

Supercritical Fluid Technology In Materials Science And Engineering Syntheses Properties And Applications

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Supercritical Fluids - Y. Arai 2012-11-02

The potential of supercritical fluid methods is presented in a comprehensive way. On the basis of a careful discussion of physical and chemical principles, the application of this method in process technology is demonstrated.

Handbook of Semiconductor Manufacturing Technology - Yoshio Nishi 2017-12-19

Retaining the comprehensive and in-depth approach that cemented the bestselling first edition's place as a standard reference in the field, the Handbook of Semiconductor Manufacturing Technology, Second Edition features new and updated material that keeps it at the vanguard of today's most dynamic and rapidly growing field. Iconic experts Robert Doering and Yoshio Nishi have again assembled a team of the world's leading specialists in every area of semiconductor manufacturing to provide the most reliable, authoritative, and industry-leading information available. Stay Current with the Latest Technologies In addition to updates to nearly every existing chapter, this edition features five entirely new contributions on... Silicon-on-insulator (SOI) materials and devices Supercritical CO₂ in semiconductor cleaning Low-k dielectrics Atomic-layer deposition Damascene copper electroplating Effects of terrestrial radiation on integrated circuits (ICs) Reflecting rapid progress in many areas, several chapters were heavily revised and updated, and in some cases, rewritten to reflect rapid advances in such areas as interconnect technologies, gate dielectrics, photomask fabrication, IC packaging, and 300 mm wafer fabrication. While no book can be up-to-the-minute with the advances in the semiconductor field, the Handbook of Semiconductor Manufacturing Technology keeps the most important data, methods, tools, and techniques close at hand.

Supercritical Fluid Nanotechnology - Concepcion Domingo Pascual 2015-10-22

The environmental and climate program demands technological solutions in the chemical industry that incorporate prevention of pollution. Major advances are needed to reduce the use of organic solvents, such as methanol, toluene, xylene, methyl ethyl ketone, and dichloromethane, which account for 27 percent of total toxics release inventory chemical

Carbon Dioxide Chemistry, Capture and Oil Recovery - Iyad Karamé 2018-08-16

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.

Handbook of Polyester Drug Delivery Systems - M. N. V. Ravi Kumar 2017-03-27

In the quest for innovative drug delivery systems attempting to meet the unmet needs in pharmaceutical

space, research has taken a much more complicated path that poses a significant challenge for translation. Despite the progress made with novel materials, polyesters still remain at the helm of drug delivery technologies. This book provides a single source of reference of polyester drug delivery systems that covers a broad spectrum of materials design, manufacturing techniques, and applications.

Introduction to Supercritical Fluids - Richard Smith Jr. 2013-12-08

This text provides an introduction to supercritical fluids with easy-to-use Excel spreadsheets suitable for both specialized-discipline (chemistry or chemical engineering student) and mixed-discipline (engineering/economic student) classes. Each chapter contains worked examples, tip boxes and end-of-the-chapter problems and projects. Part I covers web-based chemical information resources, applications and simplified theory presented in a way that allows students of all disciplines to delve into the properties of supercritical fluids and to design energy, extraction and materials formation systems for real-world processes that use supercritical water or supercritical carbon dioxide. Part II takes a practical approach and addresses the thermodynamic framework, equations of state, fluid phase equilibria, heat and mass transfer, chemical equilibria and reaction kinetics of supercritical fluids. Spreadsheets are arranged as Visual Basic for Applications (VBA) functions and macros that are completely (source code) accessible for students who have interest in developing their own programs. Programming is not required to solve problems or to complete projects in the text. Property worksheets/spreadsheets that are easy to use in learning environments Worked examples with Excel VBA Worksheet functions allow users to design their own processes Fluid phase equilibria and chemical equilibria worksheets allow users to change conditions, study new solutes, co-solvents, chemical systems or reactions

Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems - Chen, Lin 2020-08-28

Supercritical fluids are increasingly being used in energy conversion and fluid dynamics studies for energy-related systems and applications. These new applications are contributing to both the increase of energy efficiency as well as greenhouse gas reduction. Such research is critical for scientific advancement and industrial innovations that can support environmentally friendly strategies for sustainable energy systems. The Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems is a comprehensive two-volume reference that covers the most recent and challenging issues and outlooks for the applications and innovations of supercritical fluids. The book first converts basic thermodynamic behaviors and "abnormal" properties from a thermophysical aspect, then basic heat transfer and flow properties, recent new findings of its physical aspect and indications, chemical engineering properties, micro-nano-scale phenomena, and transient behaviors in fast and critical environments. It is ideal for engineers, energy companies, environmentalists, researchers, academicians, and students studying supercritical fluids and their applications for creating sustainable energy systems.

