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Modern Drying Technology

Energy Savings

Volume 4



Modern Drying Technology Energy Savings

Jin-Ying Zhang



Modern Drying Technology Energy Savings:

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techniques osmotic dehydration heat pump assisted drying zeolite usage solar drying drying and heat treatment for solid wood and other biomass sources and sludge thermal processing Volume 5 Process Intensification Volume 5 Dedicated to process intensification by more efficient distribution and flow of the drying medium foaming controlled freezing and the application of superheated steam infrared radiation microwaves power ultrasound and pulsed electric fields Process efficiency is treated in conjunction with the quality of sensitive products such as foods for a variety of hybrid and combined drying processes

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Mujumdar, 2014-01-10 This five volume series provides a comprehensive overview of all important aspects of modern drying technology concentrating on the transfer of cutting edge research results to industrial use Volume 5 is dedicated to process intensification by hybrid processes that combine convective or contact heat transfer with microwaves ultrasound or radiation Process intensification by more efficient choice distribution and flow of the drying medium such as impinging jet drying pulse combustion drying superheated steam drying drying in specially designed spouted beds are thoroughly discussed Moreover methods that favorably affect the process by changing the structure of the drying product e g foaming electroporation are treated Emphasis is placed on drying including freeze drying of sensitive materials such as foods biomaterials and pharmaceuticals Released Volumes of Modern Drying Technology Volume 1 Computational Tools at Different Scales ISBN 978 3 527 31556 7 Volume 2 Experimental Techniques ISBN 978 3 527 31557 4 Volume 3 Product Quality and Formulation ISBN 978 3 527 31558 1 Volume 4 Energy Savings ISBN 978 3 527 31559 8 Set Volume 1 5 ISBN 978 3 527 31554 3

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engineers and researchers around the globe Intermittent and Nonstationary Drying Technologies Azharul Karim, Chung-Lim Law, 2017-09-18 The first comprehensive book on intermittent drying Intermittent and Nonstationary Drying Technologies Principles and Applications demonstrates the benefits of this process and covers key issues including technologies effect of operating parameters mathematical modelling energy efficiency and product quality It discusses such topics as periodic drying conventional and intermittent food drying processes and food quality relationship among intermittency of drying microstructural changes and food quality microwave assisted pulsed fluidized and spouted bed drying and cellular level water distribution Aimed at food engineers chemical product engineers pharmaceutical engineers and technologists plant design engineers and researchers and students in these areas this useful reference helps readers

Advanced Drying Technologies for Foods Arun S Mujumdar, Hong-Wei Xiao, 2019-06-19 The goal of all drying research and development is to develop cost effective innovative processes that yield high quality dried products with less energy consumption and reduced environmental impact With the literature on drying widely scattered Advanced Drying Technologies for Foods compiles under one cover concise authoritative up to date assessments of modern drying technologies applied to foods This book assembles a number of internationally recognized experts to provide critical reviews of advanced drying technologies their merits and limitations application areas and research opportunities for further development Features Provides critical reviews of advanced drying technologies Discusses the merits and limitations of a variety of food drying technologies Explains drying kinetics energy consumption and quality of food products Reviews the principles and recent applications of superheated steam drying The first four chapters deal with recent developments in field assisted drying technologies These include drying techniques with the utilization of electromagnetic fields to deliver energy required for drying for example microwave drying radio frequency drying electrohydrodynamic drying and infrared radiation drying The remainder of this book covers a wide assortment of recently developed technologies which include pulse drying swell drying impinging stream drying and selected advances in spray drying The final chapter includes some innovative technologies which are gaining ground and are covered in depth in a number of review articles and handbooks and hence covered briefly in the interest completeness This book is a valuable reference work for researchers in academia as well as industry and will encourage further research and development and innovations in food drying technologies *Handbook of Industrial Drying, Fourth Edition* Arun S. Mujumdar, 2014-07-11 By far the most commonly encountered and energy intensive unit operation in almost all industrial sectors industrial drying continues to attract the interest of scientists researchers and engineers The Handbook of Industrial Drying Fourth Edition not only delivers a comprehensive treatment of the current state of the art but also serves as a consultative reference for streamlining industrial drying operations New to the Fourth Edition Computational fluid dynamic simulation Solar impingement and pulse combustion drying Drying of fruits vegetables sugar biomass and coal Physicochemical aspects of sludge drying Life cycle assessment of drying systems Covering commonly

