

Solid Liquid Extraction Of Bioactive Compounds Effect Of

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

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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

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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

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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

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necessary theoretical background and details about extraction by microwaves, including information on the technique, the mechanism, protocols, industrial applications, safety precautions, and environmental impacts.

Green Extraction Techniques: Principles, Advances and Applications, Volume 76, the first work to compile all the multiple green extraction techniques and applications currently available, provides the most recent analytical advances in the main green extraction techniques. This new release includes a variety of comprehensively presented topics, including chapters on Green

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Analytical Chemistry: The Role of Green Extraction Techniques, Bioactives Obtained From Plants, Seaweeds, Microalgae and Food By-Products Using Pressurized Liquid Extraction and Supercritical Fluid Extraction, Pressurized Hot Water Extraction of Bioactives, and Pressurized Liquid Extraction of Organic Contaminants in Environmental and Food Samples. In this ongoing serial, in-depth, emerging green extraction approaches are discussed, together with their miniaturization and combination, showing the newest technologies that have been developed in the last few years for each case and providing a

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picture of the most innovative applications with further insights into future trends. Compiles all the multiple green extraction techniques currently available, along with their applications Includes the most recent analytical advances in the main green extraction techniques, along with their working principles Covers emerging green extraction approaches, their miniaturization and combination and an insight into future trends Biomolecules from Natural Sources An up-to-date exploration of new and novel biomolecules In Biomolecules from Natural Sources: Advances and Applications, a team of accomplished researchers

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delivers up-to-date information on various bioresources, bioprocessing, production, mechanisms of action for selective bioactivity, biochemistry, targeted therapeutic roles and the advancements made on their bioactive potentials of new and novel biomolecules. The book presents recent trends in new and novel biomolecules and their identification, characterization, and potential applications. The selected contributions canvas a variety of breakthroughs in the understanding and applications of naturally derived biomolecules. Biomolecules from Natural Sources: Advances and

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Applications is an exhaustive collection of research and information, as well as an insightful and interdisciplinary treatment of a rapidly developing field. Readers will also find: A thorough introduction to phenolics from natural sources and plant-based natural artemisinin and its biomedical applications Comprehensive explorations of protein structure, function, and specificity and the pharmacological potential of pigments Practical discussions of biomolecules obtained through food biotechnology and the biological activities of natural glycosides In-depth examinations of biomolecules from basil and their

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pharmacological significance Perfect for biotechnologists, food technologists, and plant biologists, Biomolecules from Natural Sources: Advances and Applications will also earn a place in the libraries of bioprocessing engineers, as well as undergraduate and postgraduate students of biochemistry.

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.

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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

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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

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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.

Green Process Engineering

Fundamentals and Applications

Lipophilic Derivatisation of Flavonoids Extracted from Grape Pomace to Enhance Their Health-promoting Effects

Theory and Applications

Processing of Foods and Biomass Feedstocks by Pulsed Electric Energy

Recovering Bioactive Compounds from

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Agricultural Wastes

Fluid Mechanics for Chemical Engineers, third edition retains the characteristics that made this introductory text a success in prior editions. It is still a book that emphasizes material and energy balances and maintains a practical orientation throughout. No more math is included than is required to understand the concepts presented. To meet the demands of today's market, the author has included many problems suitable for solution by computer. Two brand new

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chapters are included. The first, on mixing, augments the book's coverage of practical issues encountered in this field. The second, on computational fluid dynamics (CFD), shows students the connection between hand and computational fluid dynamics.

A growing body of scientific evidence has revealed that many food peptides exhibit specific biological activities in addition to their established nutritional value. Bioactive peptides present in foods may help reduce the worldwide epidemic of chronic diseases

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that account for a great number of premature deaths annually. Bioactive peptides can be defined as isolated small fragments of proteins which provide some physiological health benefits. They act as potential modifiers reducing the risk of many chronic diseases. Bioactive Peptides from Food: Sources, Analysis, and Functions considers fundamental concepts, sources, hydrolysis, fractionation, purification, analysis, chemical synthesis, functions, and regulatory status of nutraceutical bioactive peptides. Methods of

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isolation of these peptides from different protein sources with their in vitro and vivo physiological effects are addressed. Divided into seven sections, this book delves into how these peptides play a major role in the development of various functional foods. Numerous bioactive peptides have been reported in recent years as naturally present or generated from food proteins of different origins like milk, eggs, soya, fish, and meat. Key Features: Includes a detailed study of the different sources of bioactive peptides

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Discusses the health benefits, such as antimicrobial, antiallergic, antihypertensive, antitumor, and immunomodulatory properties of peptides Explores the state of the art analysis methods of peptides Discovers the bioinformatics of possible bioactive peptides Written by experts in their field from around the world, Bioactive Peptides from Food reveals the world of databases of peptides. It is a great resource for food scientists, technologists, chemists, nutrition researchers, producers, and processors

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working in the whole food science and technology field as well as those who are interested in the development of innovative functional products.

