

Solid Liquid Extraction Of Bioactive Compounds Effect Of

Water Extraction of Bioactive Compounds From Plants to Drug Development Elsevier

Enhanced concern for the quality and safety of food products, increased preference for natural products, and stricter regulations on the residual level of solvents, all contribute to the growing use of supercritical fluid technology as a primary alternative for the extraction, fractionation, and isolation of active ingredients. As a solvent-free p

With increasing energy prices and the drive to reduce CO₂ emissions, food industries are challenged to find new technologies in order to reduce energy consumption, to meet legal requirements on emissions, product/process safety and control, and for cost reduction and increased quality as well as functionality. Extraction is one of the promising innovation themes that could contribute to sustainable growth in the chemical and food industries. For example, existing extraction technologies have considerable technological and scientific bottlenecks to overcome, such as often requiring up to 50% of investments in a new plant and more than 70% of total process energy used in food, fine chemicals and pharmaceutical industries. These shortcomings have led to the consideration of the use of new "green" techniques in extraction, which typically use less solvent and energy, such as microwave extraction. Extraction under extreme or non-classical conditions is currently a dynamically developing area in applied research and industry. Using microwaves, extraction and distillation can now be completed in minutes instead of hours with high reproducibility, reducing the consumption of solvent, simplifying manipulation and work-up, giving higher purity of the final product, eliminating post-treatment of waste water and consuming only a fraction of the energy normally needed for a conventional extraction method. Several classes of compounds such as essential oils, aromas, anti-oxidants, pigments, colours, fats and oils, carbohydrates, and other bioactive compounds have been extracted efficiently from a variety of matrices (mainly animal tissues, food, and plant materials). The advantages of using microwave energy, which is a non-contact heat source, includes more effective heating, faster energy transfer, reduced thermal gradients, selective heating, reduced equipment size, faster response to process heating control, faster start-up, increased production, and elimination of process steps. This book will present a complete picture of the current knowledge on microwave-assisted extraction (MAE) of bioactive compounds from food and natural products. It will provide the necessary theoretical background and details about extraction by microwaves, including information on the technique, the mechanism, protocols, industrial applications, safety precautions, and environmental impacts.

The application of analytical chemistry to the food sector allows the determination of the chemical composition of foods and the properties of their constituents, contributing to the definition of their nutritional and commodity value.

Furthermore, it is possible to study the chemical modifications that food constituents undergo as a result of the treatments they undergo (food technology). Food analysis, therefore, allows us not only to determine the quality of a product or its nutritional value, but also to reveal adulterations and identify the presence of xenobiotic substances potentially harmful to human health. Furthermore, some foods, especially those of plant origin, contain numerous substances with beneficial effects on health. While these functional compounds can be obtained from a correct diet, they can also be extracted from food matrices for the formulation of nutraceutical products or added to foods by technological or biotechnological means for the production of functional foods. On the other hand, the enormous growth of the food industry over the last 50 years has broadened the field of application of analytical chemistry to encompass not only food but also food technology, which is fundamental for increasing the production of all types of food.

Innovative Thermal and Nonthermal Processing, Bioaccessibility and Bioavailability of Nutrients and Bioactive Compounds presents the implications of conventional and innovative processing on the nutritional and health aspects of food products. Chapters cover the relationship between gastronomic science, nutrition and food science in the development of healthy products, introduce the most commonly used conventional and innovative approaches to preserve foods and extract valuable compounds, describe how processing affects bioavailability and bioaccessibility of lipids, particularly fatty acids, protein, amino acids and carbohydrates, and discuss how processing affects bioavailability and bioaccessibility of minerals, water-soluble vitamins, and fat soluble vitamins. Final sections cover processing, bioavailability and bioaccessibility of bioactive compounds, describing how processing (conventional and non-conventional) is affecting to bioavailability and bioaccessibility of bioactive sulphur compounds, polyphenols, flavonoids, and bioactive peptides. Presents the implications of conventional and innovative processing on the nutritional and health aspects of food products Introduces the most commonly used conventional and innovative approaches to preserve foods and extract valuable compounds Explains how processing (conventional and non-conventional) affects the bioavailability and bioaccessibility of bioactive sulphur compounds, polyphenols, flavonoids and bioactive peptides

Demonstrating the relationship of the basic theory of solid-phase extraction (SPE) to chromatography, this comprehensive reference illustrates how SPE techniques significantly contribute to the preparation of samples for a wide variety of analytical techniques. It provides step-by-step details on the applications of SPE to environmental matrices, broad-spectrum drug screening, veterinary drug abuse, pharmaceutical drug development, biological samples, and high-throughput screening. Written by world-renowned experts in the field, the book contains helpful reference charts, tables of solvent properties, selectivities, molecular acid/base properties, and more.