The Liquid and Supercritical Fluid States of Matter - John E. Proctor 2020-09-15

This book addresses graduate students and researchers wishing to better understand the liquid and

supercritical fluid states of matter, presenting a single cohesive treatment of the liquid and supercritical fluid states using the gas-like and solid-like approaches. Bringing this information together into one comprehensive text, this book outlines how our understanding of the liquid and supercritical fluid states is applied and explores the use of supercritical fluids in daily life and in research, for example in power generation, and their existence in planetary interiors. Presents a single coherent treatment of the key knowledge about the liquid and supercritical fluid states Provides comprehensive survey of key fluid properties from the latest experiments and applies our theoretical knowledge to understand the behaviour of these real fluids Explores the consequences of recent advances in the field on our understanding in industry, nature, and in interdisciplinary research, including planetary science

Emerging Technologies for Nanoparticle Manufacturing - Jayvadan K. Patel 2021-06-23

This book provides an overview of nanoparticle production methods, scale-up issues drawing attention to industrial applicability, and addresses their successful applications for commercial use. There is a need for a reference book which will address various aspects of recent progress in the methods of development of nanoparticles with a focus on polymeric and lipid nanoparticles, their scale-up techniques, and challenges in their commercialization. There is no consolidated reference book that discusses the emerging technologies for nanoparticle manufacturing. This book focuses on the following major aspects of emerging technologies for nano particle manufacturing. I. Introduction and Biomedical Applications of Nanoparticles II. Polymeric Nanoparticles III. Lipid Nanoparticles IV. Metallic Nanoparticles V. Quality Control for Nanoparticles VI. Challenges in Scale-Up Production of Nanoparticles VII. Injectable Nanosystems VIII. Future Directions and Challenges Leading scientists are selected as chapter authors who have contributed significantly in this field and they focus more on emerging technologies for nanoparticle manufacturing, future directions, and challenges.

Supercritical Fluid Cleaning - Samuel P. Sawan 1998-12-31

Although supercritical fluid (SCF) technology is now widely used in extraction and purification processes (in the petrochemical, food and pharmaceuticals industries), this book is the first to address the new application of cleaning. The objective is to provide a roadmap for readers who want to know whether SCF technology can meet their own processing and cleaning needs. It is particularly helpful to those striving to balance the requirements for a clean product and a clean environment. The interdisciplinary subject matter will appeal to scientists and engineers in all specialties ranging from materials and polymer sciences to chemistry and physics. It is also useful to those developing new processes for other applications, and references given at the end of each chapter provide links to the wider body of SCF literature. The book is organized with topics progressing from the fundamental nature of the supercritical state, through process conditions and materials interactions, to economic considerations. Practical examples are included to show how the technology has been successfully applied. The first four chapters consider principles governing SCF processing, detailing issues such as solubility, design for cleanability, and the dynamics of particle removal. The next three chapters discuss surfactants and microemulsions, SCF interaction with polymers, and the use of supercritical carbon dioxide (CO₂) as a cleaning solvent. The closing chapters focus on more practical considerations such as scaleup, equipment costs, and financial analysis.

Handbook on Supercritical Fluids - Jane Osborne 2014-01-01

Supercritical fluid carbon dioxide (sc-CO₂) possesses both gas-like and liquid-like properties. It is capable of depositing nanoparticles in small structures and poorly wettable substrates. Deposition and array formation of metal and metal sulphide nanoparticles on various substrates using sc-CO₂ as a medium has been a subject of considerable interest for researchers in nanomaterials area in recent years. This handbook begins by exploring nanoparticle deposition using supercritical fluid carbon dioxide. Further topics in this handbook include separation of oils using supercritical carbon dioxide; the application of an integrated supercritical extraction and impregnation process for incorporation of thyme extracts into different carriers; supercritical fluid extraction application on dairy products and by-products; and supercritical fluid technology applications in pharmaceutical drug formulations.

