmic heating, and others Features a brand new chapter on smart packaging, including biosensors (thermal-, microbial-, chemical- and light-sensing), radio frequency identification systems, and self-heating and cooling packaging Additional chapters look at the current regulatory scene in the U.S. and Europe, as well as consumer attitudes to these novel technologies Editors and contributors bring a valuable mix of industry and research experience Packaging for Nonthermal Processing of Food, Second Edition offers many benefits to the food industry by providing practical information on the relationship between new processes and packaging materials, to academia as a source of fundamental knowledge about packaging science, and to regulatory agencies as an avenue for acquiring a deeper understanding of the packaging requirements for new processes.

Potential Health Benefits and Risks

Green Food Processing Techniques

Preservation, Transformation and Extraction

Effect of Emerging Processing Methods on the Food Quality

Conventional and Advanced Food Processing Technologies

Packaging for Nonthermal Processing of Food

Green Food Processing Techniques: Preservation, Transformation and Extraction advances the

ethics and practical objectives of "Green Food Processing" by offering a critical mass of research on a series of methodological and technological tools in innovative food processing techniques, along with their role in promoting the sustainable food industry. These techniques (such as microwave, ultrasound, pulse electric field, instant controlled pressure drop, supercritical fluid processing, extrusion...) lie on the frontier of food processing, food chemistry, and food microbiology, and are thus presented with tools to make preservation, transformation and extraction greener. The Food Industry constantly needs to reshape and innovate itself in order to achieve the social, financial and environmental demands of the 21st century. Green Food Processing can respond to these challenges by enhancing shelf life and the nutritional quality of food products, while at the same time reducing energy use and unit operations for processing, eliminating wastes and byproducts, reducing water use in harvesting, washing and processing, and using naturally derived ingredients. Introduces the strategic concept of Green Food Processing to meet the challenges of the future of the food industry Presents innovative techniques for green food processing that can be used in academia, and in industry in R&D and processing Brings a multidisciplinary approach, with significant contributions from eminent scientists who are actively working on Green Food Processing techniques

Thermal technologies have long been at the heart of food processing. The application of heat is both an important method of preserving foods and a means of developing texture, flavour and colour. An essential issue for food manufacturers is the effective application of thermal technologies to achieve these objectives without damaging other desirable sensory and nutritional qualities in a food product. Edited by a leading authority in the field, and with a distinguished international team of contributors, Thermal technologies in food processing addresses this major issue. Part one of the collection begins with reviews of conventional retort and continuous heat technologies. Part two then looks at the key issues of effective measurement and control in ensuring that a thermal process is effective whilst minimising any undesirable changes in a food. There are chapters on temperature and pressure measurement, validation of heat processes, modelling and simulation of thermal processes, and the measurement and control of changes in a food during thermal processing. The final part of the book looks at emerging thermal technologies which becoming more widely used in the food industry. There are chapters on radio frequency heating, microwave processing, infrared heating, instant and high-heat infusion, and ohmic heating A final chapter considers how thermal processing may be combined with high pressure processing in producing safe, minimally-processed food products. Thermal technologies in food processing provides food manufacturers and researchers with an authoritative review of thermal processing and food quality.

The second edition of Emerging Technologies in Food Processing presents essential, authoritative, and complete literature and research data from the past ten years. It is a complete resource offering the latest technological innovations in food processing today, and includes vital information in research and development for the food processing industry. It covers the latest advances in non-thermal processing including high pressure, pulsed electric fields, radiofrequency, high intensity pulsed light, ultrasound, irradiation, and addresses the newest hurdles in technology where extensive research has been carried out. Provides an extensive list of research sources to further research development Presents current and thorough research results and critical reviews Includes the most recent technologies used for shelf life extension, bioprocessing simulation and optimization

Physical and chemical interactions between various constituents resulting from processing operations often lead to physical, sensory, and nutritional changes in foods. Combining important information on processing and food quality, Physicochemical Aspects of Food Engineering and Processing describes the effects of various processing technologies on quality changes of different major foods in an integrative manner. Written by Physicochemical Experts in Food Engineering & Processing Part I critically reviews the physicochemical property changes of different foods undergoing selected processes, such as microencapsulation, frying, microwave-assisted thermal processing, high-pressure processing, pulsed electric field processing, and freezing. This section also includes a chapter on the effects of various processing technologies on microbial growth and inactivation. Part II focuses on multiphase food systems made of proteins, seafoods, red meats, and pet foods, and the physicochemical changes they undergo when being processed. Physicochemical Aspects of Food Engineering and Processing covers the engineering, processing, and quality angles equally. It is an extremely useful resource for academic and industrial researchers seeking an up-to-date overview of the increasingly important combination of both sides of food research and development.