Extraction processes are essential steps in numerous industrial applications from perfume over pharmaceutical to fine chemical industry. Nowadays, there are three key aspects in industrial extraction processes: economy and quality, as well as environmental considerations. This book presents a complete picture of current knowledge on green extraction in terms of innovative processes, original methods, alternative solvents and safe products, and provides the necessary theoretical background as well as industrial application examples and environmental impacts. Each chapter is written by experts in the field and the strong focus on green chemistry throughout the book makes this book a unique reference source. This book is intended to be a first step towards a future cooperation in a new extraction of natural products, built to improve both fundamental and green parameters of the techniques and to increase the amount of extracts obtained from renewable resources with a minimum consumption of energy and solvents, and the maximum safety for operators and the environment. During the last ten years, several new extraction techniques have been developed that are faster, more automated and use less organic solvents compared to classical solvent extraction techniques. Furthermore, there is a clear trend going towards the use of (and research on) environmentally sustainable methods, which is encouraging for the future. Supercritical fluid extraction (SFE) and pressurized liquid extraction (PLE) are two of the most useful techniques for extraction of non-polar and medium polar solutes from solid and semi-solid samples. These techniques commonly use pressurized carbon dioxide or hot liquids such as water as extraction solvents, respectively. For aqueous samples, stir-bar sorptive extraction (SBSE) has recently been developed. These are some of the techniques that will be described in the proposed symposium series book. Focus will be on the extraction of various compounds from food and agricultural samples in either an analytical or a process-scale point-of-view. Several of the book chapters will compare the different techniques, and describe their advantages and disadvantages. Applications discussed in this book include SFE of biopolymers from distillers dried grains, SFE of lipids from oilseeds, PLE of functional ingredients from plants and herbs, tandem SFE/PLE of acrylamide from potato chips, SFE and PLE of cholesterol and fat from hamster liver, and steam distillation-extraction (SDE) and SBSE of flavors from shitake mushrooms. Designed as the primary reference for the biotechnological use of macroalgae, this comprehensive handbook covers the entire value chain from the cultivation of algal biomass to harvesting and processing it, to product extraction and formulation. In addition to covering a wide range of product classes, from polysaccharides to terpenes and from enzymes to biofuels, it systematically discusses current and future applications of algae-derived products in pharmacology, medicine, cosmetics, food and agriculture. In doing so, it brings together the expertise of marine researchers, biotechnologists and process engineers for a one-stop resource on the biotechnology of marine macroalgae. Advances in Eco-fuels for Sustainable Environment presents the most recent developments in the field of environmentally friendly eco-fuels. Dr. Kalad Azad and his team of contributors analyze the latest bio-energy technologies and emission control strategies, while also

considering other important factors, such as environmental sustainability and energy efficiency improvement. Coverage includes biofuel extraction and conversion technologies, the implementation of biotechnologies and system improvement methods in the process industries. This book will help readers develop a deeper understanding of the relevant concepts and solutions to global sustainability issues with the goal of achieving cleaner, more efficient energy. Energy industry practitioners, energy policymakers and government organizations, renewables researchers and academics will find this book extremely useful. Focuses on recent developments in the field of eco-fuels, applying concepts to various medium-large scale industries Considers the societal and environmental benefits, along with an analysis of technologies and research Includes contributions from industry experts and global case studies to demonstrate the application of the research and technologies discussed

Food Process Engineering and Technology, Third Edition combines scientific depth with practical usefulness, creating a tool for graduate students and practicing food engineers, technologists and researchers looking for the latest information on transformation and preservation processes and process control and plant hygiene topics. This fully updated edition provides recent research and developments in the area, features sections on elements of food plant design, an introductory section on the elements of classical fluid mechanics, a section on non-thermal processes, and recent technologies, such as freeze concentration, osmotic dehydration, and active packaging that are discussed in detail. Provides a strong emphasis on the relationship between engineering and product quality/safety Considers cost and environmental factors Presents a fully updated, adequate review of recent research and developments in the area Includes a new, full chapter on elements of food plant design Covers recent technologies, such as freeze concentration, osmotic dehydration, and active packaging that are discussed in detail

This is one of the first books fully dedicated to the rapidly advancing and expanding research area of deep eutectic solvents. Written by the internationally recognized expert in solution chemistry, it supplies full information regarding preparation of these new eco-friendly solvents, their properties and applications. The current and potential applications of deep eutectic solvents as organic reaction media, catalytic system, in biomass processing, nanotechnology and metal finishing industry, as well as for extraction and separation are extensively discussed. This highly informative and carefully presented book will appeal to practicing chemists (organic chemists, polymer chemists, biochemists) as well as chemical engineers and environmental scientists.