Supercritical Fluid Technology in Oil and Lipid Chemistry - Jerry W. King 1996

Thermodynamics of supercritical fluids with respect to lipid-containing systems; Solubility measurement of lipid constituents in supercritical fluids; Supercritical fluid extraction of oilseeds/lipids in natural products;

Supercritical fractionation of lipids; Oilseed solubility and extraction modeling; Modeling of the supercritical fluid extraction rate of oilseeds; Design and economic analysis of supercritical fluid extraction processes; Supercritical fluid extraction and fractionation of fish oils; Supercritical fluid extraction of egg lipids; Supercritical fluid extraction of Cocoa and Cocoa products; Supercritical CO₂ extraction of meat products and edible animal fats for cholesterol reduction; Supercritical fluid extraction of algae; Effect of supercritical fluids on residual meals and protein functionality; Treatment of food materials with supercritical carbon dioxide; Enzymatic synthesis in supercritical fluids; Basic principles and the role of supercritical fluid chromatography in lipid analysis; Supercritical fluid chromatography for the analysis of oleochemicals; Supercritical fluid chromatography of trace components in oils and fats; Analytical supercritical fluid extraction for oil and lipid analysis.

Foaming with Supercritical Fluids - Ernesto Di Maio 2021-11-06

Foaming with Supercritical Fluids, Volume Nine provides a comprehensive description of the use of supercritical fluids as blowing agents in polymer foaming. To this aim, the fundamental issues on which the proper design and control of this process are rooted are discussed in detail, with specific attention devoted to the theoretical and experimental aspects of sorption thermodynamics of a blowing agent within a polymer, the effect of the absorbed blowing agent on the thermal, interfacial and rheological properties of the expanding matter, and the phase separation of the gaseous phase, and of the related bubble nucleation and growth phenomena. Several foaming technologies based on the use of supercritical blowing agents are then described, addressing the main issues in the light of the underlying chemical-physical phenomena. Offers strong fundamentals on polymer properties important on foaming Outlines the use of supercritical fluids for foaming Covers theoretical points-of-view, including foam formation of the polymer/gas solution to the setting of the final foam Discusses the several processing technologies and applications

Supercritical Fluids and Organometallic Compounds - Can Erkey 2011-11-22

Organometallic compounds are utilized as reagents in the preparation and processing of advanced nanostructured materials, as catalysts in the production of a wide variety of specialty chemicals and polymers, and as drugs. Supercritical fluid science and technology has a wide variety of applications ranging from extraction of pharmaceutically active compounds to the synthesis of advanced materials. The combination of organometallic chemistry and supercritical fluids has significant potential. This book covers the fundamental aspects and related applications in this rapidly growing area. Covers the preparation of nanostructured composite materials using supercritical fluids Focuses on the intersection of organometallic chemistry and supercritical fluids Addresses the behavior of organometallic compounds in supercritical fluid environments

Advanced Supercritical Fluids Technologies - Igor Pioro 2020-05-20

Using SuperCritical Fluids (SCFs) in various processes is not new, because Mother Nature has been processing minerals in aqueous solutions at critical and supercritical pressures for billions of years. Somewhere in the 20th century, SCFs started to be used in various industries as working fluids, coolants, chemical agents, etc. Written by an international team of experts and complete with the latest research, development, and design, *Advanced Supercritical Fluids Technologies* is a unique technical book, completely dedicated to modern and advanced applications of supercritical fluids in various industries. *Advanced Supercritical Fluids Technologies* provides engineers and specialists in various industries dealing with SCFs as well as researchers, scientists, and students of the corresponding departments with a comprehensive overview of the current status, latest trends and developments of these technologies. Dr Igor Pioro is a professor at the University of Ontario Institute of Technology, Canada, and the Founding Editor of the ASME Journal of Nuclear Engineering and Radiation Science.

High Pressure Fluid Technology for Green Food Processing - Tiziana Fornari 2014-10-31

The aim of this book is to present the fundamentals of high pressure technologies from the perspective of mass transfer phenomena and thermodynamic considerations. Novel food applications are exposed and their relation to chemical analysis, extraction, reaction and particle formation processes are outlined. The chapters are written by a diverse group of scientists with expertise in chemistry, food processes, analytical chemistry, chemical engineering and chemical engineering thermodynamics, and biotechnology. The mission of green food engineering is to promote innovative technologies that reduce or eliminate the use or

generation of hazardous materials (solvents, reagents) in the design and operation of food related processes, with the view to improve food safety and quality. Several efficient, environmentally friendly and benign technologies based on the use of high pressure and green solvents have demonstrated to be sustainable alternatives to traditional processes in the food industry. Although hundreds of new ideas are being published in the open literature, reliable engineering tools to simulate and design those processes are still under development. High Pressure Fluid Technology for Green Food Processing presents in-depth analyses and outlines the ways towards their maturity. Tiziana Fornari, Research Institute of Food Science (CIAL) Universidad Autonoma de Madrid, Madrid, Spain Roumiana P. Stateva, Institute of Chemical Engineering, Bulgarian Academy of Sciences, Sofia, Bulgaria

