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*Hydrogen Energy and Fuel Cell
Primers is a series of concise books
that present those coming into this
broad and multidisciplinary field
the most recent advances in each of
its particular topics. Its volumes
bring together information that has*

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*thus far been scattered in many
different sources under one single
title, which makes them a useful
reference for industry
professionals, researchers and
graduate students, especially those
starting in a new topic of research.*

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*These volumes, PEM Water
Electrolysis vol 1 and 2, allows these
readers to identify the technology
gaps for the development of
commercially viable PEM
electrolysis systems for energy
applications. This primer examines*

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*the fundamentals of PEM
electrolysis and selected research
topics that are currently subject of
attention by academic and industry
community, such as gas cross-over
and AST protocols. This lays the
foundation for the exploration of*

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the current industrial trends for PEM electrolysis, such as power to gas application, are discussed, with strong focus on the current trends in the application of PEM electrolysis associated with energy storage. These include durability

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*aspects of PEM electrolysis systems
and components, accelerated stress
test protocols, manufacturing
aspects of large-scale electrolyzers
and components, gas crossover
problems in PEM electrolyzer
safety, and challenges associated*

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*with high-current density operation
of PEM electrolyzers. A technology
development matrix for systems and
components requirements will also
be covered, as well as
unconventional PEM water
electrolysis systems, such as ozone*

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*generators Presents the
fundamentals and most current
knowledge in proton exchange
membrane water electrolyzers
Explores the technology gaps and
challenges for commercial
deployment of PEM water*

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electrolysis technologies Includes
Engineering Solution

*unconventional systems, such as
ozone generators Brings together
information from many different
sources under one single title,
making it a useful reference for
industry professionals, researchers*

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and graduate students alike

Global experts provide an

authoritative source of information

on the use of electrochemical fuel

cells, and in particular discuss the

use of nanomaterials to enhance the

performance of existing energy

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*systems. The book covers the state
of the art in the design,*

*preparation, and engineering of
nanoscale functional materials as
effective catalysts for fuel cell
chemistry, highlights recent
progress in electrocatalysis at both*

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*fuel cell anode and cathode, and
details perspectives and challenges
in future research.*

Advances in Sonochemistry

*This book provides a brief research
source for optical fiber sensors for
energy production and storage*

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systems, discussing fundamental aspects as well as cutting-edge trends in sensing. This volume provides industry professionals, researchers and students with the most updated review on technologies and current trends, thus helping

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*them identify technology gaps,
develop new materials and novel
designs that lead to commercially
viable energy storage systems.*

*Handbook of Ultrasonics and
Sonochemistry*

Nanoscale Electrochemistry

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*Electrodeposition of
Nanostructured Materials*

*Challenges and Perspectives for the
21st Century*

*Theoretical and Experimental
Sonochemistry Involving Inorganic
Systems*

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Fruits and fruit based products are, in most cases, associated with very good sensory characteristics, health, well-being, perishability, relatively easy to mix with food products of diverse origin, amenable to be

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processed by conventional and novel technologies. Given the multiplicity of aspects whenever fruit preservation is considered, the editors took the challenge of covering in a thorough, comprehensive manner most aspects

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dealing with this topic. To accomplish these goals, the editors invited well known colleagues with expertise in specific disciplines associated with fruit preservation to contribute chapters to this book. Eighteen chapters were assembled in

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a sequence that would facilitate, like building blocks, to have at the same time, a birds-eye view and an in-depth coverage of traditional and novel technologies to preserve fruits. Even though processing took center stage in this book, ample space was

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dedicated to other relevant and
timely topics on fruit preservation
such as safety, consumer perception,
sensory and health aspects.

FEATURES: Traditional and Novel
Technologies to Process Fruits
Microwaves Ohmic Heating UV-C

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light Irradiation High Pressure
Engineering Solution

Pulsed Electric Fields Ultrasound

Vacuum Impregnation Membranes

Ozone Hurdle Technology Topics

Associated with Fruit Preservation

Safety Nutrition and Health

Consumer Perception Sensory

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Minimal Processing Packaging Unit
Operations for Fruit Processing
Cooling and Freezing Dehydration
Frying

The application of ultrasound waves
to chemical reactions —
sonochemistry — has huge potential

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for innovation in eco-friendly and
eco-efficient chemistry.