The Development and Application of Microwave Heating

**Microwave Cooking and Processing
Handbook of Food Processing, Two Volume Set
Their Properties, Production, and Applications to Food Processing
A Comprehensive Review
Principles and Applications**

Microwave heating of foods is a proven and mature technology for household applications. However, industrial applications of microwave heating of food and biomaterials are scarce, due to the lack of suitable equipment and research on the subject. Aseptic processing and packaging of foods offers products of high quality with long shelf life. Aseptic processing of low thermal diffusivity and high viscosity food and bio products can lead to diminishing the quality of such products due to long exposures to high temperatures. Industrial Microwave Systems (Morrisville, NC) invented a system that allows continuous flow microwave heating of foods in industrial scale, by focusing the microwave energy in a specially designed cavity. Food products can be pumped through a microwave transparent tube located in the focused area of the cavity and be heated with short time exposure to the microwave energy. Cooperation between Industrial Microwave System and North Carolina State University started this research. This research evaluated the feasibility to use IMS microwave focused cylindrical applicators, operating at 915 MHz, for continuous flow aseptic processing of fluid food materials. In order to evaluate the feasibility of using continuous flow microwave heating system to process food products, a protocol to determine this feasibility was devised. Among other findings in this study the following are noteworthy; a method to determine the temperature profile within a cross sectional area of the tube; a method to predict feasibility of a product to be processed by measuring its dielectric properties; and testing sequence to scale-up from bench-top to industrial scale operation were defined. The findings of this work, and the methodologies developed can be of use to designers and processors alike to expand the use of this technology in the food and bio process industries. The preservation processes for foods have evolved over several centuries, but recent attention to non-thermal technologies suggests that a new dimension of change has been initiated. The new dimension to be emphasized is the emerging technologies for preservation of foods and the need for sound base of information to be developed as inputs for systematic process design. The focus of the work is on process design, and emphasizes the need for quantitative information as inputs to process design. The concepts presented build on the successful history of thermal processing of foods and use many examples from these types of preservation processes. Preservation of foods by refrigeration, freezing, concentration and dehydration are not addressed directly, but many of the concepts to be presented would apply. Significant attention is given to the fate of food quality attributes during the preservation process and the concept of optimizing process parameters to maximize the retention of food quality. Focuses on Kinetic Models for Food Components Reviews Transport Models in Food Systems Assesses Process Design Models

This new volume, Emerging Thermal and Nonthermal Technologies in Food Processing, provides a comprehensive overview of thermal and nonthermal processing of food with new and innovative technologies.

The principal aim of this book is to introduce chemists through a tutorial approach to the use of microwaves by examining several experiments of microwave chemistry and materials processing. It will subsequently enable chemists to fashion their own experiments in microwave chemistry or materials processing. Microwave heating has become a popular methodology in introducing thermal energy in chemical reactions and material processing in laboratory-scale experiments. Several research cases where microwave heating has been used in a wide range of fields have been reported, including organic synthesis, polymers, nanomaterials, biomaterials, and ceramic sintering, among others. In most cases, microwave equipment is used as a simple heat source. Therefore the principal benefits of microwave radiation have seldom been taken advantage of. One reason is the necessity to understand the nature of electromagnetism, microwave engineering, and thermodynamics. However, it is difficult for a chemist to appreciate these in a short time, so they act as barriers for the chemist who might take an interest in the use of microwave radiation. This book helps to overcome these barriers by using figures and diagrams instead of equations as much as possible.

Development of Packaging and Products for Use in Microwave Ovens

Physicochemical Aspects of Food Engineering and Processing

Thermal Food Processing

A List of References

Microwaves - Their Commercial Applications, Properties and Effects

Thermal Processing of Foods

This book consists of peer-reviewed articles reporting on the latest developments in several food engineering and agricultural processing laboratories at US land-granted universities. The contributors are leading experts in their respective fields. The topics covered in the book include new food processing technologies (such as high voltage electric field processing and microwave sterilization/pasteurization), conversion of agricultural by-products into high quality refined cellulose or biodegradable plastics, and advances in machine vision inspection and sorting techniques for fruit and vegetable packaging lines. Each chapter begins with a general background review with important references, and ends with the latest results from each research laboratory.