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

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distribution. Additionally, it examines cooling and preservation techniques used to maintain the quality and the decrease spoilage and withering of agricultural products.

Extraction is an important operation in food engineering, enabling the recovery of valuable soluble components from raw materials. With increasing energy costs and environmental concerns, industry specialists are looking for improved techniques requiring less solvents and energy consumption.

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Enhancing Extraction Processes in the Food Industry is a

Principles and Applications

Microwave-assisted Extraction for Bioactive Compounds

Advances and Applications

Innovations and Shelf-Life

Sustainable Seaweed Technologies

Herbs, Spices and Medicinal Plants

A guide to the extraction, isolation and purification of bioactive compounds from agricultural wastes, and their

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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

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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

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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

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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 book provides a detailed account of the most recent developments, challenges and solutions to seamlessly advance and launch a lyophilized biologics or vaccine

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product, based on diverse modalities, ranging from antibodies (e.g., monoclonal, fused), complex biologics (e.g., antibody drug conjugate, PEGylated proteins), and vaccines (e.g., recombinant-protein based). The authors adeptly guide the reader through all crucial aspects, from biophysical and chemical stability considerations of proteins, analytical methods, advances in controlled ice nucleation and quality-by-design approaches, alternate drying technology, to latest regulatory, packaging and

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technology transfer considerations to develop a stable, safe and effective therapeutic protein, vaccine and biotechnology products. Lyophilized Biologics and Vaccines: Modality-Based Approaches is composed of four sections with a total of 17 chapters. It serves as a reference to all critical assessments and steps from early pre-formulation stages to product launch: Provides recent understanding of heterogeneity of protein environment and selection of appropriate buffer for stabilization of lyophilized

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formulations Details the latest developments in instrumental analysis and controlled ice nucleation technology Explains in-depth lyophilized (or dehydrated) formulation strategies considering diverse modalities of biologics and vaccines, including plasmid DNA and lipid-based therapeutics Details an exhaustive update on quality-by-design and process analytical technology approaches, illustrated superbly by case studies and FDA perspective Provides the latest detailed account of alternate

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drying technologies including spray drying, bulk freeze-drying and crystallization, supported exceptionally by case studies Provides a step-by-step guide through critical considerations during process scale-up, technology transfer, packaging and drug delivery device selection, for a successful lyophilization process validation, regulatory submission and product launch Chapters are written by one or more world-renowned leading authorities from academia, industry or regulatory agencies,

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whose expertise cover lyophilization of the diverse modalities of biopharmaceuticals. Their contributions are based on the exhaustive review of literature coupled with excellent hands-on experiences in laboratory or GMP setup, making this an exceptional guide to all stages of lyophilized or dehydrated product development.

Food Packaging: Innovations and Shelf-life covers recently investigated developments in food packaging and their influence in food quality preservation, shelf-life

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extension, and simulation techniques. Additionally, the book discusses the environmental impact and sustainable solutions of food packaging. This book is divided into seven chapters, written by worldwide experts. The book is an ideal reference source for university students, food engineers and researchers from R&D laboratories working in the area of food science and technology. Professionals from institutions related to food packaging. Biotechnological Production of Bioactive Compounds provides insights on the most

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recent innovations, trends, concerns, solutions and practical challenges encountered in the fields of enzyme technology and nanobiotechnology for the production of bioactive materials with extra health benefits. As nanobiotechnology has improved the bioactive extraction process significantly, many bioactives, including bioflavonoids, omega-3 fatty acids, biopigments and low calorie sugar substitutes are a pivotal part of the food industry. The book highlights the

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production of extra health benefits “bioactives” from plants and microbes and explains how the extraction efficiency of bioactives molecules improves significantly with the recent advances in nanobiotechnology. Researchers in the fields of biochemical engineering, biotechnology, bioremediation, environmental sustainability and those in pharma industries will find the information in this book very helpful and illuminating. Outlines technological advances in bioactives extraction Covers