Green technologies are no longer the “future” of science, but the present. With more and more mature industries, such as the process industries, making large strides seemingly every single day, and more consumers demanding products created from green technologies, it is essential for any business in any industry to be familiar with the latest processes and technologies. It is all part of a global effort to “go greener,” and this is nowhere more apparent than in fermentation technology. This book describes relevant aspects of industrial-scale fermentation, an expanding area of activity, which already generates commercial values of over one third of a trillion US dollars annually, and which will most likely radically change the way we produce chemicals in the long-term future. From biofuels and bulk amino acids to monoclonal antibodies and stem cells, they all rely on mass suspension cultivation of cells in stirred bioreactors, which is the most widely used and versatile way to produce. Today, a wide array of cells can be cultivated in this way, and for most of them genetic engineering tools are also available. Examples of products, operating procedures, engineering and design aspects, economic drivers and cost, and regulatory issues are addressed. In addition, there will be a discussion of how we got to where we are today, and of the real world in industrial fermentation. This chapter is exclusively dedicated to large-scale production used in industrial settings.

Grape and Wine Biotechnology is a collective volume divided into 21 chapters focused on recent advances in vine pathology and pests, molecular tools to control them, genetic engineering and functional analysis, wine biotechnology including molecular techniques to study *Saccharomyces* and non-*Saccharomyces* yeast in enology, new fermentative applications of nonconventional yeasts in wine fermentation, biological aging on lees and wine stabilization, advanced instrumental techniques to detect wine origin and frauds, and many other current applications useful for researchers, lecturers, and vine or wine professionals. The chapters have been written by experts from different universities and research centers of 13 countries being representative of the knowledge, research, and know-how of many wine regions worldwide.

The large quantity of waste generated from agricultural and food production remains a great challenge and an opportunity for the food industry. As there are numerous risks associated with waste for humans, animals and the environment, billions of dollars are spent on the treatment of agricultural and food waste. Therefore, the utilisation of bioactive compounds isolated from waste not only could reduce the risks and the costs for treatment of waste, but also could potentially add more value for agricultural and food production. This book provides comprehensive information related to extraction and isolation of bioactive compounds from agricultural and food production waste for utilisation in the food, cosmetic and pharmaceutical industries. The topics range from an overview on challenges and opportunities related to agricultural and food waste, the bioactive compounds in the waste, the techniques used to analyse, extract and isolate these compounds to several specific examples for potential utilisation of waste from agricultural and food industry. This book also further discusses the potential of bioactives isolated from agricultural and food waste being re-utilised in the food, cosmetic and pharmaceutical industries. It is intended for students, academics, researchers and professionals who are interested in or associated with agricultural and food waste.

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

This book offers comprehensive information on the fundamentals and applications of ionic-liquid-based aqueous biphasic systems, which have predominantly (and successfully) been employed as alternative platforms for the extraction, separation and purification of diverse high-value products. The book consists of an initial introduction providing a brief overview, from fundamentals to applications, followed by nine chapters addressing the respective phase diagrams (interpretation and characterization) and remarkable examples of their applications. It also includes two final chapters focusing on recent developments in the search for more environmentally-benign and biocompatible ionic-liquid-based aqueous biphasic systems, and

on the progress made to date concerning the recovery, recycling and reuse of the phase-forming components, the goal being the development of cost-effective and sustainable processes. The book offers an interesting and useful guide for a broad readership in the fields of green chemistry, biotechnology, chemical engineering, and biochemistry, among others. Mara G. Freire is a Coordinator Researcher at CICECO - Aveiro Institute of Materials, Chemistry Department, University of Aveiro, Portugal.