Ion Exchange and Solvent Extraction - Yitzhak Marcus 2004-07-23

Volume 17 in the Ion Exchange and Solvent Extraction series represents the vanguard of research on solvent extraction. It covers the principles of electrolyte extraction and other subjects of increasing interest to the field. This volume begins with pharmaceutical applications of supercritical fluid solvents, particularly supercritical carbon dioxide. It also contains chapters on liquid ion exchangers and relevant experiment protocols, SCF applications in drug formulation and pollution reduction, exploiting SCF as reaction media, applications of metal bis(dicarbollide) in analytical chemistry and radioactive waste treatment, and synergistic extraction of metal ions. Volume 17 discusses the ion exchange isothermal supersaturation technique, metal separation via pH-induced parametric pumping, modeling of ion exchange kinetics for ultrapure water, and the engineering of activated carbons and carbonaceous materials for removal of metal ions and organic micropollutants in water. Volume 17 cover topics that include supercritical fluid applications, applications of metal bis(dicarbollide), and synergistic extraction of metal ions.

Handbook of Pharmaceutical Granulation Technology - Dilip M. Parikh 2021-05-12

This fully revised edition of Handbook of Pharmaceutical Granulation Technology covers the rapid advances in the science of agglomeration, process control, process modelling, scale-up, emerging particle engineering technologies, along with current regulatory changes presented by some of the prominent scientist and subject matter experts around the globe. Learn from more than 50 global subject matter experts who share their years of experience in areas ranging from drug delivery and pharmaceutical technology to advances in nanotechnology. Every pharmaceutical scientist should own a copy of this fourth edition resource. Key Features: Theoretical discussions covering granulation and engineering perspectives. Covers new advances in expert systems, process modelling and bioavailability Chapters on emerging technologies in particle engineering Updated Current research and developments in granulation technologies

Supercritical Fluid Technology for Energy and Environmental Applications - Vladimir Anikeev 2013-12-21

Supercritical Fluid Technology for Energy and Environmental Applications covers the fundamental principles involved in the preparation and characterization of supercritical fluids (SCFs) used in the energy production and other environmental applications. Energy production from diversified resources — including renewable materials — using clean processes can be accomplished using technologies like SCFs. This book is focused on critical issues scientists and engineers face in applying SCFs to energy production and environmental protection, the innovative solutions they have found, and the challenges they need to overcome. The book also covers the basics of sub- and supercritical fluids, like the thermodynamics of phase and chemical equilibria, mathematical modeling, and process calculations. A supercritical fluid is any substance at a temperature and pressure above its critical point where distinct liquid and gas phases do not exist. At this state the compound demonstrates unique properties, which can be "fine-tuned," making them suitable as organic solvents in a range of industrial and laboratory processes. This volume enables readers to select the most appropriate medium for a specific situation. It helps instructors prepare course material for graduate and postgraduate courses in the area of chemistry, chemical engineering, and environmental engineering. And it helps professional engineers learn supercritical fluid-based technologies and use them in solving the increasingly challenging environmental issues. Relates theory, chemical characteristics, and properties of the particular supercritical fluid to its various applications Covers the fundamentals of supercritical fluids, like thermodynamics of phase and chemical equilibria, mathematical modeling, and process calculations Includes the most recent applications of supercritical fluids, including energy

generation, materials synthesis, and environmental protection

Supercritical Fluid Technology for Drug Product Development - Peter York 2004-03-23

Interconnecting the fundamentals of supercritical fluid (SCF) technologies, their current and anticipated utility in drug delivery, and process engineering advances from related methodological domains and pharmaceutical applications, this volume unlocks the potential of supercritical fluids to further the development of improved pharmaceutical products—from drug powders for respiratory delivery to drug delivery systems for controlled release.