Sonochemistry: New Opportunities
for Green Chemistry first introduces
the basics of ultrasonic waves and
the history of sonochemistry before
moving on to look at acoustic

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cavitation and the estimation of ultrasonic parameters. After this comes a discussion of the equipment needed for experimentation with sonochemistry. Finally there is an in-depth look at green sonochemistry in different fields of research,

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covering concepts such as new combinations of ultrasound with ionic liquids, microwave irradiation, enzyme combination, and sono-assisted electrochemistry. In conclusion, distinguished sonochemists from around the world

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share their opinions on the green
sonochemistry, and their predictions
in the field. Undergraduate and
graduate students in chemistry, and
practitioners of ultrasonic
technology will gain a unique insight
into the opportunities and

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challenges facing sonochemistry
today in its theoretical and practical
implementation.

This updated guide to the current
state-of-the-art of this complex and
multidisciplinary area fills an urgent
need for a unified source of

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information on piezoelectric devices
and their astounding variety of
existing and emerging applications.
New understandings underlying the
principles of Piezoelectric
Transducers, new technological
advances in its applications, and new

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areas of utility for these transducers
made a second edition of this book
inevitable.

This new volume of Modern Aspects
of Electrochemistry reviews different
methods for the production of metal
powders including mechanical,

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chemical and electrochemical
powders. Electrochemically
produced metal powders are of high
purity and they are extremely active
during sintering. These powders find
a wide-range of applications in
automotive, aerospace, energy

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device and electronics industries.

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Nanomaterials for Fuel Cell
Catalysis

Cavitation

Fundamentals and Engineering

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Energy Aspects of Acoustic

Cavitation and Sonochemistry

PEM Water Electrolysis

Hydrogen and Bioenergy:

Integration Pathways for

Renewable Energy Applications

focuses on the nexus between

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hydrogen and carbon
compounds as energy carriers,
with a particular focus on
renewable energy solutions. This
book explores opportunities for
integrating hydrogen in the
bioenergy value chain, such as

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adding hydrogen to upgrade
biofuels and lower CO₂
emissions during production. The
book also takes the inverse path
to examine hydrogen production
by chemical and biological routes
from various bioresources,

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including solid waste,
wastewater, agricultural products
and algae. This broad coverage
of technologies and applications
presents a unique resource for
researchers and practitioners
developing integrated hydrogen

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and bioenergy technologies. This
book will also be useful for
graduate students and new
researchers, presenting an
introductory resource in the
areas of hydrogen and
bioenergy. Energy planners and

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engineers will also benefit from this content when designing and deploying hydrogen infrastructure for power, heating and transportation. Provides a comprehensive picture of hydrogen generation from

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biomass, as well as other sources of hydrogen for power, heating, transportation and storage applications Explores the ways hydrogen can be utilized in combination with bio-derived hydrocarbon chains to produce a

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variety of substitutes for fossil
fuel-based petrochemicals Fills
the gap between theoretical
knowledge and technology
viability Analyzes how these
technologies fit into an overall
energy strategy targeted at

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expanding the renewable energy
sector

This brief explains in detail
fundamental concepts in
acoustic cavitation and bubble
dynamics, and describes
derivations of the fundamental

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equations of bubble dynamics in order to support those readers just beginning research in this field. Further, it provides an in-depth understanding of the physical basis of the phenomena. With regard to

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sonochemistry, the brief presents the results of numerical simulations of chemical reactions inside a bubble under ultrasound, especially for a single-bubble system and including unsolved problems.

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Written so as to be accessible both with and without prior knowledge of fundamental fluid dynamics, the brief offers a valuable resource for students and researchers alike, especially those who are unfamiliar with

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this field. A grasp of fundamental undergraduate mathematics such as partial derivative and fundamental integration is advantageous; however, even without any background in mathematics, readers can skip

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the equations and still understand the fundamental physics of the phenomena using the book's wealth of illustrations and figures. As such, it is also suitable as an introduction to the field.

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Sustainable development is now accepted as a necessary goal for achieving societal, economic and environmental objectives. Within this chemistry has a vital role to play. The chemical industry is successful but traditionally

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success has come at a heavy
cost to the environment. The
challenge for chemists and
others is to develop new
products, processes and
services that achieve societal,
economic and environmental

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benefits. This requires an approach that reduces the materials and energy intensity of chemical processes and products; minimises the dispersion of harmful chemicals in the environment; maximises

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the use of renewable resources
and extends the durability and
recyclability of products in a way
that increases industrial
competitiveness as well as
improve its tarnished image.