encountered dryers as well as innovative dryers with future potential the Handbook of Industrial Drying Fourth Edition not only details the latest developments in the field but also explains how improvements in dryer design and operation can increase energy efficiency and cost effectiveness *Energy Efficiency in Industry* Markus Blesl, Alois Kessler, 2022-01-01 This book quantifies the potential for greater energy efficiency in industry on the basis of technology and sector related analyses Starting from the methodological fundamentals the first part discusses the electricity and heat based basic technologies and cross sectional processes on the basis of numerous application examples In addition to classic topics such as lighting and heat recovery the study also covers processes that have received less attention to date such as drying and painting The second part is devoted to energy intensive industries in particular metal production and processing the manufacture of the non metallic materials cement and glass and the chemical paper plastics and food industries Both parts are concluded by placing them in a larger energy and economic context The findings are condensed into checklists at many points and summarized in the overall view at the end to form generally applicable recommendations This book is a translation of the original German 2nd edition Energieeffizienz in der Industrie by Markus Blesl and Alois Kessler published by Springer Verlag GmbH Germany part of Springer Nature in 2017 The translation was done with the help of artificial intelligence machine translation by the service DeepL com A subsequent human revision was done primarily in terms of content so that the book will read stylistically differently from a conventional translation Springer Nature works continuously to further the development of tools for the production of books and on the related technologies to support the authors **Novel and Alternative Methods in Food Processing** N. Veena, Megh R. Goyal, Ritesh B. Watharkar, 2023-08-04 This new volume explores emerging and advanced techniques in the food processing sector Novel food processing methods such as ultrasound processing microwave heating advanced drying methods and nonthermal technologies are discussed in detail The volume also covers the application of irradiation and encapsulation methods microbial valorizing and other novel food processing and preservation methods Mathematical modeling concepts and case studies are also included to illustrate applications of modeling techniques in food processing The volume promotes the understanding of the thermodynamics of food polymers structural design principles structural hierarchy and the steps involved in food structuring and structure measurement techniques **Handbook of Biomass Valorization for Industrial Applications** Shahid Ul Islam, Aabid Hussain Shalla, Salman Ahmad Khan, 2022-01-05 HANDBOOK of BIOMASS VALORIZATION for INDUSTRIAL APPLICATIONS The handbook provides a comprehensive view of cutting edge research on biomass valorization from advanced fabrication methodologies through useful derived materials to current and potential application sectors Industrial sectors such as food textiles petrochemicals and pharmaceuticals generate massive amounts of waste each year the disposal of which has become a major issue worldwide As a result implementing a circular economy that employs sustainable practices in waste management is critical for any industry Moreover fossil fuels which are the primary sources of fuel in the transportation

sector are also being rapidly depleted at an alarming rate. Therefore, to combat these global issues without increasing our carbon footprint, we must look for renewable resources to produce chemicals and biomaterials. In that context, agricultural waste materials are gaining popularity as cost-effective and abundantly available alternatives to fossil resources for the production of a variety of value-added products including renewable fuels, fuel components, and fuel additives. *Handbook of Biomass Valorization for Industrial Applications* investigates current and emerging feedstocks as well as provides in-depth technical information on advanced catalytic processes and technologies that enable the development of all possible alternative energy sources. The 22 chapters of this book comprehensively cover the valorization of agricultural wastes and their various uses in value-added applications like energy, biofuels, fertilizers, and wastewater treatment. Audience: The book is intended for a very broad audience working in the fields of materials sciences, chemical engineering, nanotechnology, energy, environment, chemistry, etc. This book will be an invaluable reference source for the libraries in universities and industrial institutions, government, and independent institutes, individual research groups, and scientists working in the field of valorization of biomass. *Pinch Analysis for Energy and Carbon Footprint Reduction* Ian C. Kemp, Jeng Shiun

Lim, 2020-08-08. *Pinch Analysis for Energy and Carbon Footprint Reduction* is the only dedicated pinch analysis and process integration guide covering a breadth of material from foundational knowledge to in-depth processes. Readers are introduced to the main concepts of pinch analysis: the calculation of energy targets for a given process, the pinch temperature, and the golden rules of pinch-based design to meet energy targets. More advanced topics include the extraction of stream data necessary for a pinch analysis, the design of heat exchanger networks, hot and cold utility systems, combined heat and power (CHP), refrigeration, batch and time-dependent situations, and optimization of system operating conditions including distillation, evaporation, and solids drying. This new edition offers tips and techniques for practical applications supported by several detailed case studies. Examples stem from a wide range of industries including buildings and other non-process situations. This reference is a must-have guide for chemical process engineers, food and biochemical engineers, plant engineers, and professionals concerned with energy optimization including building designers. Covers practical analysis of both new and existing processes. Teaches readers to extract the stream data necessary for a pinch analysis and describes the targeting process in depth. Includes a downloadable spreadsheet to calculate energy targets. Demonstrates how to achieve the targets by heat recovery, utility system design, and process change. Updated to include carbon footprint, water, and hydrogen pinch developments in industrial applications and software, site data reconciliation, additional case studies, and answers to selected exercises. **Food Engineering Handbook** Theodoros Varzakas, Constantina Tzia, 2014-11-24. *Food Engineering Handbook* Food Process Engineering addresses the basic and applied principles of food engineering methods used in food processing operations around the world. Combining theory with a practical, hands-on approach, this book examines the thermophysical properties and modeling of selected processes such as chilling, freezing, and dehydration. A complement to Food Engineering