Supercritical Fluids as Solvents and Reaction Media - Gerd H. Brunner 2004-06-11

Supercritical fluids behave either like a gas or a liquid, depending on the values of thermodynamic properties. This tuning of properties, and other advantageous properties of supercritical fluids led to innovative technologies. More than 100 plants of production size are now in operation worldwide in the areas of process and production technology, environmental applications, and particle engineering. New processes are under research and development in various fields. This book provides an overview of the research activities in the field of Supercritical Fluids in Germany. It is based on the research program "Supercritical fluids as solvents and reaction media" on the initiative of the "GVC-Fachauschuß Hochdruckverfahrenstechnik" (i.e. the German working party on High Pressure Chemical Engineering of the Society of Chemical Engineers). This research program provided an immensely valuable platform for exchange of knowledge and experience. More than 50 young researchers were involved contributing with their expertise, their new ideas, and the motivation of youth. The results of this innovative research are described in this book. - This book provides an overview of the research activities in the field of Supercritical Fluids in Germany - Contains results of projects within the research program on "Supercritical fluids as solvents and reaction media" on the initiative of the German working party on High Pressure Chemical Engineering of the Society of Chemical Engineers. - More than 50 young researchers were involved in contributing with their expertise, their new ideas, and the motivation of youth.

Biomedical Polymers - Mike Jenkins 2007-08-06

Given the rapid development and use of biomaterials, it is becoming increasingly important to understand the structure, processing and properties of biomedical polymers and their medical applications. With its distinguished editor and team of international contributors, Biomedical Polymers reviews the latest research on this important group of biomaterials. The book discusses natural, synthetic, biodegradable and non bio-degradable polymers and their applications. Chapters review polymeric scaffolds for tissue engineering and drug delivery systems, the use of polymers in cell encapsulation, their role as replacement materials for heart valves and arteries, and their applications in joint replacement. The book also discusses the use of polymers in biosensor applications. Biomedical polymers is an essential reference for scientists and all those concerned with the development and use of this important group of biomaterials Reviews the latest research in this important group of biomaterials Discusses natural, synthetic, biodegradable and non-biodegradable polymers and their applications Examines the use of biomedical polymers in such areas as drug delivery systems and cell encapsulation

Supercritical Fluid Technology in Materials Science and Engineering - Ya-Ping Sun 2002-03-26

This title analyzes the chemical reactions, structures and fundamental properties of supercritical fluid systems for the production of new compounds, nanomaterials, fibers, and films. It compiles contemporary research and technological advances for increased selectivity and reduced waste in chemical, industrial, pharmaceutical, and biomedical applications. Topics include fluid dynamics, catalysis, hydrothermal synthesis, surfactants, conducting polymers, crystal growth, and other aspects and applications of supercritical fluids.

Encyclopedia of Chromatography - Jack Cazes 2009-10-12

Thoroughly revised and expanded, the third edition of the Encyclopedia of Chromatography is an authoritative source of information for researchers in chemistry, biology, physics, engineering, and materials science. This quick reference and guide to specific chromatographic techniques and theory provides a basic introduction to the science and techn

Supercritical Fluid Processing of Food and Biomaterials - S. S. H. Rizvi 2011-11-21

The need for understanding the fundamentals of supercritical fluid processing and their applications to

ever-widening ranges of materials and conditions continues to expand. There has been much interest in the use of supercritical fluids as solvents in bioprocessing of food and related materials. Admittedly, a few successful applications of supercritical fluids could be cited but these are minuscule in comparison with the potential applications as yet undeveloped and unexploited. This volume is based on the papers presented at the symposium on Super critical fluid processing of biomaterials: Basics of process design and applications organized during the 8th World Congress of Food Science and Technology held in Toronto, Sept. 29-Oct. 4, 1991. The coverage represents the breadth of interest in this field around the world. I am indeed indebted to the authors who so willingly brought their work to the symposium and provided revised manuscripts of their papers for publication. I would also like to acknowledge the assistance of Professor M. LeMaguer of the University of Guelph for co-chairing the symposium. , The organization and successful completion of the symposium and the production of this volume is due to the assistance of the Technical Program Committee of the Congress and the cooperation of many people. I express my appreciation to them all. S. S. H.

Supercritical Fluid Technology for Energy and Environmental Applications - Vladimir Anikeev
2014-01-24

Supercritical Fluid Technology for Energy and Environmental Applications covers the fundamental principles involved in the preparation and characterization of supercritical fluids (SCFs) used in the energy production and other environmental applications. Energy production from diversified resources - including renewable materials - using clean processes can be accomplished using technologies like SCFs. This book is focused on critical issues scientists and engineers face in applying SCFs to energy production and environmental protection, the innovative solutions they have found, and the challenges they need to overcome. The book also covers the basics of sub- and supercritical fluids, like the thermodynamics of phase and chemical equilibria, mathematical modeling, and process calculations. A supercritical fluid is any substance at a temperature and pressure above its critical point where distinct liquid and gas phases do not exist. At this state the compound demonstrates unique properties, which can be "fine-tuned," making them suitable as organic solvents in a range of industrial and laboratory processes. This volume enables readers to select the most appropriate medium for a specific situation. It helps instructors prepare course material for graduate and postgraduate courses in the area of chemistry, chemical engineering, and environmental engineering. And it helps professional engineers learn supercritical fluid-based technologies and use them in solving the increasingly challenging environmental issues. Relates theory, chemical characteristics, and properties of the particular supercritical fluid to its various applications Covers the fundamentals of supercritical fluids, like thermodynamics of phase and chemical equilibria, mathematical modeling, and process calculations Includes the most recent applications of supercritical fluids, including energy generation, materials synthesis, and environmental protection

