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Engineering In Practice

Microchemical Engineering In Practice

**This one-stop reference is
the first book on this**

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**emerging and rapid
developing field with a
focus on synthesis and
catalysis. As such, it
covers all aspects from
academia and industry in
a clearly structured way.**

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Leading experts provide the background information as an initial aid for newcomers to the field, while chapters on different reaction types and industrial

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**applications make this an
equally vital resource for
specialists. From the
contents: - Introduction
and background -
Fabrication of
microractors - Properties**

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**and use of microreactors
- Organic chemistry in
microreactors -
Homogeneous reactions
(including photochemical
and electrochemical
reactions) -**

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Heterogeneous reactions
- Biphasic reactions
(liquid/liquid, liquid/gas) -
Bioorganic reactions -
Industrial applications
Thomas Wirth is
Professor of Organic

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**Chemistry at Cardiff
University in Wales. After
a postdoctoral stay with
Kaoru Fuji at Kyoto
University as a JSPS
fellow, he started his
independent research in**

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**the group of Bernd Giese
in Basel, Switzerland. He
was invited as a visiting
professor to various
places: University of
Toronto, Canada (1999),
Chuo University in Tokyo,**

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**Japan (2000), Osaka
University, Japan (2004).
He was awarded the
Werner-Prize from the
New Swiss Chemical
Society in 2000. He is the
author of about 80**

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**publications and has
written or edited 4 books.
In the nearly 10 years
since the publication of
the bestselling first
edition of Introduction to
Green Chemistry, interest**

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in green chemistry and clean processes has grown so much that topics, such as fluorous biphasic catalysis, metal organic frameworks, and process intensification,

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barely mentioned in the first edition, have become major areas of research. In addition, government funding has ramped up the development of fuel cells

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and biofuels. It reflects the evolving focus from pollution remediation to pollution prevention. Copiously illustrated with over 800 figures, this second edition provides

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**an update from the
frontiers of the field. New
and expanded research
topics: Metal-organic
frameworks Solid acids
for alkylation of
isobutene by butanes**

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**Carbon molecular sieves
Mixed micro- and
mesoporous solids
Organocatalysis Process
intensification and gas
phase enzymatic
reactions Hydrogen**

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**storage for fuel cells
Reactive distillation
Catalysts in action on an
atomic scale Updated and
expanded current events
topics: Industry
resistance to inherently**

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power Removal of
mercury from vaccines
Removal of mercury and
lead from primary
explosives Biofuels Uses
for surplus glycerol New**

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**hard materials to reduce
wear Electronic waste
Smart growth The book
covers traditional green
chemistry topics,
including catalysis,
benign solvents, and**

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alternative feedstocks. It also discusses relevant but less frequently covered topics with chapters such as Chemistry of Longer Wear and Population and the

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Environment. This coverage highlights the importance of chemistry to everyday life and demonstrates the benefits the expanded exploitation of green

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**chemistry can have for
society.**

**This is the first book in
the field to focus on
these aspects, providing
extremely valuable
information unavailable**

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**elsewhere for anyone
seeking the practical
application of
microreactor technology
in preparative chemistry.
The topics covered
branch out in three**

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different directions. To begin with, the knowledge necessary for the preparative chemistry concerning the influence of the so-called microeffects on the

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reaction procedure and on mass and heat transfer as well as the surface phenomena are provided in detail. Next, practical aspects of the synthesis of various basic

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**chemicals and fine
chemicals, polymers,
bioproducts and
nanoparticles are
discussed, including
important advice for both
the researcher and**

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**industrial chemist.
Finally, reaction
examples in
microreactors whose
reaction guidance are
best understood are
given together with**

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universally applicable correlations as well as modeling approaches and transfer potential on related reaction systems. With its specific instructions, tips and

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**experimental procedures
for product syntheses as
well as the inclusion of
both the technical and
theoretical background
this is a must-have for
beginners and experts**

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**alike working in this
emerging field.**

**Announcements for the
Year ...**

**Micro Process
Engineering**

Managing the Risks of

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**Emerging Biological and
Chemical Technologies
Green Chemistry and
Technologies
Public Health Engineering
Abstracts
Current Trends and**

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Future Developments on (Bio-) Membranes

Green chemistry and chemical engineering belong together and this twelfth volume in the successful Handbook of Green Chemistry series represents the perfect one-

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stop reference on the topic. Written by an international team of specialists with each section edited by international leading experts, this book provides first-hand insights into the field, covering chemical engineering process

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design, innovations in unit operations and manufacturing, biorefining and much more besides. An indispensable source for every chemical engineer in industry and academia.