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bioflavonoids, biopigments, omega-3-fatty acids and low sugar substitutes Explains the mechanisms of Green cargo (biogenic nanoparticles) for the delivery of bioactive molecules

Solid-Phase Extraction

Phytochemicals, Primary Metabolites and Value-Added Biomass Processing

Green Extraction Techniques: Principles, Advances and Applications

Extracting Bioactive Compounds for Food Products

Food Packaging

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An Introduction to Ionic Liquids

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

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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 70oC

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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

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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 oC. 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 la. Model

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was found to be the most effective one among the selected models for modeling of the process. Optimisation of Solid-liquid Extraction of Bioactive Compounds from Orthosiphon Stamineus Benth Leaves Herbs, Spices and Medicinal Plants Processing, Health Benefits and Safety John Wiley & Sons The Role of Materials Science in Food Bioengineering, Volume 19 in the Handbook of Food Bioengineering, presents an up-to-date review of the most recent advances in materials science, further demonstrating its broad applications in the food industry and bioengineering. Many types of materials are described, with their impact in food design discussed. The book

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provides insights into a range of new possibilities for the use of materials and new technologies in the field of food bioengineering. This is an essential reference on bioengineering that is not only ideal for researchers, scientists and food manufacturers, but also for students and educators. Discusses the role of material science in the discovery and design of new food materials Reviews the medical and socioeconomic impact of recently developed materials in food bioengineering Includes encapsulation, coacervation techniques, emulsion techniques and more Identifies applications of new materials for food safety, food packaging and consumption Explores bioactive compounds,

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polyphenols, food hydrocolloids, nanostructures and other materials in food bioengineering

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

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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.

Green Extraction of Natural Products

Biotechnological Production of Bioactive Compounds

From Concepts to Industrial Applications

Enhancing Extraction Processes in the Food Industry

Theory and Practice

Handbook of Fruit Wastes and By-Products

The demand for functional foods and nutraceuticals is on the rise, leaving product development companies racing to improve bioactive compound extraction

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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

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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*

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demonstrates how to successfully optimize bioactive compound extraction methods and use them to create new and better natural food options.

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

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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

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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

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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

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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.

Ingredients Extraction by Physico-chemical Methods, Volume Four, the latest release in the Handbook of

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Food Bioengineering series, reveals the most investigated extraction methods of ingredients and their impact on the food industry. This resource describes types of ingredients that may be extracted through physico-chemical methods (i.e. specific plants, fruits, spices, etc.), along with their particularities to help readers understand their biological effect and solve research problems. The extraction methods of bioactive compounds and functional ingredients are discussed, along with information on green ingredient extraction strategies to help reduce harmful environmental and health effects. Extraction methods in this book can be applied for multiple purposes within

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the food industry, such as ingredients separation for food development, the purification and separation of toxic compounds from a food mixture, and the recovery of natural bioactive compounds. Offers advanced knowledge and skills of physiochemical analysis for ingredient extraction Presents various methods for food component analysis to evaluate structure function relations in changing environments Discusses the importance of enzymes during processing and storage of foods Includes methods to evaluate and enhance extraction, such as ultrasound, to produce novel foods more efficiently
Human Health

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Modality-Based Approaches

Pulsed Electric Fields Technology for the Food Industry

Fluid Mechanics for Chemical Engineers

Alternative Solvents for Natural Products Extraction

Liquid-Phase Extraction

As wine production increases to meet growing consumer demands, this results in large amounts of grape pomace. There are limitations to the current practices of managing this waste material and the concerns about its impact on the environment are growing. Due to this, there is a need to find alternative solutions towards utilising this

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waste material. This thesis project investigates the strategy of using grape pomace as a source of bioactive flavonoids which can then be derivatised into more lipophilic compounds to enhance their health-promoting potential. The work to achieve this began with the preliminary small scale solid-liquid extraction work on Pinot noir pomace to determine the ideal solvent systems that would give an extract with higher content of desired bioactive flavonoids. Synthetic studies were then conducted to afford a series of model lipophilic luteolin and quercetin derivatives. These model lipophilic

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flavonoid derivatives were subjected to antiproliferative activity, radical scavenging activity and computed logP studies. The results of which were compared to their parent flavonoids to determine which of the lipophilic groups displayed enhanced health-promoting outcome. The findings from the above studies provided important information towards the final work of this project. A larger scale solid-liquid extraction work was conducted on Pinot noir pomace using the selected solvent system to obtain an extract with higher amounts of the desired bioactive flavonoids. This flavonoid-

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containing extract was derivatised with the selected derivatising agents. A preliminary bioactivity assessment on these derivatised extracts was attempted to determine whether the proposed strategy was suitable towards enhancing their health-promoting effects.