Handbook of Food Analysis Instruments - Semih Otles 2016-04-19

Explore the Pros and Cons of Food Analysis Instruments The identification, speciation, and determination of components, additives, and contaminants in raw materials and products will always be a critical task in food processing and manufacturing. With contributions from leading scientists, many of whom actually developed or refined each technique or

Supercritical Fluids - E. Kiran 2012-12-06

Supercritical fluids are neither gas nor liquid, but can be compressed gradually from low to high density and they are therefore interesting and important as tunable solvents and reaction media in the chemical process industry. By adjusting the density the properties of these fluids can be customised and manipulated for a given process - physical or chemical transformation. Separation and processing using supercritical solvents such as CO₂ are currently on-line commercially in the food, essential oils and polymer industries. Many agencies and industries are considering the use of supercritical water for waste remediation. Supercritical fluid chromatography represents another, major analytical application. Significant advances have recently been made in materials processing, ranging from particle formation to the creation of porous materials. The chapters in this book provide tutorial accounts of topical areas centred around: (1) phase equilibria, thermodynamics and equations of state; (2) critical behaviour, crossover effects; (3) transport and interfacial properties; (4) molecular modelling, computer simulation; (5) reactions, spectroscopy; (6) phase separation kinetics; (7) extractions; (8) applications to polymers, pharmaceuticals, natural materials

and chromatography; (9) process scale-up.

Introduction to Supercritical Fluids - Richard Smith 2013

This text provides an introduction to supercritical fluids with easy-to-use Excel spreadsheets suitable for both specialized-discipline (chemistry or chemical engineering student) and mixed-discipline (engineering/economic student) classes. Each chapter contains worked examples, tip boxes and end-of-the-chapter problems and projects. Part I covers web-based chemical information resources, applications and simplified theory presented in a way that allows students of all disciplines to delve into the properties of supercritical fluids and to design energy, extraction and materials formation systems for real-world processes that use supercritical water or supercritical carbon dioxide. Part II takes a practical approach and addresses the thermodynamic framework, equations of state, fluid phase equilibria, heat and mass transfer, chemical equilibria and reaction kinetics of supercritical fluids. Spreadsheets are arranged as Visual Basic for Applications (VBA) functions and macros that are completely (source code) accessible for students who have interest in developing their own programs. Programming is not required to solve problems or to complete projects in the text. Property worksheets/spreadsheets that are easy to use in learning environments Worked examples with Excel VBA Worksheet functions allow users to design their own processes Fluid phase equilibria and chemical equilibria worksheets allow users to change conditions, study new solutes, co-solvents, chemical systems or reactions

Hydrothermal and Supercritical Water Processes - Gerd Brunner 2014-04-04

Hydrothermal and Supercritical Water Processes presents an overview on the properties and applications of water at elevated temperatures and pressures. It combines fundamentals with production process aspects. Water is an extraordinary substance. At elevated temperatures (and pressures) its properties change dramatically due to the modifications of the molecular structure of bulk water that varies from a stable three-dimensional network, formed by hydrogen bonds at low and moderate temperatures, to an assembly of separated polar water molecules at high and supercritical temperatures. With varying pressure and temperature, water is turned from a solvent for ionic species to a solvent for polar and non-polar substances. This variability and an enhanced reactivity of water have led to many practical applications and to even more research activities, related to such areas as energy transfer, extraction of functional molecules, unique chemical reactions, biomass conversion and fuel materials processing, destruction of dangerous compounds and recycling of useful ones, growth of monolithic crystals, and preparation of metallic nanoparticles. This book provides an introduction into the wide range of activities that are possible in aqueous mixtures. It is organized to facilitate understanding of the main features, outlines the main applications, and gives access to further information Summarizes fundamental properties of water for engineering applications Compares process and reactor designs Evaluates processes from thermodynamic, economic, and social impact viewpoints