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Practice provides the information chemists and engineers need to evaluate the use of microreactors, covering the technical, operational, and economic considerations for various applications. It explains the systems needed to use

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microreactors in production and presents examples of microreactor use in different chemistries, including larger scale production processes. There are guidelines on calculating the costs and the risks of production using continuous flow

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microreactors. Complete with case studies, this is an essential guide for chemists and engineers interested in investigating the advantages of chemical microreactors.

A framework for assessing the

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security risks of emerging dual-use technologies and devising tailored governance strategies is proposed and applied to contemporary case studies. Recent advances in disciplines such as biotechnology, nanotechnology, and

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neuropharmacology entail a “dual-use dilemma” because they promise benefits for human health and welfare yet pose the risk of misuse for hostile purposes. The emerging field of synthetic genomics, for example, can

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produce custom DNA molecules for life-saving drugs but also makes possible the creation of deadly viral agents for biological warfare or terrorism. The challenge for policymakers is to prevent the misuse of these new technologies

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without forgoing their benefits. Innovation, Dual Use, and Security offers a systematic approach for managing the dual-use dilemma. The book presents a “decision framework” for assessing the security risks of emerging

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technologies and fashioning governance strategies to manage those risks. This framework is applied to fourteen contemporary case studies, including synthetic genomics, DNA shuffling and directed evolution, combinatorial

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chemistry, protein engineering, immunological modulation, and aerosol vaccines. The book also draws useful lessons from two historical cases: the development of the V-series nerve agents in Britain and the use and misuse of LSD by

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the U.S. Army and the CIA. Innovation, Dual Use, and Security offers a comprehensive, multifaceted introduction to the challenges of governing dual-use technologies in an era of rapid innovation. The book will be of

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interest to government officials and other practitioners as well as to students and scholars in security studies, science and technology studies, biology, and chemistry. Cornell University Announcements Principles of Chemical Engineering

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Practice

Green Chemical Engineering

Microreactors in Organic Synthesis
and Catalysis

Extrusion Processing Technology

An Index of U.S. Voluntary
Engineering Standards

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Process intensification (PI) is a chemical and process design approach that leads to substantially smaller, cleaner, safer and more energy-efficient process technology. A hot topic across the chemical and process industries, this is the first

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book to provide a practical working guide to understanding and developing successful PI solutions that deliver savings and efficiencies. It will appeal to engineers working with leading-edge process technologies and those involved

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research and development of chemical, process, environmental, pharmaceutical, and bioscience systems. * Shows chemical and process engineers how to apply process intensification to their system, process or operation * A

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hard-working reference and user guide to the technology AND application of PI, covering fundamentals, industry applications, supplemented by a development and implementation guide * Leading author team, including Professor

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Colin Ramshaw, developer of the HiGee high-gravity distillation process at ICI, widely credited as the instigator of PI principles
Enables chemical engineering students to bridge theory and practice
Integrating scientific principles with

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practical engineering experience, this text enables readers to master the fundamentals of chemical processing and apply their knowledge of such topics as material and energy balances, transport phenomena, reactor design, and separations

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across a broad range of chemical industries. The author skillfully guides readers step by step through the execution of both chemical process analysis and equipment design. Principles of Chemical Engineering Practice is divided into

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two sections: the Macroscopic View and the Microscopic View. The Macroscopic View examines equipment design and behavior from the vantage point of inlet and outlet conditions. The Microscopic View is focused on the

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equipment interior resulting from conditions prevailing at the equipment boundaries. As readers progress through the text, they'll learn to master such chemical engineering operations and equipment as: Separators to divide a

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mixture into parts with desirable concentrations Reactors to produce chemicals with needed properties Pressure changers to create favorable equilibrium and rate conditions Temperature changers and heat exchangers to

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regulate and change the temperature of process streams Throughout the book, the author sets forth examples that refer to a detailed simulation of a process for the manufacture of acrylic acid that provides a unifying thread for equipment

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sizingin context. The manufacture of hexyl glucoside provides a threadfor process design and synthesis.