Contents: Microwave Heating in Food Processing (J Tang et al.) Improving Safety and Quality of Orange Juice by Pulse Electric Field Processing (Q H Zhang et al.) High-Speed Machine Vision Inspection for On-Line Sorting of Fresh Fruit and Vegetables (Y Tao & Z Wen) Machine Vision Techniques for Defect Inspection on Fruit Packing Lines (Y Tao & Z Wen) Highly Refined Cellulose from Agricultural Fibrous By-Products (R R Ruan & P L Chen) Biodegradable Plastics from Renewable Biomaterials (S X Sun) Readership: Graduate students and advanced undergraduate students in food and bioprocessing engineering, researchers in related fields, government administrators, and businessmen in agriculture and food science, technology, engineering and business development. Keywords: Microwave; Pulse Electric Field; Sterilization; Pasteurization; Machine Vision; Sorting; Biomaterials, Refined Cellulose; Biodegradable Materials; Plastics; Microwave Heating; Dielectric Properties; Imaging Processing; Machine Vision; Color Sorting; Agricultural By-Products; Biopolymers; Biodegradable Plastics

Food properties, whether they concern the physical, thermodynamic, chemical, nutritional or sensory characteristics of foods, play an important role in food processing. In our quest to gain a mechanistic understanding of changes occurring during food processing, the knowledge of food properties is essential. Quantitative information on the food properties is necessary in the design and operation of food processing equipment. Foods, because of their biological nature and variability, vary in the magnitude of their properties. The variation in properties offer a challenge both in their measurement and use in the food processing applications. Often a high level of precision in measurement of properties is not possible as the measurement method may itself cause changes to the product, resulting in a variation in the obtained values. Recognizing the difficulties in measurement of food properties, and the lack of completeness of such information, several research programs have been in existence during the last two decades. In Europe, a multinational effort has been underway since 1978. The first project supported by COST (European Cooperation in the Field of Scientific and Technical Research), was titled COST 90 "The Effect of Processing on the Physical Properties of Foodstuffs". This and another project COST 90bis have considerably added to our knowledge of measurement

methods and data on a number of physical properties. Two publications that summarize the work conducted under 1 2 these projects are Physical Properties of Foods and Physical Properties of Foods .

Packed with case studies and problem calculations, Handbook of Food Processing: Food Safety, Quality, and Manufacturing Processes presents the information necessary to design food processing operations and describes the equipment needed to carry them out in detail. It covers the most common and new food manufacturing processes while addressing rele

Advances in Thermal and Non-Thermal Food Preservation provides current, definitive and factual material written by experts on different thermal and non-thermal food preservation technologies. Emphasizing inactivation of microorganisms through the application of traditional as well as newer and novel techniques and their combinations, the book's chapters cover: thermal food preservation techniques (e.g., retorting, UHT and aseptic processing), minimal thermal processing (e.g., sous-vide processing), and non-thermal food preservation techniques (e.g., high pressure processing and pulsed technologies).

Editors Tewari and Juneja give special emphasis to the commercial aspects of non-conventional food preservation techniques. As the most comprehensive and contemporary resource of its kind, Advances in Thermal and Non-Thermal Food Preservation is the definitive standard in describing the inactivation of microorganisms through conventional and newer, more novel techniques.

Handbook of Food Processing

Innovative Food Processing Technologies

Advances in Thermal and Non-Thermal Food Preservation

Thermal Technologies in Food Processing

Recent Developments and Applications

Novel Food Processing Technologies

The Microwave Processing of Foods, Second Edition, has been updated and extended to include the many developments that have taken place in the last 10 years. Including new chapters on microwave assisted frying, microwave assisted microbial inactivation, microwave assisted disinfection, it continues to provide the basic principles for microwave technology, while also presenting current and emerging research trends for future development. Led by an international team of experts, this book will serve as a practical guide for those interested in applying microwave technology.

Provides thoroughly up-to-date information on the basics of microwaves and microwave heating Discusses the main factors for the success of microwaves and the main problems that may arise Includes current and potential future applications for real-world application as well as new and advances Includes new chapters on microwave-assisted frying, microbial inactivation, and disinfection

A comprehensive source of in-depth information provided on existing and emerging food technologies based on the electromagnetic spectrum. Electromagnetic Technologies in Food Science examines various methods employed in food applications that are based on the entire electromagnetic spectrum. Focusing on recent advances and challenges in food science and technology, this is an up-to-date volume that features vital information from an international panel of experts who have shared both fundamental and advanced knowledge of information on the dosimetry methods and potential applications of gamma irradiation, electron beams, X-rays, radio and microwaves, ultraviolet, visible, pulsed light, and more. Organized in two parts, the text begins with an accessible overview of the physics of the electromagnetic spectrum, followed by discussion on the application of the spectrum to non-thermal food processing. The physics of infrared radiation, microwaves, and other advanced heating methods are then discussed in detail—supported by case studies and examples that illustrate a range of both current and potential applications of EM-based methods.