Betel (Piper betle L.) is one of the invaluable medicinal plants originated from Malaysia. Its leaves have been used traditionally for various medication purposes. Scientific research on the leaf of this plant reveals that it possesses many beneficial bioactivities and its extract from betel leaves has a great potential to be used in developing commercial products. However, there is a lack of research on the processing aspects to produce its bioactive extract. This research studied three key processes including drying, solid-liquid extraction, and freeze drying which are involved in processing of bioactive extract from betel leaves. Different experiments were designed and carried out to look into the effects of various operating parameters on the qualitative and quantitative aspects of betel leaves extract. Hydroxychavicol (HC) and eugenol (EU) were selected as the quality indicators of the product because these two compounds were reported to play an important role in the bioactivities of betel leaves including antioxidant, anti-inflammatory, and anticarcinogenic and antibacterial. The effect of drying temperature on the quality of betel leaves and drying kinetics were studied in order to determine the optimum drying temperature. Changes in the concentration of HC and EU reveal that the optimum temperature for drying of betel leaves was 70°C because degradation of HC and EU was observed above this temperature. Logarithmic model was found to be the most suitable model among the selected thin layer model in predicting the process. Water was the most suitable solvent for extracting betel leaves compared to ethanol ethyl acetate, and hexane. This was because it gave highest yield and the extract from water indicated high antioxidant and anti-inflammatory activities in which the activities were related to HC and EU. The optimum extraction temperature was determined as 60°C to avoid degradation of EU. The ratio of water to solid of 30:1 (ml:g) was found to be optimum based on analysis of Response Surface Methodology (RSM). Extraction kinetics of betel leaves reveals that the optimum extraction time is one hour. A new model named equilibrium driven solid-liquid extraction (EDSLE) model was developed and successfully applied in describing the process. The study of freeze drying process of betel leaves extract was conducted in two sections namely freezing and drying. The freezing kinetics data shows that the freezing point of betel leaves extract with 20%SC was about -4 °C. Prediction of freezing kinetics and freezing time was carried out successfully with numerical model. The results of drying kinetics of betel leaves extract show that the increase of drying temperature increased the drying rate. Midilli et al. Model was found to be the most effective one among the selected models for modeling of the process.

This new volume explores the importance of phytochemicals from plants in therapeutics, focusing on the extraction of bioactive compounds and their applications in human health. Natural products and their bioactive compounds are increasingly utilized in preventive and therapeutic medication as well as for the production of pharmaceutical supplements and, more recently, as food additives to increase the functionality of foods. The first section of the volume describes recent advances in the extraction of bioactive compounds from various sources. It looks at advanced extraction techniques such as enzyme-assisted, microwave-assisted, ultrasound-assisted, pressurized liquid extraction, and supercritical extraction techniques. Part 2, on bioactive compounds and health claims, covers the roles of different bioactive compounds and their health-promoting potential for lifestyle diseases. This section explains the botany, physical characteristics, uniqueness, uses, distribution, importance, phytochemistry, bioactivities, and future trends of different functional foods.

The latest research on the health benefits and optimal processing technologies of herbs and

spices This book provides a comprehensive overview of the health benefits, analytical techniques used, and effects of processing upon the physicochemical properties of herbs and spices. Presented in three parts, it opens with a section on the technological and health benefits of herbs and spices. The second part reviews the effect of classical and novel processing techniques on the properties of herbs/spices. The third section examines extraction techniques and analytical methodologies used for herbs and spices. Filled with contributions from experts in academia and industry, *Herbs, Spices and Medicinal Plants: Processing, Health Benefits and Safety* offers chapters covering thermal and non-thermal processing of herbs and spices, recent developments in high-quality drying of herbs and spices, conventional and novel techniques for extracting bioactive compounds from herbs and spices, and approaches to analytical techniques. It also examines purification and isolation techniques for enriching bioactive phytochemicals, medicinal properties of herbs and spices, synergy in whole-plant medicine, potential applications of polyphenols from herbs and spices in dairy products, biotic and abiotic safety concerns, and adverse human health effects and regulation of metal contaminants in terrestrial plant-derived food and phytopharmaceuticals. Covers the emerging health benefits of herbs and spices, including their use as anti-diabetics, anti-inflammatories, and anti-oxidants Reviews the effect of classical and novel processing techniques on the properties of herbs and spices Features informed perspectives from noted academics and professionals in the industry Part of Wiley's new IFST Advances in Food Science series *Herbs, Spices and Medicinal Plants* is an important book for companies, research institutions, and universities active in the areas of food processing and the agri-food environment. It will appeal to food scientists and engineers, environmentalists, and food regulatory agencies.