Particle Formation with Supercritical Fluids - Michael Türk 2014-11-06

Particle formation with supercritical fluids is a promising alternative to conventional precipitation processes as it allows the reduction of particle size and control of morphology and particle size distribution without degradation or contamination of the product. The book comprehensively examines the current status of research and development and provides perspectives and insights on promising future directions. The introduction to high pressure and high temperature phase equilibria and nucleation phenomena provides the basic principles of the underlying physical and chemical phenomena, allowing the reader an understanding of the relationship between process conditions and particle characteristics. Bridging the gap between theory and application, the book imparts the scientific and engineering fundamentals for innovative particle formation processes. The interdisciplinary "modus operandi" will encourage cooperation between scientists and researchers from different but complementary disciplines. Focuses on the general principles of particle formation in supercritical fluids Considers high pressure and high temperature phase equilibria, fluid dynamics and nucleation theory Discusses the underlying physical and chemical phenomena needed to understand the different applications, pointing out the relationship between process conditions and product properties

Solubility in Supercritical Carbon Dioxide - Ram B. Gupta 2006-12-06

Supercritical fluid extraction is an environmentally safe and cost-effective alternative to traditional organic

solvents. Carbon dioxide is widely used as the solvent of choice for applications such as caffeine and nicotine extraction due to its mild critical temperature, nontoxicity, nonflammability, and low cost. Introducing the most complete collection of supercritical CO₂ solubility data currently available, *Solubility in Supercritical Carbon Dioxide* features experimental data on more than 780 solutes in consistent units and an easily accessible format. This book reflects the authors' painstaking efforts to compile solubility data for an extensive variety of compounds including liquids, solids, polymers, foods, drugs, nutraceuticals, pesticides, dyes, and metal complexes. Each of the more than 1200 tables is arranged in alphabetical order by compound, includes a graphical plot of its data, and features the following information: Compound name, molecular formula, and molecular weight Temperature and pressure given in Kelvin and bar, respectively Name and amount of cosolvent, if applicable Molar or mass solubility, when applicable Mole- or mass-fraction solubility Synonyms for the compound, where available Reference source for the data Density data for CO₂ appears in one appendix, while a complete list of solutes by molecular formula appears in the other. Clear, consistent, and carefully organized, *Solubility in Supercritical Carbon Dioxide* is the most convenient quick-lookup guide for reliable data.

Nanoparticles in Translational Science and Medicine - 2011-11-14

This volume explores some of the most exciting recent advances in basic research on nanoparticles in translational science and medicine and how this knowledge is leading to advances in the various fields. This series provides a forum for discussion of new discoveries, approaches, and ideas Contributions from leading scholars and industry experts Reference guide for researchers involved in molecular biology and related fields

Supercritical Fluid Extraction - Jason Lindy 2014-01-01

The technology of application of fluids in the supercritical state is a viable option and a high quality scientific method for obtaining materials, insulation, and extractions among other situations in which it may be applied yielding a high quality material. Due to its wide range of application, it has been extensively used to investigate different raw materials focusing on obtaining high quality products and applicability in various industrial segments. Its use has been mentioned in several studies as a high-quality and efficient technology for obtaining high-value added products. This book discusses the technology used in supercritical fluid extraction, as well as its applications and limitations.

Nanomaterials: A Danger or a Promise? - Roberta Brayner 2012-08-10

With the increased presence of nanomaterials in commercial products such as cosmetics and sunscreens, fillers in dental fillings, water filtration process, catalysis, photovoltaic cells, bio-detection, a growing public debate is emerging on toxicological and environmental effects of direct and indirect exposure to these materials. *Nanomaterials: A Danger or a Promise?* forms a balanced overview of the health and environmental issues of nanoscale materials. By considering both the benefits and risks associated with nanomaterials, *Nanomaterials: A Danger or a Promise?* compiles a complete and detailed image of the many aspects of the interface between nanomaterials and their real-life application. The full cycle of nanomaterials life will be presented and critically assessed to consider and answer questions such as: How are nanomaterials made? What they are used for? What is their environmental fate? Can we make them better? Including coverage of relevant aspects about the toxicity of manufactured nanomaterials, nanomaterials life cycle, exposure issues, *Nanomaterials: A Danger or a Promise?* provides a comprehensive overview of the actual knowledge in these fields but also presents perspectives for the future development of a safer nanoscience. This comprehensive resource is a key reference for students, researcher, manufacturers and industry professionals alike.