The use of power ultrasound to

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promote industrial electrochemical processes, or sonoelectrochemistry, was first discovered over 70 years ago, but recently there has been a revived interest in this field. Sonoelectrochemistry is a

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technology that is safe, cost-effective, environmentally friendly and energy efficient compared to other conventional methods. The book contains chapters on the following topics, contributed from leading

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researchers in academia and
industry: Use of electrochemistry
as a tool to investigate Cavitation
Bubble Dynamics
Sonoelectroanalysis
Sonoelectrochemistry in
environmental applications

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Organic Sonoelectrosynthesis
Engineering Solution

Sonoelectrodeposition Influence
of ultrasound on corrosion
kinetics and its application to
corrosion tests

Sonoelectropolymerisation

Sonoelectrochemical production

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of nanomaterials Sonochemistry
and Sonoelectrochemistry in
hydrogen and fuel cell
technologies

Ultrasound in Food Processing
Sonoelectrochemical Synthesis
of Submicron Metal Powders

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Disease Which Requires Optimal
Approach in Emergency Manner
Particle Adhesion and Removal
Applied Sonochemistry
**Pulsed sonoelectrochemical
synthesis is a widely used**

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technique for producing nanoparticles. In this technique, alternating pulses of electric current and power ultrasound are applied to an electrochemical cell to create and suspend particles in the electrolyte. The pulsed technique largely separates the

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**particle morphology defining
physical action of
electrochemistry and ultrasound.
Despite the large body of work
characterizing the pulsed
method, surprisingly little is
written about the behavior of
particles in the continuous case,**

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**where electric current and
ultrasound are simultaneously
present. In this thesis,
continuous ultrasound assisted
electrochemical synthesis of
nanoparticles is established.
Potentially useful mechanisms
for particle size and shape**

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**control in continuous reactors
are discussed. A continuous
sonoelectrochemical reactor was
designed and demonstrated to
produce submicron copper
powders. Improvements to the
batch reactor design are
proposed to extend the technique**

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**to a flow reactor useful for
commercial production of
submicron metal powders.
This book discusses the
ultrasonic synthesis,
characterization and application
of various nanoparticles, as well
as the ultrasonic synthesis of**

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**metal and inorganic
nanoparticles such as noble
metals, transition metals,
semiconductors, nanocomposites,
alloys and catalysts. In addition,
it describes the engineering of
micro- and nanosystems using
ultrasound-responsive**

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biomolecules. In acoustic cavitation, unique phenomena based on bubbles dynamics, extreme high-temperature and pressure conditions, radical reactions, extreme heating and cooling rates, strong shockwaves, and microstreaming are

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generated, and under certain conditions, mist generation (atomization of a liquid) is effectively induced by ultrasonic irradiation. These unique phenomena can be used to produce various high-performance functional metal

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and inorganic nanoparticles.

Nanoparticles and nanomaterials are key materials in advancing nanotechnology and as such ultrasound and sonochemical techniques for producing nanoparticles and nanomaterials have been actively studied for the

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last two decades. Although a few professional books related to “ultrasound” and “nanomaterials” have been published, these mainly target professional researchers. This book covers this topic in a way that appeals to graduate

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**students, researchers and
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**PEM Water Electrolysis, a volume
in the Hydrogen Energy and Fuel
Cell Primers series presents the
most recent advances in the field.
It brings together information
that has thus far been scattered**

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**in many different sources under
one single title, making it a
useful reference for industry
professionals, researchers and
graduate students. Volumes One
and Two allow readers to identify
technology gaps for commercially
viable PEM electrolysis systems**

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**for energy applications and
examine the fundamentals of
PEM electrolysis and selected
research topics that are top of
mind for the academic and
industry community, such as gas
cross-over and AST protocols. The
book lays the foundation for the**

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**exploration of the current
industrial trends for PEM
electrolysis, such as power to gas
application and a strong focus on
the current trends in the
application of PEM electrolysis
associated with energy storage.
Presents the fundamentals and**

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**most current knowledge in
proton exchange membrane
water electrolyzers Explores the
technology gaps and challenges
for commercial deployment of
PEM water electrolysis
technologies Includes
unconventional systems, such as**

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**ozone generators Brings together
information from many different
sources under one single title,
making it a useful reference for
industry professionals,
researchers and graduate
students alike**

This SpringerBrief provides an

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**overview of the use of ultrasound
in various dairy applications,
highlighting their significant
benefits for the dairy industry,
including energy savings and
product improvement. It
describes in detail the physical
and chemical effects of high- and**

