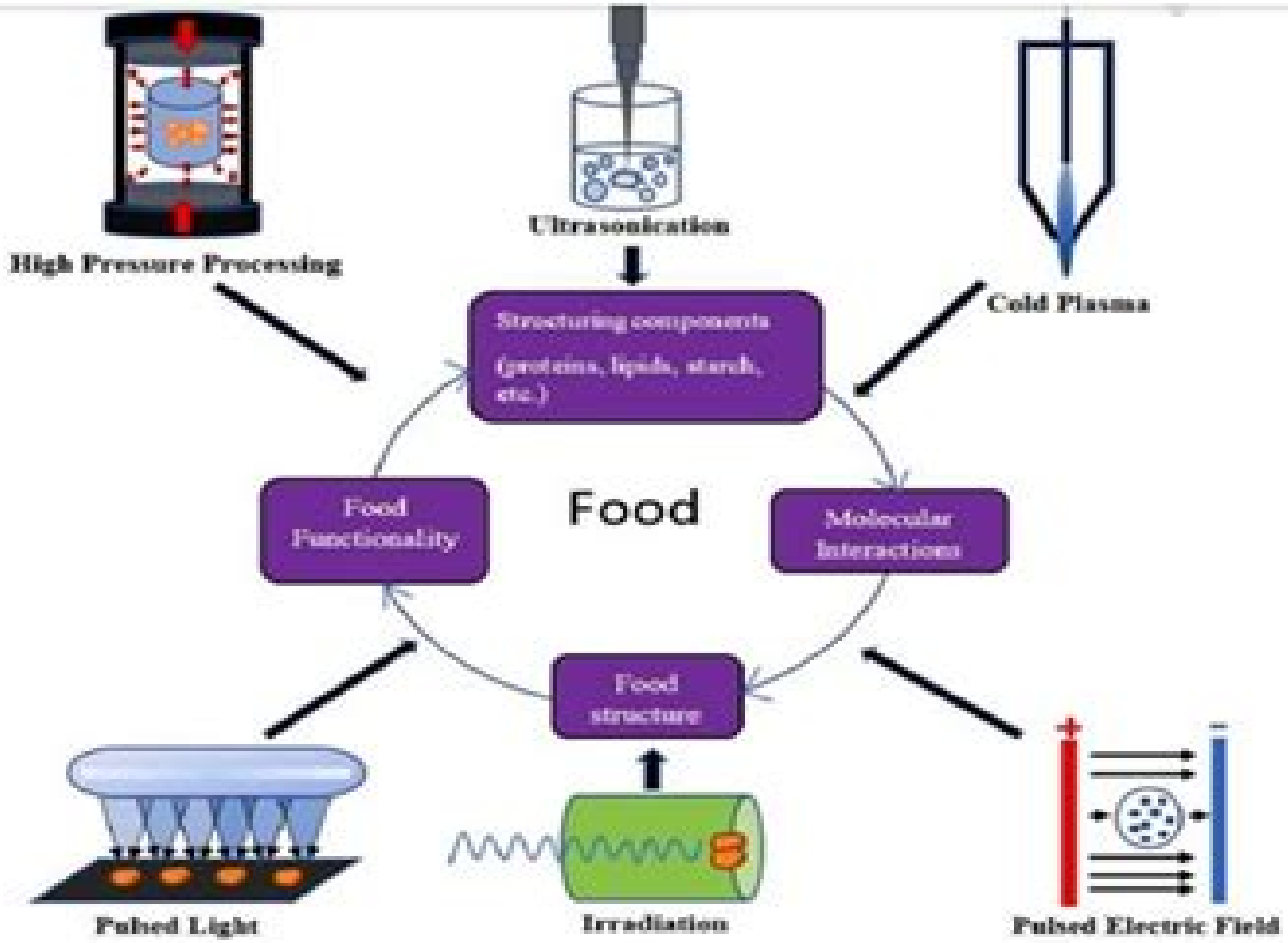

Fig 1: *The impact of different Non-Thermal Processing Technologies on foods.*

[Image Credit: Barbhuiya, R. I., Singha, P., & Singh, S. K. (2021). A comprehensive review on impact of non-thermal processing on the structural changes of food components. Food Research International, 149, 110647.]