This book presents a comprehensive range of research on pulsed electric energy used in food processing, including sections on the fundamentals of electroporation and important techniques for the estimation of electroporation effects in various foods and biomass feedstocks. By focusing on application over theory, this book presents researchers with practical steps for processing techniques such as solid-liquid extraction, pressing, osmotic dehydration, drying, freezing and cooking. Special interest is given to the selective recovery and extraction of sugar, inulin, starch, proteins, polysaccharides, polyphenols, pigments, flavor compounds, phytochemicals and other of high-value components from food biomasses such as fruits and vegetables, leaves, herbs, mushrooms, microalgae and suspensions of cells. *Processing of Foods and Biomass Feedstocks by Pulsed Electric Energy* presents a singular overview of the biorefinery applications of pulsed electric energy for the processing of wastes and non-food biomasses such as root and tuber crops, grape waste, lignocellulosic biomass, oil crops and residues and seeds and peels of exotic and citrus fruits. The book begins by presenting general information on the fundamentals of electroporation and information on the procedures and protocols involved. Further chapters focus on the specific food processing operations involved and biorefinery applications for the processing of wastes and non-food biomasses. All of the relevant and up-to-date information any researcher needs on pulsed electric energy in food processing is presented here in this text.

A valuable handbook containing reviews, practical methods and standard operating procedures. A valuable and practical working handbook containing introductory and specialist content that tackles a major and growing field of environmental, microbiological and ecotoxicological monitoring and analysis Includes introductory reviews, practical analytical chapters and a comprehensive listing of almost thirty Standard Operating Procedures (SOPs) For use in the laboratory, in academic and government institutions and industrial settings Fossil fuels still need to meet the growing demand of global economic development, yet they are often considered as one of the main sources of the CO₂ release in the atmosphere. CO₂, which is the primary greenhouse gas (GHG), is periodically exchanged among the land surface, ocean, and atmosphere where various creatures absorb and produce it daily.

However, the balanced processes of producing and consuming the CO₂ by nature are unfortunately faced by the anthropogenic release of CO₂. Decreasing the emissions of these greenhouse gases is becoming more urgent. Therefore, carbon sequestration and storage (CSS) of CO₂, its utilization in oil recovery, as well as its conversion into fuels and chemicals emerge as active options and potential strategies to mitigate CO₂ emissions and climate change, energy crises, and challenges in the storage of energy.

Gas chromatography mass spectrometry (GC-MS) has been the technique of choice of analytical scientists for many years. The latest developments in instrumentation, including tandem mass spectrometry (MS-MS) and time-of-flight (TOF) detectors, have opened up and broadened the scope of environmental analytical chemistry. This book summarizes the major advances and relevant applications of GC-MS techniques over the last 10 years, with chapters by leading authors in the field of environmental chemistry. The authors are drawn from academia, industry and government. The book is organized in three main parts. Part I covers applications of basic GC-MS to solve environmental-related problems. Part II focuses on GC-MS-MS instrumentation for the analyses of a broad range of analysis in environmental samples (pesticides, persistent organic pollutants, endocrine disruptors, etc.). Part III covers the use of more advanced GC-MS techniques using low- and high-resolution mass spectrometry for many applications related to the environment, food and industry. Summarizes the major advances of GC-MS techniques in the last decade Presents relevant applications of GC-MS techniques Covers academic, industrial and governmental sectors

Seas and oceans offer a wide range of temperature, pressure, light and chemical conditions thus allowing a wide diversity of marine organisms from shallow coastal waters to the deep ocean. These resources can be used to obtain new products and develop services, and in turn help to provide solutions to the challenges that affect our planet, including offering a sustainable supply of food and energy, new industrial materials and processes, new bioactive compounds, and new health treatments.