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

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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

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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

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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

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

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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

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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

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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

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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.

Sustainable Seaweed Technologies: Cultivation, Biorefinery, and Applications collates key background information on efficient cultivation and biorefinery of seaweeds, combining underlying chemistry and methodology with industry experience.

Beginning with a review of the opportunities for seaweed biorefinery and the varied components and properties of macroalgae, the

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book then reviews all the key steps needed for industrial applications, from its cultivation, collection and processing, to extraction techniques, concentration and purification. A range of important applications are then discussed, including the production of energy and novel materials from seaweed, before a set of illustrative case studies shows how these various stages work in practice. Drawing on the expert knowledge of a global team of editors and authors, this book is a practical resource for both researchers and businesses who currently work with macroalgae. Highlights

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the specific challenges and benefits of developing seaweed for sustainable products
Presents useful case studies that demonstrate varied approaches and methodologies in practice
Covers the complete seaweed chain, from cultivation to waste management
Drying And Solid-Liquid Extraction Of Hydroxychavicol And Eugenol From Betel Leaves (Piper Betle L.)
From Plants to Drug Development
Ingredients Extraction by Physico-Chemical Methods in Food
Ingredients Extraction by Physicochemical Methods in Food

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Lyophilized Biologics and Vaccines
Biorefinery Co-Products

Liquid Phase Extraction thoroughly presents both existing and new techniques in liquid phase extraction. It not only provides all information laboratory scientists need for choosing and utilizing suitable sample preparation procedures for any kind of sample, but also showcases the contemporary uses of sample preparation techniques in the most important industrial and academic project environments, including countercurrent chromatography, pressurized-liquid extraction, single-drop

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Microextraction, and more. Written by recognized experts in their respective fields, it serves as a one-stop reference for those who need to know which technique to choose for liquid phase extraction. Used in conjunction with a similar release, Solid Phase Extraction, it allows users to master this crucial aspect of sample preparation. Defines the current state-of-the-art in extraction techniques and the methods and procedures for implementing them in laboratory practice Includes extensive referencing that facilitates the identification of key information Aimed at

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both entry-level scientists and those who want to explore new techniques and methods
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

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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.

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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

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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.

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

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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

*Processing, Health Benefits and Safety
Water Extraction of Bioactive Compounds
Biomolecules from Natural Sources
Plant Extracts: Applications in the Food*

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Industry

Cereals, Fruits, Vegetables, Tea, and Spices Sources, Analysis, and Functions

Processing of fruits produces large volumes of wastes and these wastes can create pollution problems and also result in loss of valuable biomass and nutrients. The Handbook of Fruit Wastes and By-Products: Chemistry, Processing Technology, and Utilization deals with the various techniques and methods involved in processing of fruit by-products. Although there are some general books on by-

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products of food processing industry but they are limited in context to the by-products of some particular fruits. This is the first book devoted to fruit processing by-products of wide range of important fruits including tropical, subtropical and temperate fruits; and their possible utilization in food and non-food industries. Key Features Discusses the valorization of fruit processing by-products Covers the role of the by-products as prebiotics and dietary fibers Presents extraction techniques of

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bioactive compounds from fruit wastes This book provides in-depth information about the fruit processing by-products, their nutritional composition, biochemistry, processing technology of by-products and the utilization of by-products into various food applications. This book also offers comprehensive coverage on the role of the fruit by-products as prebiotics and dietary fibers, their potential as the source of bioactive ingredients and their utilization in the development of novel functional foods. It also includes various

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novel technologies useful in extraction and evaluation of the functional components from these fruit processing by-products. The book addresses how the proper utilization of fruit processing by-products would not only emerge as a source of extra profit to the fruit processing industry but also will help in lessen the environment pollution due to these fruit processing by-products. Plant Extracts in Food Applications is the first book of its kind focusing on the application of plant extracts in the food

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industry. Topics cover sources, extraction and encapsulation techniques, the chemistry and stability of plant extracts, antimicrobials, preservatives, nutrient enhancers, enzymes, flavoring and coloring agents, packaging aid, health benefits, opportunities and the challenges surrounding the use of plant extracts in food applications. Written by several experts in the field, this book is a valuable resource for students, scientists, and professionals in food science, food chemistry and nutrition.