Nonthermal Processing Technologies For Food

C. Anandharamakrishnan,V. R. Sinija,R. Mahendran

Nonthermal Processing Technologies For Food:

Nonthermal Processing Technologies for Food Howard Q. Zhang,Gustavo V. Barbosa-C¿novas,V. M. Balasubramaniam,C. Patrick Dunne,Daniel F. Farkas,James T. C. Yuan,2011-02-04 Nonthermal Processing Technologies for Food offers a comprehensive review of nonthermal processing technologies that are commercial emerging or over the horizon In addition to the broad coverage leading experts in each technology serve as chapter authors to provide depth of coverage Technologies covered include physical processes such as high pressure processing HPP electromagnetic processes such as pulsed electric field PEF irradiation and UV treatment other nonthermal processes such as ozone and chlorine dioxide gas phase treatment and combination processes Of special interest are chapters that focus on the pathway to commercialization for selected emerging technologies where a pathway exists or is clearly identified These chapters provide examples and case studies of how new and nonthermal processing technologies may be commercialized Overall the book provides systematic knowledge to industrial readers with numerous examples of process design to serve as a reference book Researchers professors and upper level students will also find the book a valuable text on the subject **Emerging Thermal and Nonthermal Technologies in Food Processing** Prem Prakash Srivastav,Deepak Kumar Verma,Ami R. Patel,Asaad Rehman Al-Hilphy,2020-05-06 This new volume provides a comprehensive overview of thermal and nonthermal processing of food with new and innovative technologies Recent innovations in thermal as well as nonthermal technologies which are specifically applied for potable water and fluid foods milk juice soups etc are well documented for their high bioavailability of macro and micronutrients and are very promising This volume brings together valuable information on fluid and microbial characteristics and quality dynamics that facilitate the adoption of new technology for food processing Some new technologies and methods covered include the application of microwaves in heating drying pasteurization sterilization blanching baking cooking and thawing microwave assisted extraction of compounds using low electric fields alternation of temperature and pressure of supercritical carbon dioxide ultrasound assisted osmotic dehydration hydrodynamic cavitation high pressure processing gamma irradiation and more The nonthermal technologies discussed have been developed as an alternative to thermal processing while still meeting required safety or shelf life demands and minimizing the effects on nutritional and quality attributes **Non-thermal Processing of Foods** O. P. Chauhan,2019-01-10 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 **Food Processing** Kshirod Kumar Dash,Sourav Chakraborty,2021-06-27 Non thermal operations in food processing are an alternative to thermal operations and similarly aimed at retaining the quality and organoleptic properties of food products This volume covers different non thermal processing technologies such as high pressure processing ultrasound ohmic heating pulse electric field pulse light membrane processing cryogenic freezing nanofiltration and cold plasma processing technologies The book focuses both on fundamentals and on recent advances in non thermal food processing technologies It also provides information with the description and results of research into new emerging technologies for both the academy and industry Key features Presents engineering focus on non thermal food processing technologies Discusses sub classification for recent trends and relevant industry information examples Different current research oriented results are included as a key parameter Covers high pressure processing pulse electric field pulse light technology irradiation and ultrasonic techniques Includes mathematical modeling and numerical simulations Food Processing Advances in Non Thermal Technologies is aimed at graduate students professionals in food engineering food technology and biological systems engineering

Non-Thermal Technologies for the Food Industry C. Anandharamakrishnan,V. R. Sinija,R. Mahendran,2024-02-29 Depending on the mechanisms involved in non thermal technologies such as ozonization irradiation ultrasound processing plasma processing and advanced oxidative processes interaction with food molecules differs which might lead to desirable reactions Non Thermal Technologies for the Food Industry Advances and Regulations explores the possibility of using non thermal technologies for various purposes such as shelf life extension reduced energy consumption adhesion and safety improvement Further it reviews the present status of these technologies international regulations and sustainability aspects in food processing including global case studies Features Provides a comprehensive overview of all the non thermal processing technologies that have potential for use within food manufacturing Covers novel disinfectant technologies and packaging methods for non thermal processing Includes electro spraying and electrospinning low temperature drying techniques cold plasma techniques hydrodynamic cavitation oscillating magnetic field processing and so forth Focus on topics such as the valorization of agri food wastes and by products and sustainability Reviews ClO2 in combined hybrid technologies for food processing This book is aimed at researchers and graduate students in food and food process