Marine compounds have been identified as having antibacterial, anticoagulant, antifungal, antimalarial, antiprotozoal, antituberculosis, and antiviral activities. The major sources of these bioactive compounds are marine sponges, coelenterates, and microorganisms, followed by algae, echinoderms, tunicates, molluscs, and bryozoans. The discovery of bioactive compounds from marine samples is a hot topic considering the current need for sustainable use of marine resources. This book is a comprehensive overview of the analytical techniques employed in the discovery and characterization of bioactive compounds isolated from (all possible) marine samples and gives future perspectives of analytical methodologies. This overview includes an assessment of the sampling and preparation of extracts, the separation and isolation of bioactive compounds, their structural characterization and the application of bioassays in the discovery of bioactive compounds. Comprehensive coverage of analytical techniques and applications Clear diagrams to adequately support important topics Real examples of applications of analytical techniques in the search for new bioactive compounds

Phenolic compounds as a large class of metabolites found in plants have attracted attention since long time ago due to their properties and the hope that they will show beneficial health effects when taken as dietary supplements. This book presents the state of the art of some of the natural sources of phenolic compounds, for example, medicinal plants, grapes or blue maize, as well as the modern methods of extraction, quantification, and identification, and there is a special section discussing the treatment, removal, and degradation of phenols, an important issue in those phenols derived from

the pharmaceutical or petrochemical industries.

30th European Symposium on Computer Aided Chemical Engineering, Volume 47 contains the papers presented at the 30th European Symposium of Computer Aided Process Engineering (ESCAPE) event held in Milan, Italy, May 24-27, 2020. It is a valuable resource for chemical engineers, chemical process engineers, researchers in industry and academia, students, and consultants for chemical industries. Presents findings and discussions from the 30th European Symposium of Computer Aided Process Engineering (ESCAPE) event Offers a valuable resource for chemical engineers, chemical process engineers, researchers in industry and academia, students, and consultants for chemical industries

This book has been edited by Martine Poux, Patrick Cognet and Christophe Gourdon from the Laboratoire de Génie Chimique/ENSIACET, Toulouse. It presents an ensemble of methods and new chemical engineering routes that can be integrated in industrial processing for safer, more flexible, economical, and ecological production processes in the context of green and sustainable engineering. Different methods for improving process performance are dealt with, including: • Eco-design and process optimization by systemic approaches • New technologies for intensification • Radical change of industrial processes via the use of new media and new routes for chemical synthesis These various methods are fully illustrated with examples and industrial cases, making this book application oriented.

The Handbook of Postharvest Technology presents methods in the manufacture and supply of grains, fruits, vegetables, and spices. It details the physiology, structure, composition, and characteristics of grains and crops. The text covers postharvest technology through processing, handling, drying and milling to storage, packaging, and distribution. Additionally, it examines cooling and preservation techniques used to maintain the quality and the decrease spoilage and withering of agricultural products. This book presents a complete picture of the current state-of-the-art in alternative and green solvents used for laboratory and industrial natural product extraction in terms of the latest innovations, original methods and safe products. It provides the necessary theoretical background and details on extraction, techniques, mechanisms, protocols, industrial applications, safety precautions and environmental impacts. This book is aimed at professionals from industry, academicians engaged in extraction engineering or natural product chemistry research, and graduate level students. The individual chapters complement one another, were written by respected international researchers and recognized professionals from the industry, and address the latest efforts in the field. It is also the first sourcebook to focus on the rapid developments in this field.

Pulsed Electric Fields to Obtain Healthier and Sustainable Food for Tomorrow illustrates innovative applications derived from the use of pulsed electric fields beyond microbial inactivation. The book begins with an introduction on how pulsed electric fields work and then addresses the impact of pulsed electric fields on bioaccessability/bioavailability and the development of nutraceuticals and food additives. Other sections explore the reduction of contaminants and assess the improvement of industrial process efficiency. A final section explores patents and commercial applications. This book will be a welcomed resource for anyone interested in the technological, physiochemical and nutritional perspectives of product development and the reduction of food toxins and contaminants. The concepts explored

in this book could have a profound impact on addressing the concept of "food on demand," a concept that is a top priority in industry.

In the late 1990s, there was an explosion of research on ionic liquids and they are now a major topic of academic and industrial interest with numerous existing and potential applications. Since then, the number of scientific papers focusing on ionic liquids has risen exponentially, including a few edited multi-author books covering the latest advances in ionic liquids chemistry and several volumes of symposium proceedings. Much of the content in these books and volumes is written using technical jargon that only scientists at the cutting edge of ionic liquids research will understand and ionic liquids are hardly covered in most modern chemistry textbooks. This is the first single-author book on ionic liquids and the first introductory book on the topic. It is written in a clear, concise and consistent way. The book provides a useful introduction to ionic liquids for those readers who are not familiar with the topic. It is also wide ranging, embracing every aspect of the chemistry and applications of ionic liquids. The book draws extensively on the primary scientific literature to provide numerous examples of research on ionic liquids. These examples will enable the reader to become familiar with the key developments in ionic liquids chemistry over recent years. The book provides an introduction to: ionic liquids; their nomenclature; history; physical, chemical and biological properties; and their wide ranging uses and potential applications in catalysis, electrochemistry, inorganic chemistry, organic chemistry, analysis, biotechnology, green chemistry and clean technology. Notable and important chapters include "The Green Credentials of Ionic Liquids" and "Biotechnology." The chapter on "Applications" includes sections with brief descriptions of recent research on the development of ionic liquids: - for the construction of a liquid mirror for a moon telescope - for use as rocket propellants - for use as antimicrobial agents that combat MRSA - as active pharmaceutical ingredients and antiviral drugs - for embalming and tissue preservation Science students, researchers, teachers in academic institutions and chemists and other scientists in industry and government laboratories will find the book an invaluable introduction to one of the most rapidly advancing and exciting fields of science and technology today.