Sustainable Nanotechnology - Yashwant V. Pathak 2022-03-29

Sustainable Nanotechnology A robust examination of the use of nanotechnology in the manufacture of sustainable products In *Sustainable Nanotechnology: Strategies, Products, and Applications*, a team of distinguished researchers delivers a comprehensive and up-to-date exploration of nanotechnology applications in environmental, pharmaceutical, and engineering products in the context of global sustainability. The book offers balanced coverage of the benefits and risks of nanotechnology. Divided into three parts, the editors have included contributions from leading scholars discussing sustainability, toxicological impacts, and nanomaterial-based adsorbents. This edited volume helps readers understand

how nanotechnology and nanomaterials apply in different global sustainability challenges. It also discusses models for understanding the lifecycle and risk assessments of manufactured nanomaterials. Case studies are included to explore such topics as design, remediation, and technology assessment. The book also provides: Thorough introductions to nanotechnology-based research priorities for global sustainability and the challenges and opportunities of modern, sustainable nanotechnology Comprehensive explorations of improving the sustainability of bio-based products with nanotechnology and the improvement of the environmental sustainability of biopolymers using nanotechnology Practical discussions of nanotechnology-based polymers for drug delivery applications In-depth examinations of green nanotechnology-driven drug delivery systems Perfect for nanotechnology-focused professionals, sustainability experts, biomedical experts, and pharmaceutical industry practitioners, *Sustainable Nanotechnology: Strategies, Products, and Applications* will also earn a place in the libraries of neuroscientists, bioengineering professionals, and those involved in neuroprosthetic engineering.

Advanced Applications of Supercritical Fluids in Energy Systems - Chen, Lin 2017-03-24

Supercritical fluids have been utilized for numerous scientific advancements and industrial innovations. As the concern for environmental sustainability grows, these fluids have been increasingly used for energy efficiency purposes. *Advanced Applications of Supercritical Fluids in Energy Systems* is a pivotal reference source for the latest academic material on the integration of supercritical fluids into contemporary energy-related applications. Highlighting innovative discussions on topics such as renewable energy, fluid dynamics, and heat and mass transfer, this book is ideally designed for researchers, academics, professionals, graduate students, and practitioners interested in the latest trends in energy conversion. *Supercritical Fluid Extraction of Nutraceuticals and Bioactive Compounds* - Jose L. Martinez 2007-11-28 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

Nucleic Acids as Gene Anticancer Drug Delivery Therapy - Loutfy H. Madkour 2019-08-27

Nucleic Acids as Gene Anticancer Drug Delivery Therapy highlights the most recent developments in cancer treatment using nucleic acids, nanoparticles and polymer nanoparticles for genomic nanocarriers as drug delivery, including promising opportunities for targeted and combination therapy. The development of a wide spectrum of nanoscale technologies is beginning to change the scientific landscape in terms of disease diagnosis, treatment, and prevention. This book presents the use of nanotechnology for medical applications, focusing on its use for anticancer drug delivery. Various intelligent drug delivery systems such as inorganic nanoparticles and polymer-based drug delivery are discussed. The use of smart drug delivery systems seems to be a promising approach for developing intelligent therapeutic systems for cancer immunotherapies and is discussed in detail along with nucleic acid-targeted drug delivery combination therapy for cancer. *Nucleic Acids as Gene Anticancer Drug Delivery Therapy* will be a useful reference for pharmaceutical scientists, pharmacologists, and those involved in nanotechnology and cancer research. Discusses intelligent drug delivery systems such as inorganic nanoparticles and polymer-based drug delivery Contains a comprehensive comparison of various delivery systems, listing their advantages and limitations Presents combination therapy as a new hope for enhancing current gene-based treatment efficacy

Synthesis of Nanostructured Materials in Near and/or Supercritical Fluids - Can Erkey 2021-12-08

Synthesis of Nanostructured Materials in Near and/or Supercritical Fluids: Methods, Fundamentals and Modeling offers a comprehensive review of the current status of research, development and insights on promising future directions, covering the synthesis of nanostructured materials using supercritical fluid-based processes. The book presents fundamental aspects such as high-pressure phase behavior of complex mixtures, thermodynamics and kinetics of adsorption from supercritical solutions, mechanisms of particle formation phenomena in supercritical fluid-based processes, and models for further development. It bridges the gap between theory and application, and is a valuable resource for scientists, researchers and students alike. Includes thermodynamic and mass transfer data necessary for industrial plant design Explains the mechanisms of reactions in a supercritical fluid environment Lists numerous industrial processes for the

production of many consumer products