engineering **Food Processing** Kshirod Kumar Dash,Sourav Chakraborty,2021-08-09 Advances in thermal and non thermal food processing aims to discuss emerging trends based on the future scope and challenges and to explain uncertain challenges in food processing In thermal processing different operations in food engineering namely advance drying methods evaporation extrusion cooking different extraction techniques crystallizations are covered in terms food engineering and process modeling aspect For non thermal processing high pressure processing ultrasound ohmic heating pulse electric field pulse light technology osmotic dehydration and so forth are discussed Relevant mathematical modeling and numerical simulations has been included in every chapter Features Presents engineering focus on thermal and non thermal food processing technologies Discusses sub classification for recent trends and relevant industry information examples Describes advances in drying evaporation blanching crystallization and ohmic heating Covers high pressure processing pulse electric field pulse light technology irradiation and ultrasonic techniques Includes mathematical modeling and numerical simulations The book is aimed at graduate students professionals in food engineering and food technology biological systems engineering

Non-Thermal Processing of Functional Foods Sudip Kumar Pattanayek,Debashis Dutta,Ajay Singh,2024-12-31 Functional foods also known as nutraceuticals began to gain prominence in the 1980s in Japan as foods for specified health use and became more widely recognized in the 1990s as research and interest in foods that could provide specific health benefits beyond essential nutrition grew worldwide These foods are typically enriched with bioactive components or formulated to contain substances or live microorganisms with a possible health enhancing or disease preventing value and at a safe and sufficiently high concentration to achieve the intended benefit Usually the added ingredients are classified as nutrients dietary fiber phytochemicals other substances or probiotics The production storage and consumer consumption of these functional foods require special attention to preserve quality attributes The production process of these foods can be classified as conventionally used thermal processing methods and non thermal alternatives In addition these processes may be combined with biological approaches involving enzymatic treatment and fermentation The various non thermal processes such as ultrasounds high hydrostatic pressure vacuum impregnation high voltage electrical discharge cold plasma pulsed light ozonation etc can be utilized for a product to sustain preserve quality attributes of the ingredients long shelf life and sensory qualities This book compiles the latest non thermal processing technologies to develop functional foods The book discusses bioactivity bioaccessibility and bioavailability related to nutrition and functional food ingredients It has 16 articles on different aspects of non thermal processing technologies Chapter 1 has discussed a general overview of emerging technologies and various non thermal processing techniques are discussed in Chapters 2 6 8 9 and 12 Chapters 7 11 13 15 and 16 discuss food safety and preservation We have discussed the functional foods and bioactive compounds in Chapters 10 and 14 A few of these reviews discuss the impact of developing non thermal technologies on several food components proteins carbohydrates lipids minerals vitamins polyphenols glucosinolates fragrance compounds and enzymes while

maintaining the structure and functional properties This book is an excellent source of information for professionals postgraduate students and researchers in food sciences and chemical engineering **Non-Thermal Processing of Functional Foods** Sudip Kumar Pattanayek,Debashis Dutta,Ajay Singh,2024-12-31 Functional foods also known as nutraceuticals began to gain prominence in the 1980s in Japan as foods for specified health use and became more widely recognized in the 1990s as research and interest in foods that could provide specific health benefits beyond essential nutrition grew worldwide These foods are typically enriched with bioactive components or formulated to contain substances or live microorganisms with a possible health enhancing or disease preventing value and at a safe and sufficiently high concentration to achieve the intended benefit Usually the added ingredients are classified as nutrients dietary fiber phytochemicals other substances or probiotics The production storage and consumer consumption of these functional foods require special attention to preserve quality attributes The production process of these foods can be classified as conventionally used thermal processing methods and non thermal alternatives In addition these processes may be combined with biological approaches involving enzymatic treatment and fermentation The various non thermal processes such as ultrasounds high hydrostatic pressure vacuum impregnation high voltage electrical discharge cold plasma pulsed light ozonation etc can be utilized for a product to sustain preserve quality attributes of the ingredients long shelf life and sensory qualities This book compiles the latest non thermal processing technologies to develop functional foods The book discusses bioactivity bioaccessibility and bioavailability related to nutrition and functional food ingredients It has 16 articles on different aspects of non thermal processing technologies Chapter 1 has discussed a general overview of emerging technologies and various non thermal processing techniques are discussed in Chapters 2 6 8 9 and 12 Chapters 7 11 13 15 and 16 discuss food safety and preservation We have discussed the functional foods and bioactive compounds in Chapters 10 and 14 A few of these reviews discuss the impact of developing non thermal technologies on several food components proteins carbohydrates lipids minerals vitamins polyphenols glucosinolates fragrance compounds and enzymes while maintaining the structure and functional properties This book is an excellent source of information for professionals postgraduate students and researchers in food sciences and chemical engineering *Emerging Non-Thermal Food Processing Technologies* Asgar Farahnaky,Mahsa Majzoobi,Mohsen Gavahian,2024-01-11 There is a strong consumer trend towards high quality and healthy foods with fresh like characteristics On the other hand thermal processing technologies especially conventional ones negatively affect both the sensory and nutritional properties of foods At the same time limited shelf life and safety concerns of fresh foods necessitate food processing Therefore scientists are exploring the possibility of using nonthermal technologies for various purposes such as shelf life extension and safety improvement However their applicability and scalability are still under intensive investigation This reprint presents examples of studies in non thermal emerging food processing technologies It provides practical examples that can help graduate students further understand