Presenting basic thermodynamics, Principles of ChemicalEngineering Practice enables students in chemical engineeringand related

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disciplines to master and apply the fundamentals and to proceed to more advanced studies in chemical engineering.

This book represents a collection of papers presented at the 2nd World Congress on Integrated

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Computational Materials
Engineering (ICME), a specialty
conference organized by The
Minerals, Metals & Materials
Society (TMS).

Microreactors in Preparative
Chemistry

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Annual Catalogue of the
Agricultural and Mechanical
College of Texas. Session ...
Chemical Engineering Progress
Innovation, Dual Use, and Security
Microreactors in Organic Chemistry
and Catalysis

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Nanomaterials: A Danger or a Promise?

This proceedings volume of the 8th International Microchemical Symposium contains the plenary and keynote lectures delivered at the conference. Besides basic and historic

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aspects the following major topics are covered: "Microchemistry Arts and Archeology" in "Microchemistry in Life Sciences" "Microchemistry Sciences" in Environmental "Microchemistry in Material Sciences" "Instrumentation, Methods and Automation in

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Microchemistry". The papers show the present state of microchemistry and the development of this field since the pioneer days of Fritz Pregl and Friedrich Emich. Today microchemistry is a different science as compared to the Pregl and Emich days,

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for it combines many disciplines like chemistry, physics, mathematics, informatics, biology and does not only mean microanalysis- even if it is still predominant and the best tool for elucidation of the microcosmos. Due to this development modern

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microchemistry plays an important role in science and technology. It had been the intention of the Scientific th Executive Committee to demonstrate this at the 8 International Microchemical Symposium with the goal to encourage interdisciplinary

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communication and stimulate discussion.

This book serves as a reference for those interested in state-of-the-art research on the science and technology of ionic liquids (ILs), particularly in relation to lipids processing and

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analysis. Topics include a review of the chemistry and physics of ILs as well as a quantitative understanding of structure-activity relationships at the molecular level. Further, chapter authors examine the molecular basis of the toxicity of ILs, the prediction of the

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properties of ILs, and the rationale and steps toward a priori design of ionic liquids for task-defined applications. Emerging research in developing lipid-inspired ILs and their prospective use in drug formulation is described. Among the highlights are the latest

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advances in IL-mediated biocatalysis and biotransformation, along with lipase production, purification, and activation. Reviews the state-of-the-art applications of ionic liquids in lipid processing and relevant areas from a variety of perspectives Summarizes the

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latest advances in the measurement of the physical and chemical properties of ionic liquids and available databases of thermodynamic property datapoints
Presents the tremendous opportunities provided and challenges faced from ionic liquids as a newly emerging

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technology for lipids processing area
"Flow Chemistry fills the gap in graduate education by covering chemistry and reaction principles along with current practice, including examples of relevant commercial reaction, separation, automation, and

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analytical equipment. The Editors of Flow Chemistry are commended for having taken the initiative to bring together experts from the field to provide a comprehensive treatment of fundamental and practical considerations underlying flow

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chemistry. It promises to become a useful study text and as well as reference for the graduate students and practitioners of flow chemistry."

Professor Klavs Jensen Massachusetts Institute of Technology, USA Broader theoretical insight in driving a chemical

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reaction automatically opens the window towards new technologies particularly to flow chemistry. This emerging concept promotes the transformation of present day's organic processes into a more rapid continuous set of synthesis operations, more

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compatible with the envisioned sustainable world. These two volumes Fundamentals and Applications provide both the theoretical foundation as well as the practical aspects.