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**low-frequency power ultrasound
in specific applications such as
emulsification, ultrafiltration,
crystallisation, inactivation of
microbes, functionality
modifications of secondary dairy
products and fat separation.
Although to date the majority of**

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these applications have only been proven in the laboratory, some have been successfully implemented on a larger scale. By offering a concise review that includes the transition from laboratory-scale projects to large-scale commercialization, this

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SpringerBrief fills a gap in the literature. Ultrasound processing has the advantage of minimising flavour loss, increasing homogeneity, reducing energy requirements, reducing processing times, enhancing end-product quality, reducing

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**chemical and physical hazards
and lowering the environmental
impact compared to conventional
dairy processes. As a result, the
use of ultrasound in the dairy
industry has become a hot topic
and has generated considerable
research interest in recent years.**

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The SpringerBrief is intended for industry professionals, researchers and graduate students with a basic understanding of simple ultrasound, especially those starting on a new topic of research or coming into the field.

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**Organic Electrochemistry
Characterization of Cavitation
Bubbles and Sonoluminescence
Theory, Applications and Uses of
Ultrasound in Chemistry
Advances in Electrochemical
Science and Engineering, Volume
8**

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Ultrasound in Chemistry Advances in Sonochemistry

Meningoencephalitis remains a major global threat, despite the prevention, diagnosis, and antibiotic therapy that have been improved considerably in

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the last years. In this thematic issue, the scientists present their results of accomplished studies, in order to provide several guidelines regarding the strategies of diagnosis and treatment of patients with

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meningoencephalitis, by adding valuable data and thus helping public health decision. This book presents the latest research on fundamental aspects of acoustic bubbles, and in particular on various

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complementary ways to
characterize them. It starts
with the dynamics of a single
bubble under ultrasound, and
then addresses few-bubble
systems and the formation and
development of bubble

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structures, before briefly reviewing work on isolated bubbles in standing acoustic waves (bubble traps) and multibubble systems where translation and interaction of bubbles play a major role.

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Further, it explores the interaction of bubbles with objects, and highlights non-spherical bubble dynamics and the respective collapse geometries. It also discusses the important link between

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bubble dynamics and energy focusing in the bubble, leading to sonochemistry and sonoluminescence. The second chapter focuses on the emission of light by cavitation bubbles at collapse

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(sonoluminescence) and on the information that can be gained by sonoluminescence (SL) spectroscopy, e.g. the conditions reached inside the bubbles or the nature of the excited species formed. This

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chapter also includes a section on the use of SL intensity measurement under pulsed ultrasound as an indirect way to estimate bubble size and size distribution. Lastly, since one very important feature of

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cavitation systems is their sonochemical activity, the final chapter presents chemical characterizations, the care that should be taken in using them, and the possible visualization of chemical activity. It also

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explores the links between
bubble dynamics, SL
spectroscopy and
sonochemical activity. This
book provides a fundamental
basis for other books in the
Molecular Science: Ultrasound

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and Sonochemistry series that
are more focused on applied
aspects of sonochemistry. A
basic knowledge of the
characterization of cavitation
bubbles is indispensable for
the optimization of

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sonochemical processes, and as such the book is useful for specialists (researchers, engineers, PhD students etc.) working in the wide area of ultrasonic processing.

As nanomaterials and their end

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products occupy the pinnacle position of consumer markets, it becomes vital to analyze their generation processes. One of the green chemistry principles underlines the need for unusual energy sources to

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generate them. Utilizing the extreme energy from the collapse of cavitation bubbles, generated by either ultrasound or hydrodynamic forces, for the generation of nanomaterials is a merit to consider in this

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"Green Chemical Processing Era." A wide range of nanomaterials have been developed in the past decade using cavitation or coupling cavitation with other techniques such as microwave,

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photochemistry, and electrochemistry, resulting in nanomaterials with unique morphologies, reduced size, narrow size distribution, and innumerable advantages. While a few currently available books

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deal with the fundamental aspects of cavitation and sonochemistry, this book is devoted specifically to the technologically important nanomaterials obtained by cavitation.