the concepts involved in emerging non thermal technologies therefore it can be used as a teaching material reference in universities Moreover the benefits of these novel technologies highlighted in this reprint could be utilized by the food industry s R D to enhance academic industry collaborations and possible commercialization *Non-Thermal Processing Technologies for the Grain Industry* M. Selvamuthukumaran,2021-08-18 Food can rapidly spoil due to growth of microorganisms and traditional methods of food preservation such as drying canning salting curing and chemical preservation can affect the quality of the food Nowadays various non thermal processing techniques can be employed in grain processing industries to combat this They include pulsed electric field processing high pressure processing ultrasonic processing cold plasma processing and more Such techniques will satisfy consumer demand for delivering wholesome food products to the market Non Thermal Processing Technologies for the Grain Industry addresses these many new non thermal food processing techniques that are used during grain processing and minimize microbial contamination and spoilage Key Features Explains the mechanism involved in application of cold plasma techniques for grain processing and its strategy for inactivation of microbes by using this technique Deals with the effect of incorporation of electric pulses on quality aspects of various grain based beverage products Details the innovative high pressure processing techniques used for extraction of antioxidant from food grains Explores the safety issues and applications of non thermal food processing techniques This book will benefit food scientists food process engineers academicians students as well as anyone else in the food industry by providing in depth knowledge and emerging trends about non thermal processing techniques in various grain based food processing industries *Non-Thermal Technologies for the Food Industry* C. Anandharamakrishnan,V. R. Sinija,R. Mahendran,2024-02-29 Depending on the mechanisms involved in non thermal technologies such as ozonization irradiation ultrasound processing plasma processing and advanced oxidative processes interaction with food molecules differs which might lead to desirable reactions Non Thermal Technologies for the Food Industry Advances and Regulations explores the possibility of using non thermal technologies for various purposes such as shelf life extension reduced energy consumption adhesion and safety improvement Further it reviews the present status of these technologies international regulations and sustainability aspects in food processing including global case studies Features Provides a comprehensive overview of all the non thermal processing technologies that have potential for use within food manufacturing Covers novel disinfectant technologies and packaging methods for non thermal processing Includes electro spraying and electrospinning low temperature drying techniques cold plasma techniques hydrodynamic cavitation oscillating magnetic field processing and so forth Focus on topics such as the valorization of agri food wastes and by products and sustainability Reviews ClO2 in combined hybrid technologies for food processing This book is aimed at researchers and graduate students in food and food process engineering **Emerging Technologies for the Food Industry** C. Anandharamakrishnan,Jeyan Arthur Moses,2024-04-30 With changing consumer preferences and a focus on developing resilient food systems food processing is