Modeling and Simulation Techniques
in Structural Engineering

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Annual Review

Current Engineering Practice
Fundamentals, Modelling and
Reactions

Covering Those Standards,
Specifications, Test Methods, and
Recommended Practices Issued by

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National Standardization
Organizations in the United States
A Workshop Summary

For the second edition
of 'Microreactors in
Organic Chemistry and
Catalysis' all chapters

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have been revised and updated to reflect the latest developments in this rapidly developing field. This new edition has 60% more content, and it remains a

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comprehensive
publication covering
most aspects of the
topic. The use of
microreactors in
homogeneous,
heterogeneous as well as

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biphasic reactions is covered in the main part of the book, together with catalytic, bioorganic and automation approaches. The initial chapters

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also provide a solid physical chemistry background on fluidics in microdevices.

Finally, a chapter on industrial applications and developments covers

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recent progress in process chemistry. An excellent reference for beginners and experts alike.

In the last few decades great strides have been

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made in chemistry at the nanoscale, where the atomic granularity of matter and the exact positions of individual atoms are key determinants of

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structure and dynamics. Less attention, however, has been paid to the mesoscale--it is at this scale, in the range extending from large molecules (10 nm)

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through viruses to eukaryotic cells (10 microns), where interesting ensemble effects and the functionality that is critical to macroscopic

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phenomenon begins to manifest itself and cannot be described by laws on the scale of atoms and molecules alone. To further explore how knowledge

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about mesoscale
phenomena can impact
chemical research and
development activities
and vice versa, the
Chemical Sciences
Roundtable of the

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National Research Council convened a workshop on mesoscale chemistry in November 2014. With a focus on the research on chemical phenomena at the

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mesoscale, participants examined the opportunities that utilizing those behaviors can have for developing new catalysts, adding new

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functionality to materials, and increasing our understanding of biological and interfacial systems. The workshop also

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highlighted some of the challenges for analysis and description of mesoscale structures. This report summarizes the presentations and discussion of the

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workshop.

In the last decade, the attention paid to the environmental protection has generated a considerable interest towards the development

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of new energy carriers
and green energy
production methods.

Hydrogen as an energy
carrier becomes a
potential important
source of energy due to

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its neutral
environmental impact.
However, its production,
transformation and
purification, presents a
challenge in the so
called hydrogen economy.

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Current Trends and
Future Developments on
(Bio-) Membranes gives a
comprehensive review on
the present state of the
art of the hydrogen
production and

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purification using new and alternative technologies stressing green processes and environment protection. The book covers green processes, renewable

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feedstocks utilization
and membrane reactor
technology for hydrogen
production in line with
new process
intensification
strategy. The book is

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divided in four
sections, ie
fundamentals of hydrogen
generation, its impact
on environmental issue,
new applications
involving hydrogen and

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its storage and distribution. The main scope of this book is to offer a new horizon on hydrogen generation and utilization. It stresses the role of new

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technologies for hydrogen generation, including the “micro-reactors technology for portable applications , their combination with high temperature fuel

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cells, the role of gas-separation for both hydrogen purification and CO₂ sequestration, the exploitation of renewable sources (biogas, bioethanol and

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other renewables feedstocks) in reforming processes useful to generate hydrogen, membrane and membrane reactor technology as well as membrane bio-

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reactors etc. Presents
process intensification
and commercialization of
new and alternative
hydrogen generation
technologies Relates new
hydrogen production

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methods to their
environmental impact
Outlines the
fundamentals of hydrogen
generation Includes new
developed technologies
for hydrogen transport

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and storage

Register

Food and Non-Food

Biomaterials

Evaluation of the

Microbiology Standards

for Drinking Water

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General information
New Perspectives on
Hydrogen Production,
Separation, and
Utilization

Process Intensification

The 21st century is associated with

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a number of environmental, social, and economic challenges spanning from globalization and migration to climate change, global health, urbanization, and natural hazards. These challenges of the modern age command our immediate reaction towards an equal society.