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Concerns and potential risks regarding the use of synthetic chemicals have renewed the interests of consumers using natural and safe alternatives. Plant extracts represent an interesting ingredient, mainly due to their natural origin and phytochemical properties, allowing for obtaining active materials to extend shelf-life and add value to the product.

Presents chapters that deal with different sources of plant extracts and their applications in the food industry Covers the various extraction procedures which

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are used for plant extracts Includes the health benefits and stability of plant extracts Provides the role of plant extracts for shelf life enhancement, packaging aid, and as flavoring and coloring agents

Solid Phase Extraction thoroughly presents both new and historic techniques for dealing with solid phase extraction. It provides all information laboratory scientists need for choosing and utilizing suitable sample preparation procedures for any kind of sample. In addition, the book

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showcases the contemporary uses of sample preparation techniques in the most important industrial and academic project environments, including solid-phase Microextraction, molecularly imprinted polymers, magnetic nanoparticles, and more. Written by recognized experts in their respective fields, this one-stop reference is ideal for those who need to know which technique to choose for solid phase extraction. Used in conjunction with a similar release, Liquid Phase Extraction, this book allows users to

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master this crucial aspect of sample preparation. Defines the current state-of-the-art in extraction techniques and the methods and procedures for implementing them in laboratory practice Includes extensive referencing that facilitates the identification of key information Aimed at both entry-level scientists and those who want to explore new techniques and methods In order to successfully compete as a sustainable energy source, the value of biomass must be maximized through the production of valuable co-products in the

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biorefinery. Specialty chemicals and other biobased products can be extracted from biomass prior to or after the conversion process, thus increasing the overall profitability and sustainability of the biorefinery. Biorefinery Co-Products highlights various co-products that are present in biomass prior to and after processing, describes strategies for their extraction , and presents examples of bioenergy feedstocks that contain high value products. Topics covered include: Bioactive compounds from woody biomass

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Phytochemicals from sugar cane, citrus waste and algae Valuable products from corn and other oil seed crops Proteins from forages Enhancing the value of existing biomass processing streams Aimed at academic researchers, professionals and specialists in the bioenergy industry, Biorefinery Co-Products is an essential text for all scientists and engineers working on the efficient separation, purification and manufacture of value-added biorefinery co-products. For more information on the Wiley Series in

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Optimisation of Solid-liquid Extraction of Bioactive Compounds from Orthosiphon Stamineus Benth Leaves

30th European Symposium on Computer Aided Chemical Engineering

Food and Agricultural Samples

Application of Analytical Chemistry to Foods and Food Technology

Chemistry, Processing Technology, and Utilization

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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

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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

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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.

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

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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

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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

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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.

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

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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

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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

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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-inflammatory, 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

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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.

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

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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

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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

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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.

Gases in Agro-food Processes

Natural Product Extraction

Modern Extraction Techniques

Analysis of Marine Samples in Search of Bioactive Compounds

Cultivation, Biorefinery, and Applications

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High Value Fermentation Products, Volume 1
Gases in Agro-food Processes is the ultimate reference covering all applications of gases in agro-Food processes, from farm to fork. Divided into 11 sections, the book covers chemical and physical gas properties, gas monitoring, regulation, heat and mass transfers. Sections are dedicated to agriculture and food processing, wastewater treatment, safety applications and market trends. Users will find this to be a valuable resource for industrial scientists and researchers in technical centers who

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are developing agro-food products. In addition, the book is ideal for graduate students in agro-food science, chemistry and the biosciences. Explores quality, safety, regulatory aspects and market conditions, along with an industry outlook on gases used in agro-food processes Presents the application areas of gases in industries and explores the basic principles for each application Provides a single-volume reference on the wide range of potential uses for gases, facilitating use-case comparison and selection

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considerations Includes sections dedicated to agriculture and food processing, wastewater treatment, safety applications and market trends

Role of Materials Science in Food

Bioengineering

Handbook of Postharvest Technology

Bioactive Peptides from Food