finding its place in key policies government interventions global trade and the overall food and nutritional security Given this this new 3 volume set presents a compilation of emerging and futuristic food processing technologies introducing fundamental concepts of food technology trending applications and a range of interdisciplinary concepts that have found numerous interwoven applications in the food industry Volume 2 focuses on nonthermal processing and its applications which includes high pressure processing ultrasound processing high intensity pulsed light technology pulsed electric field processing cold plasma ozone processing as well as the use of sub and supercritical processing It also discusses emerging electrohydrodynamic technologies electrospinning and electrospraying This volume provides rich content on fundamental concepts applications and challenges in nonthermal processing throwing light on the scope of developing sustainable technologies for the food industry The other volumes in the series are Volume 1 Fundamentals of Food Processing Technology which presents the basics of food preservation covering hurdle technology aspects of minimal processing ohmic heating of foods edible coatings and electromagnetics and allied applications in food processing and Volume 3 ICT Applications and Future Trends in Food Processing which provides an exploration of the future of food processing highlighting certain emerging and disruptive technologies and their gaining influence in the food sector *Nonthermal Processing in Agri-Food-Bio Sciences* Anet Režek Jambrak,2022-09-26 This book addresses important questions on the legislation regulations sustainability technology transfer safety of biomaterials and mechanism of action of nonthermal processing on the molecular level of biomaterials and its impact on health The chapters take an interdisciplinary approach that is of interest to specialists from engineering physics chemistry agriculture life sciences and beyond with a focus on further development of existing and new applications of nonthermal processing and their combination with other methods in the processing of biomaterials agriculture biotechnology and the re use of waste and by products Nonthermal Processing in Agri Food Bio Sciences Sustainability and Future Goals aims to boost further developments and applications of nonthermal technologies to develop healthier products to ensure consumer approval for these innovative technologies and to improve the sustainability of biomaterials production The industrial application of nonthermal processing has led to an increase in innovative value products and the overall improvement of production capacity Nonthermal processes use less energy and chemicals reduce processing times have less environmental impact produce less waste and have the potential for industrial scale up and a return on investment in under 5 years According to The United Nations and the 2030 Agenda for Sustainable Development 17 goals should be incorporated within development projects and researchers are starting to use novel techniques to meet them In covering the fundamental engineering theories underlying nonthermal processing this book will aid in this mission The book overviews the advantages and disadvantages of novel technologies over to sustainability goals to correct steps for the scale up and return on investment The book includes the chemistry and physics of nonthermal processing technologies dedicated to specialists and researchers from a wide range of subject areas Interdisciplinary

scientists and engineers sustainability experts can use this text to aid in their work in green technologies *Non-Thermal Food Processing Technologies* Kaavya Rathnakumar,R. Pandiselvam,2024-10-03 Various processes are required to preserve and extend the shelf life of food many of which cause detrimental effects on the color and appearance of food Alternative methods for the thermal processing of food are gaining importance day by day due to increased consumer demand for minimally processed fresh like food products with high sensory appearance and nutritional qualities This new book provides an informative overview of non thermal food processing technologies that can preserve food color and appearance The book offers comprehensive coverage of the application of emerging technologies on the color profile of different food products such as fruits vegetables beverages dairy products and meat It discusses the influence and impact of emerging technologies on the color and appearance of foods and beverages along with their challenges and prospects The food processing technologies discussed include cold plasma ultrasound microwave processing ozone processing ohmic heating pulsed light UV irradiation pulsed electric field high pressure processing vacuum frying and others This book Non Thermal Food Processing Technologies Impact on Color Profile offers an important context on applying emerging food processing technologies to solve food safety issues and enhance shelf life extension while paying attention to food appearance It is an excellent resource for food engineers and technologists processors nutritionists and food industry professionals for exploring new non thermal techniques **Packaging for Nonthermal Processing of Food** Melvin A. Pascall,Jung H. Han,2018-02-19 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 *Non-Thermal Processing Technologies for the Fruit and Vegetable Industry* M. Selvamuthukumaran,2022-11-02 Fruits and vegetables rapidly spoil due to growth of microorganisms which further render them unsafe for human consumption The traditional methods of food preservation which involves drying canning salting curing and chemical preservation can significantly affect food quality by diminishing nutrients during heat processing This can alter the texture of the products leave chemical residues in the final processed products which in turn has greater impact over consumers safety and health concerns To combat this problem various current non thermal food processing techniques can be employed in fruit and vegetable processing industries to enhance consumer satisfaction for delivering wholesome food products to the market thus increasing demand Non Thermal Processing Technologies for the Fruit and Vegetable Industry introduces the various non thermal food processing techniques especially employed for fruits and vegetables processing industries it deals with the effect of several non thermal processing techniques on quality aspects of processed fruits and vegetable products and keeping quality and consumer acceptability Key Features Describes the high pressure processing techniques employed for processing fruit and vegetable based beverages Discusses the safety aspects of using various innovative non thermal based technologies for the fruits and vegetables processing industries Explains ozone application cold plasma ultrasound and UV irradiation for fruits and vegetables with their advantages disadvantages process operations mechanism for microbes in activation etc Presents the commercially viable and economically feasible non thermal processing technologies for fruit and vegetable industry This book addresses professors scientists food engineers research scholars students and industrial personnel for stability enhancement of fruit and vegetable based food products by using novel non thermal food processing techniques Readers will come to know the current and emerging trends in use of non thermal processing techniques for its application in several fruit and vegetable based food processing industries *Nonthermal Preservation of Foods* Enrique Palou,1997-10-06 Written by four experts actively researching alternatives to conventional thermal methods in food preservation Presents information on traditional and emerging nonthermal food processing technologies in a convenient single source volume offering an incisive view of the latest experimental results state of the art applications and new developments in food preservation technology Furnishes a thorough review of nonthermal techniques such as high hydrostatic pressure pulsed electric fields oscillating magnetic fields light pulses ionizing irradiation the use of chemicals and bacteriocins as preservation aids and combined methods hurdle technology Special Issue: Advances in Research and Applications of Nonthermal Technologies for Food Processing and Preservation Petros Taoukis,Nikolaos