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There is an urgent need for scientists, researchers, and politicians to take the reins by providing immediate solutions to tackle this harsh reality. The need for a more human approach has recently led to what we call humanitarian engineering. Modern

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Challenges and Approaches to Humanitarian Engineering provides relevant theoretical frameworks and the latest empirical research findings in this area. It discusses the most recent challenges and approaches in the field of humanitarian engineering and

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presents research, case studies, and innovative models. Covering topics such as contact tracing apps, scientific production, and sustainable management, this book is an essential resource for engineers, government officials, scientists, activists, humanitarians,

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emergency management agencies, students and educators of higher education, researchers, and academicians.

Interest in green chemistry and clean processes has grown so much in recent years that topics such as fluororous biphasic catalysis,

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metal organic frameworks, and process intensification, which were barely mentioned in the First Edition, have become major areas of research. In addition, government funding has ramped up the development of fuel cells and biofuels. This reflects the evolving

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focus from pollution remediation to pollution prevention. Copiously illustrated with more than 800 figures, the Third Edition provides an update from the frontiers of the field. It features supplementary exercises at the end of each chapter relevant to the chemical

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examples introduced in each chapter. Particular attention is paid to a new concluding chapter on the use of green metrics as an objective tool to demonstrate proof of synthesis plan efficiency and to identify where further improvements can be made

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**through fully worked examples
relevant to the chemical industry.
NEW AND EXPANDED RESEARCH
TOPICS Metal-organic frameworks
Metrics Solid acids for alkylation of
isobutene by butanes Carbon
molecular sieves Mixed micro- and
mesoporous solids**

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**Organocatalysis Process
intensification and gas phase
enzymatic reactions Hydrogen
storage for fuel cells Reactive
distillation Catalysts in action on an
atomic scale UPDATED AND
EXPANDED CURRENT EVENTS
TOPICS Industry resistance to**

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**inherently safer chemistry Nuclear
power Removal of mercury from
vaccines Removal of mercury and
lead from primary explosives
Biofuels Uses for surplus glycerol
New hard materials to reduce wear
Electronic waste Smart growth The
book covers traditional green**

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chemistry topics, including catalysis, benign solvents, and alternative feedstocks. It also discusses relevant but less frequently covered topics with chapters such as "Chemistry of Long Wear" and "Population and the Environment." This coverage

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highlights the importance of chemistry to everyday life and demonstrates the benefits the expanded exploitation of green chemistry can have for society. With the increased presence of nanomaterials in commercial products such as cosmetics and

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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

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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

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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?

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**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**

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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

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professionals alike.

The University Records

Catalog issue

**Practical Aspects in Bioprocessing,
Nanotechnology, Catalysis and
more**

**Engineering for Efficiency,
Sustainability and Flexibility**

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Applications

A Comprehensive Handbook

This three-volume handbook provides an overview of the key aspects of micro process engineering. Volume 1 covers the fundamentals,

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operations and catalysts,
volume 2 examines devices,
reactions and applications,
with volume 3 rounding off
the trilogy with system,
process and plant
engineering. Fluid

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dynamics, mixing, heat/mass transfer, purification and separation microstructured devices and microstructured reactors are explained in the first volume. Volume 2 segments microreactor

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design, fabrication and assembly, bulk and fine chemistry, polymerisation, fuel processing and functional materials into understandable parts. The final volume of the handbook

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addresses microreactor systems design and scale-up, sensing, analysis and control, chemical process engineering, economic and eco-efficiency analyses as well as microreactor plant

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case studies in one book. Together, this 3-volume handbook explains the science behind micro process engineering to the scale-up and their real life industrial applications.

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A MULTI-FACETED,
HIERARCHIC ANALYSIS OF
CHEMICAL MICRO
PROCESS TECHNOLOGY
Micro Reactor
Differentiation and Process
Intensification

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Consequences of Chemical
Micro Processing Physical
and Chemical Implications
Impact on Chemical
Engineering Impact on
Process Engineering Impact
on Process Results Impact

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on Society and Ecology
Impact on Economy
Application Fields and
Markets of Micro Reactors
MODELLING AND
SIMULATION OF MICRO
REACTORS Flow

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Phenomena on the
Microscale Methods of
Computational Fluid
Dynamics Flow Distributions
Heat Transfer Mass Transfer
and Mixing Reaction
Kinetics and Modelling Free