Divided into five sections, *Agri-Food Industry Strategies for Healthy Diets and Sustainability: New Challenges in Nutrition and Public Health* provides an overview of the challenges and future perspectives related to nutrition, public health, and sustainability. The book addresses strategies to reduce fat, trans fat, saturated fat, sugar, and salt consumption, while also exploring the manufacturing, safety, and toxicology of new food manufacturing. This book examines commercial labeling and nutritional education, nutrigenomics and public health, and provides coverage of the valorization of waste and by-products from the food industry. Nutrition researchers and practitioners, food scientists, technologists, engineers, agronomists, food product developers, medical and public health professionals, and postgraduate students focused in food science and nutrition are sure to find this reference work a welcomed addition to their libraries. Contains innovative strategies to achieve a healthy diet through the design of new food products Provides comprehensive information related to agriculture, nutrition, food industry, government, and sustainable waste management and details their roles in addressing food waste Explores the ways in which innovative approaches, used to valorize and give an added value to agri-food waste and by-

products, ensure the sustainability of the production process Presents nutritive education about reducing empty calories by lowering consumption of fats, sugars, and other high-calorie nutrients Delineates the roles of food industry and government in shaping the best policies for the general public and the design of new products Tannins are one of the polyphenols group found in plants and are mainly studied because of their structural properties and bioactive behavior. Every year new findings concerning their properties and functions are made, and today concerns are mainly focused on how they can be used efficiently in the wood, food, textile, health, and pharmaceutical industries. Thus, the aim of this book is to present the most updated information on the structural properties of tannins, their food sources and variations, biological properties, and health, among other important issues. In addition, the most recent methods used for their isolation, quantifications, and industrial applications will also be covered.

Aflatoxins are a group of highly toxic and carcinogenic substances, which occur naturally, and can be found in food substances. Aflatoxins are secondary metabolites of certain strains of the fungi *Aspergillus flavus* and *A. parasiticus* and the less common *A. nomius*. Aflatoxins B1, B2, G1, and G2 are the most important members, which can be categorized into two groups according to the chemical structure. As a result of the adverse health effects of mycotoxins, their levels have been strictly regulated especially in food and feed samples. Therefore, their accurate identification and determination remain a Herculean task due to their presence in complex food matrices. The great public concern and the strict legislation incited the development of reliable, specific, selective, and sensitive analytical methods for pesticide monitoring that are discussed in this book.

A guide to the extraction, isolation and purification of bioactive compounds from agricultural wastes, and their applications Recovering Bioactive Compounds from Agricultural Wastes offers a guide to the many uses of agricultural wastes from the production of major food types including tea, coffee, cacao, cashew, fruit and vegetables, wine, edible oils, sugar, starch and more. Written by a noted expert in the field, the text explores the various methods for extraction, isolation and purification of bioactive compounds from agricultural wastes. The author also makes recommendations concerning the most effective applications of bioactive compounds and discusses the economics and market for recovered bioactive compounds. Recent studies reveal that bioactive compounds have been directly linked to biological activity such as antioxidant, anticancer, antidiabetic, anti-cardiovascular capacities, etc. In particular, agricultural wastes are considered as potential and inexpensive sources of bioactive compounds. Recovering Bioactive Compounds from Agricultural Wastes fills a gap in the literature by providing a text that explores this important topic and examines the: Sustainability of waste management and shows how to extract, isolate and purify bioactive compounds from agricultural wastes, and their most effective application Wide range of agricultural food produce that can be processed and the special techniques used for recovering the bioactive compounds from these sources Health applications of bioactive compounds that have been directly linked to pharmacological activities including antioxidant, anticancer, and more Designed for use by researchers and producers in the agriculture, pharmaceuticals and nutraceuticals, Recovering Bioactive Compounds from Agricultural Wastes contains the knowledge, history and definition,