Stoforos,2016 *Non-thermal Processing of Major Food Macromolecules* Seid Reza Falsafi,Hadis Rostamabadi,Navin Kumar Rastogi,2025-06-09 Non thermal Processing of Major Food Macromolecules provides comprehensive knowledge on state of the art approaches utilized to process foods and or modify their physicochemical structural along with the technofunctional attributes of food macromolecules i e protein starch lipids through novel non thermal processing techniques Sections explore the impact of non thermal processing on proteins starches and on lipids and present the challenges for the food application of non thermal processing treatments thus suggesting how to push the food application of these architectures forward around the world Edited by a team of experts in the field this book is a great resource for researchers and industry personnel working in the various fields of non thermal processing treatments particularly in the food areas Discusses the effects of non thermal processing on food macromolecules Includes the following techniques sonication high pressure processing ozonation PEF irradiation and cold plasma treatment Presents the regulatory considerations for implementation of non thermal processing Covers safety issues and health risks associated with the use of non thermal processing techniques Offers new information on how non thermal processing treatment of foods can affect consumer acceptance *Nonthermal Food Processing Technologies* Kaavya Rathnakumar,Ravi Pandiselvam,2025 Various processes are required to preserve and extend the shelf life of food many of which cause detrimental effects on the color and appearance of food Alternative methods for the thermal processing of food are gaining importance day by day due to increased consumer demand for minimally processed fresh like food products with high sensory appearance and nutritional qualities This new book provides an informative overview of non thermal food processing technologies that can preserve food color and appearance The book offers comprehensive coverage of the application of emerging technologies on the color profile of different food products such as fruits vegetables beverages dairy products and meat It discusses the influence and impact of emerging technologies on the color and appearance of foods and beverages along with their challenges and prospects The food processing technologies discussed include cold plasma ultrasound microwave processing ozone processing ohmic heating pulsed light UV irradiation pulsed electric field high pressure processing vacuum frying and others This book Non Thermal Food Processing Technologies Impact on Color Profile offers an important context on applying emerging food processing technologies to solve food safety issues and enhance shelf life extension while paying attention to food appearance It is an excellent resource for food engineers and technologists processors nutritionists and food industry professionals for exploring new non thermal techniques

Nonthermal Processing Technologies For Food Book Review: Unveiling the Power of Words

In some sort of driven by information and connectivity, the ability of words has become more evident than ever. They have the ability to inspire, provoke, and ignite change. Such could be the essence of the book **Nonthermal Processing Technologies For Food**, a literary masterpiece that delves deep to the significance of words and their effect on our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall affect readers.

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