Handbook Food Engineering Fundamentals this text Discusses size reduction mixing emulsion and encapsulation Provides case studies of solid liquid and supercritical fluid extraction Explores fermentation enzymes fluidized bed drying and more Presenting cutting edge information on new and emerging food engineering processes Food Engineering Handbook Food Process Engineering is an essential reference on the modeling quality safety and technologies associated with food processing operations today *Energy Technology 2012* Maria D. Salazar-Villalpando, Neale R. Neelameggham, Donna Post Guillen, Soobhankar Pati, Gregory K. Krumdick, 2012-05-09 Proceedings of symposia sponsored by the Energy Committee of the Extraction and Processing Division and the Light Metals Division of TMS The Minerals Metals Materials Society Held during the TMS 2012 Annual Meeting Exhibition Orlando Florida USA March 11 15 2012 *Next Generation Renewable Thermal Energy Harvesting, Conversion and Storage Technologies* Dhananjay Yadav, Mukesh Kumar Awasthi, Ashwani Kumar, 2025-09-01 Next Generation Renewable Thermal Energy Harvesting Conversion and Storage Technologies is an essential guide for those interested in the field of renewable thermal energy The book covers a wide range of topics focusing on solar thermal geothermal and biomass energy By presenting the fundamentals advancements and practical applications the book bridges the gap in interdisciplinary knowledge Readers will find valuable insights into the latest technological advancements and real world case studies making it a comprehensive resource for researchers engineers students and policymakers The book aims to inspire collaboration and innovation contributing to a cleaner and more sustainable future The book is divided into three sections each dedicated to a specific renewable energy source The first section covers solar thermal energy including solar collectors concentrating solar power systems and thermal energy storage The second section focuses on geothermal energy discussing exploration techniques drilling technologies and optimizing power generation The last section explores biomass energy emphasizing sustainability and the integration of biomass with other energy sources Delivers a consolidated resource that covers both theoretical foundations and real world applications Unveils the latest innovations in solar thermal energy harvesting including Photothermal Conversion Technologies and Materials Innovations in Collector Technologies Reveals the power of Nanomaterials and Coatings for Enhanced Solar Thermal Absorption as well as the use of Phase Change Materials for Energy Storage and Retrieval Dives into Geothermal Energy Harvesting Enhanced Geothermal Systems EGS and their applications in agriculture aquaculture communities buildings and more **Flame Spray Drying** Mariia Sobulska, Ireneusz Zbicinski, 2021-09-22 Drying processes are among the most energy consuming operations in industry Flame spray drying FSD is a novel approach to reduce the energy supply needed for the spray drying process Flame Spray Drying Equipment Mechanism and Perspectives describes FSD technology and current developments in flame techniques and evaluates potential industrial implementation Details advantages of FSD in terms of energy consumption and reduced drying time Promotes applications of biofuels for the drying process Analyzes the FSD method from CFD modelling to product quality Evaluates potential safety and product degradation risks Provides examples of

potential applications of the FSD technique in drying of different materials This book describes an important new technique that is useful to chemical and process engineering researchers professionals and students working with drying technologies

Handbook of Drying of Vegetables and Vegetable Products Min Zhang,Bhesh Bhandari,Zhongxiang Fang,2017-07-12 This handbook provides a comprehensive overview of the processes and technologies in drying of vegetables and vegetable products The Handbook of Drying of Vegetables and Vegetable Products discusses various technologies such as hot airflow drying freeze drying solar drying microwave drying radio frequency drying infrared radiation drying ultrasound assisted drying and smart drying The book s chapters are clustered around major themes including drying processes and technologies drying of specific vegetable products properties during vegetable drying and modeling measurements packaging changes to the properties of pigments nutrients and texture during drying process dried products storage nondestructive measurement and monitoring of moisture and morphological changes during vegetable drying novel packaging and computational fluid dynamics **Modern Tendencies in Organic and Bioorganic Chemistry** Gennadii Efremovich Zaikov,2008 This volume includes the following analyses factors regarding thermal and thermooxidative degradation of polyolefine nanocomposites modelling of catalytic complexes in the oxidation reactions modelling the kinetics of moisture adsorption by natural and synthetic polymers new trends achievements and developments on the effects of beam radiation structural behaviour of composite materials comparative evaluation of antioxidant properties synthesis properties and application of polymeric composites and nanocomposites photodegradation and light stabilisation of polymers wear resistant composite polymeric materials some macrokinetic phenomena transport phenomena in polymer matrixes liquid crystals flammability of polymeric materials and new flame retardants

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