classification and synthesis, and extraction techniques of bioactive compounds. This overview of diffusion and separation processes brings unsurpassed, engaging clarity to this complex topic. Diffusion is a key part of the undergraduate chemical engineering curriculum and at the core of understanding chemical purification and reaction engineering. This spontaneous mixing process is also central to our daily lives, with importance in phenomena as diverse as the dispersal of pollutants to digestion in the small intestine. For students, Diffusion goes from the basics of mass transfer and diffusion itself, with strong support through worked examples and a range of student questions. It also takes the reader right through to the cutting edge of our understanding, and the new examples in this third edition will appeal to professional scientists and engineers. Retaining the trademark enthusiastic style, the broad coverage now extends to biology and medicine.

Water Extraction of Bioactive Compounds: From Plants to Drug Development draws together the expert knowledge of researchers from around the world to outline the essential knowledge and techniques required to successfully extract bioactive compounds for further study. The book is a practical tool for medicinal chemists, biochemists, pharmaceutical scientists and academics working in the discovery and development of drugs from natural sources. The discovery and extraction of bioactive plant compounds from natural sources is of growing interest to drug developers, adding greater fuel to a simultaneous search for efficient, green technologies to support this. Particularly promising are aqueous based methods, as water is a cheap, safe and abundant solvent. The book is a detailed guide to the fundamental concepts and necessary equipment needed to successfully undertake such processes, supported by application examples and highlighting the most influential variables. Part 1 begins with a thorough introduction to plants as sources of drugs, highlighting strategies for the discovery of novel bioactive constituents of botanicals, the need for standardization and a move toward more rational and greener techniques in the field, the development of plant-based extraction processes and pretreatments for the efficient extraction. Part 2 then reviews a broad range of available techniques, including sections on conventional hot water extraction and pressurized hot water extraction in a range of settings. Intensified processes are then discussed in detail, including sections on microwave-assisted processes, ultrasound-assisted processes and enzyme assisted extraction. Covers the theoretical background and range of techniques available to researchers, helping them to select the most appropriate extraction method for their needs Presents up-to-date and cutting edge applications by international experts Highlights current use and future potential for industrial scale applications Offers a thorough introduction to plants as sources of drugs, highlighting strategies for the discovery of novel bioactive constituents of botanicals

Natural products are sought after by the food, pharmaceutical and cosmetics industries, and research continues into their potential for new applications. Extraction of natural products in an economic and environmentally-friendly way is of high importance to all industries involved. This book presents a holistic and in-depth view of the techniques available for extracting natural products, with modern and more environmentally-benign methods, such as ultrasound and supercritical fluids discussed alongside conventional methods. Examples and case studies are presented, along with the decision-making process needed to determine the most appropriate method. Where appropriate, scale-

up and process integration is discussed. Relevant to researchers in academia and industry, and students aiming for either career path, Natural Product Extraction presents a handy digest of the current trends and latest developments in the field with concepts of Green Chemistry in mind.

The demand for functional foods and nutraceuticals is on the rise, leaving product development companies racing to improve bioactive compound extraction methods – a key component of functional foods and nutraceuticals development. From established processes such as steam distillation to emerging techniques like supercritical fluid technology, *Extracting Bioactive Compounds for Food Products: Theory and Applications* details the engineering aspects of the processes used to extract bioactive compounds from their food sources. Covers Bioactive Compounds Found in Foods, Cosmetics, and Pharmaceuticals Each well-developed chapter provides the fundamentals of transport phenomena and thermodynamics as they relate to the process described, a state-of-the-art literature review, and replicable case studies of extraction processes. This authoritative reference examines a variety of established and groundbreaking extraction processes including: Steam distillation Low-pressure solvent extraction Liquid-liquid extraction Supercritical and pressurized fluid extraction Adsorption and desorption The acute view of thermodynamic, mass transfer, and economical engineering provided in this book builds a foundation in the processes used to obtain high-quality bioactive extracts and purified compounds. Going beyond the information traditionally found in unit operations reference books, *Extracting Bioactive Compounds for Food Products: Theory and Applications* demonstrates how to successfully optimize bioactive compound extraction methods and use them to create new and better natural food options.

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