A section of the book describes analytical techniques adopted for quality control, such as hyperspectral imaging, infrared and Raman spectroscopy. This authoritative book resource: Covers advanced theoretical knowledge and practical applications on the use of EM spectrum as novel methods for food processing technology Discusses the latest progress in developing quality control methods, thus enabling the control of continuous fast processing Explores future challenges and benefits of employing electromagnetic spectrum in food technology applications Addresses emerging processing technologies related to improving safety, preservation, and overall quality of various food commodities Electromagnetic Technologies in Food Science is an essential reading material for undergraduate and graduate students, researchers, academics, and agri-food professionals working in the field of food preservation, novel food processing techniques and sustainable food production.

Radio-Frequency Heating in Food Processing: Principles and Applications covers the fundamentals of radio-frequency (RF) heating and the application of heating technologies in modern food processing, preservation, and related industries. Focusing on industrial and lab-scale applications where RF heating has been employed successfully or reported to have potential benefits over conventional heating options, this state-of-the-art reference work discusses similarities, differences, advantages, and limitations of RF and microwave heating as applied to agricultural products. Describes fiber-optic sensors and their utility in monitoring temperature during RF and microwave heating Discusses the dielectric and thermo-physical properties of agricultural products amenable to RF and microwave heating, presenting measurement techniques, mathematical concepts, and computational models Provides practical perspectives on industrial RF units used in manufacturing food products, addressing free-running oscillators and matching networks for RF heaters and applicators Uses finite-element formulations to determine design parameters including resonant modes, circuit impedance, and field distribution in RF applicators Examines RF-heating effects on microorganisms, enzymes, and food quality attributes for products such as beef, pork, eggs, fish, milk, fruits, vegetables, and seafood Explores RF-heating applications beyond food processing, such as agricultural pest deinfestation, waste treatment, counterfeit prevention, package tracking, and transportation of food from farm to table Radio-Frequency Heating in Food Processing: Principles and Applications supplies an in-depth overview of the fundamental science and engineering principles governing RF heating, as well as a solid understanding of industrial RF unit design options, challenges, and opportunities for development.

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Alternatives to Conventional Food Processing

Emerging Thermal and Nonthermal Technologies in Food Processing

Non-thermal Processing of Foods

The Microwave Processing of Foods

Thermal Processing of Food

Emerging Technologies for Food Processing

Food safety is a constant challenge for the food industry, and food irradiation technology has developed significantly since its introduction, moving from isotope irradiation to the use of electron beam technology. Electron Beam Pasteurization and Complementary Food Processing Technologies explores the application of electron beam pasteurization in conjunction with other food processing technologies to improve the safety and quality of food. Part one provides an overview of the issues surrounding electron beam pasteurization in food processing. Part two looks at different thermal and non-thermal food processing technologies that complement irradiation. Finally, a case study section on the commercial applications of e-beam processing provides examples from industry.

This book presents the latest developments in the area of non-thermal preservation of foods and covers various topics such as high-pressure processing, pulsed electric field processing, pulsed light processing, ozone processing, electron beam processing, pulsed magnetic field, ultrasonics, and plasma processing. Non-thermal Processing of Foods discusses the use of non-thermal processing on commodities such as fruits and vegetables, cereal products, meat, fish and poultry, and milk

and milk products. Features: Provides latest information regarding the use of non-thermal processing of food products Provides information about most of the non-thermal technologies available for food processing Covers food products such as fruits and vegetables, cereal products, meat, fish and poultry, and milk and milk products Discusses the packaging requirements for foods processed with non-thermal techniques The effects of non-thermal processing on vital food components, enzymes and microorganisms is also discussed. Safety aspects and packaging requirements for non-thermal processed foods are also presented. Rounding out coverage of this technology are chapters that cover commercialization, regulatory issues and consumer acceptance of foods processed with non-thermal techniques. The future trends of non-thermal processing are also investigated. Food scientists and food engineers, food regulatory agencies, food industry personnel and academia (including graduate students) will find valuable information in this book. Food product developers and food processors will also benefit from this book.

This multi-authored book is edited by an expert in the field and includes chapters from international contributors. It is fully cross disciplinary relating green principles to the food industry, covering legal and policy issues, engineering, food processing and food science. It addresses the alternatives to conventional food processing that have reduced energy requirements or solvent use and how they affect final food quality. Initially, the principles of green chemistry and technologies are outlined to provide a justification and basis for the processing methods that are addressed. This is followed by a discussion of legal and policy issues in both the EU and the US which provide further justification for the need for such technologies and the constraints and benefits of current policies and regulations. The major green technologies available to the food industry are discussed, outlining the main principles and applications of each. The degree to which they are already in commercial use and developments needed to extend their use further are also covered.

Food Preservation Process Design

Electron Beam Pasteurization and Complementary Food Processing Technologies

New Methods of Food Preservation