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Surface Flow Flow in Porous
Media GAS-PHASE
REACTIONS Catalyst
Coatings in Micro Channels
Micro Reactors for Gas-
Phase Reactions Oxidations
Hydrogenations

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Dehydrogenations
Substitutions Eliminations
Additions and Coupling
Reactions LIQUID- AND
LIQUID/LIQUID-PHASE
REACTIONS Micro Reactors
for Liquid-Phase and

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Liquid/Liquid-Phase
Reactions Aliphatic
Nucleophilic and
Electrophilic Substitution
such as Esterification,
Acylation of Amines,
Thiocyanation, and much

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more Aromatic Electrophilic
and Nucleophilic
Substitution such as
Nitrations, Amino-de-
halogenations, Diazo
Chemistry, and much more
Metal-catalysed Aromatic

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Substitution such as Suzuki
and Sonogashira Couplings,
and more Free Radical
Substitution such as Alkane
Nitration Addition to Carbon-
Carbon and Carbon-hetero
Multiple Bonds such as the

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Michael Addition, the Diels-Alder-Reaction, the Aldol Reaction, and much more
Oxidations and Reductions
Eliminations and
Rearrangements Inorganic
Reactions such as the Belous

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ov-Zhabotinskii-Reaction,
Complex Formations, and
much more GAS/LIQUID
CONTACTING Micro
Reactors for Gas/Liquid
Contacting Aromatic
Electrophilic Substitution

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such as Direct Fluorinations
Free Radical Substitution
such as Alkane Fluorinations
and Chlorinations Addition
to Carbon-Carbon and
Carbon-hetero Multiple
Bonds such as Nitro-group

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Hydrogenation, Cycloalkane
Hydrogenation, and more
Oxidations and Reductions
such as Alcohol Oxidation,
Photo Diels-Alder Reactions,
and more Inorganic
Reactions such as Sulfite

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Oxidation.

The book gives a systematic introduction to green chemistry principles and technologies in inorganic and organic chemistry, polymer sciences and

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pharmaceutical industry. It also discusses the use of biomass and marine resources for synthesis as well as renewable energy utilization and the concepts and evaluation of recycling

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economy and eco-industrial
parks.

Ionic Liquids in Lipid
Processing and Analysis
Modern Challenges and
Approaches to Humanitarian
Engineering

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Proceedings of the 8th
International Microchemical
Symposium Organized by
the Austrian Society for
Microchemistry and
Analytical Chemistry, Graz,
Austria, August 25-30, 1980

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A Chemical and Biological
Perspective
Introduction to Green
Chemistry, Second Edition
The Annual Catalogue of
Purdue University,
Lafayette, Indiana ... with

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Announcements for ...

The only up-to-date book on this important technology, Extrusion Processing Technology: Food and Non-Food Biomaterials bridges the gap between the principles of extrusion science

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and the practical "know how" of operational engineers and technicians. Written by internationally renowned experts with over forty years of experience between them, this valuable reference for food

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scientists, food engineers, chemical engineers, and students includes coverage of new, greener technologies as well as case studies to illustrate the practical, real-world application of the principles in

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various settings.

Advances in Hydrogen
Production, Storage and
Distribution reviews recent
developments in this key
component of the emerging
"hydrogen economy," an energy

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infrastructure based on hydrogen. Since hydrogen can be produced without using fossil fuels, a move to such an economy has the potential to reduce greenhouse gas emissions and improve energy

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security. However, such a move also requires the advanced production, storage and usage techniques discussed in this book. Part one introduces the fundamentals of hydrogen production, storage, and

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distribution, including an overview of the development of the necessary infrastructure, an analysis of the potential environmental benefits, and a review of some important hydrogen production

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technologies in conventional, bio-based, and nuclear power plants. Part two focuses on hydrogen production from renewable resources, and includes chapters outlining the production of hydrogen through water

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electrolysis, photocatalysis, and bioengineered algae. Finally, part three covers hydrogen production using inorganic membrane reactors, the storage of hydrogen, fuel cell technology, and the potential of

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