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From reviews of the previous volumes: "This is an essential book for researchers in electrochemistry; it covers areas of both fundamental and practical importance, with reviews of high quality. The

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material is very well presented
and the choice of topics

reflects a balanced editorial
policy that is welcomed." —The
Analyst "All the contributions in
this volume are well up to the
standard of this excellent

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series and will be of great value to electrochemists.... The editors again deserve to be congratulated on this fine collection of reviews." —Journal of Electroanalytical Chemistry and Interfacial Chemistry

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"...competently and clearly
written." —Berichte der Bunsen-
Gesellschaft für physikalische
Chemie

A Novel Energy-Efficient
Technique for the Generation
of Nanomaterials

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Engineering Solution
Dynamics

Introduction to Ultrasound,
Sonochemistry and
Sonoelectrochemistry
Sonochemistry: New
Opportunities For Green

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Meningoencephalitis

Integration Pathways for
Renewable Energy Applications

Hydrogen and Fuel Cells

***Primers is a series focused
on Energy applications. Its***

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*concise volumes present
those coming into this broad
and multidisciplinary field
with the most recent
advances in each of its
particular topics. They bring
together information that*

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*has thus far been scattered
in many different sources
under one single title, which
makes them a useful
reference for industry
professionals, researchers
and graduate students,*

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*especially those starting in a
new topic of research. This
volume, Recent Advances in
High Temperature PEM Fuel
Cells, provides an up-to-date
progress of High
Temperature Polymer*

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*Electrolyte Membrane Fuel
Cells (HTPEMFCs), including
three critical subjects for this
type of fuel cells: Membrane
Electrode Assembly (MEA)
development, stack
development and systems*

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*development. The MEA and
stack development sections
cover the recent advances in
this area and highlight the
areas in most need of
improvement. The systems
development section focuses*

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*on stationary systems,
mainly Combined Heat and
Power (CHP), based on
HTPEMFCs. Finally the
conclusions summarize the
recent advances of
HTPEMFCs in all these areas*

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and provide some insights
for future developments.

*Prof. Bruno G. Pollet, Series
Editor Presents the most
current knowledge in
membrane electrode
assembly, stack, and*

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*systems development for
HTPEMFCs Highlights the
areas that need
improvement in electrode
assembly and stack
development Examines
stationary high temperature*

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*PEMFC systems, including
CHP*

*This book provides an
introduction to the
fundamental and applied
aspects of sonochemistry,
discussing a number of basic*

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*concepts in sonochemistry,
such as how ultrasonic
waves interact with gas
bubbles in liquids to
generate cavitation, and how
the high temperatures
generated within cavitation*

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*bubbles could be estimated.
It explains how redox
radicals are produced and
how to make use of both the
physical and chemical forces
generated during cavitation
for various applications.*

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*Intended for academic
researchers, industry
professionals as well as
undergraduate and graduate
students, especially those
starting on a new research
topic or those new to the*

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*field, it provides a clear
understanding of the
concepts and methodologies
involved in ultrasonic and
sonochemistry.*

*This book addresses the
future development of*

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*ultrasound in food
processing, covering both
High Power (material
altering) and Low Power (non-
destructive testing)
applications. Leading work is
presented for a non-expert*

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*audience, so that people in
industry and academia can
make informed decisions
about future research and
the adoption of ultrasound
techniques. It will be of
particular interest to food*

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*manufacturing personnel
responsible for process
development, engineering
and research. It will be
invaluable for scientists and
technologists involved in
active ultrasound research*

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and instrument manufacture.
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Revised and Expanded

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Analytical Applications
Engineering Solution

*Sonochemical Production of
Nanomaterials*

*Electroless Nickel Plating:
Fundamentals to*

Applications

The Uses of Power

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*Ultrasound in Chemistry and
Processing*

*Ultrasound Technology in
Dairy Processing*

**The book provides a
comprehensive and easily
accessiblereference source**

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**covering all important aspects
of particle adhesion and
removal. The core objective is
to cover both fundamental and
applied aspects of particle
adhesion and removal with
emphasis on recent
developments. Among the**

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topics to be covered include:

- 1. Fundamentals of surface forces in particle adhesion and removal.**
- 2. Mechanisms of particle adhesion and removal.**
- 3. Experimental methods (e.g. AFM, SFA, SFM, IFM, etc.)**

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**to understand particle-particle
and particle-**

substrate interactions. 4.

**Mechanics of adhesion of
micro- and**

**nanoscale particles. 5. Various
factors affecting particle
adhesion to a variety**

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**of substrates. 6. Surface
modification techniques to
modulate particle adhesion. 7.
Various cleaning methods
(both wet & dry) for
particle removal. 8. Relevance
of particle adhesion in a host
of technologies ranging from**

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simple to ultra-sophisticated.
Praise for the Fourth

Edition"Outstanding praise
for previous editions.the
single best general reference
for the organic
chemist."-Journal of the
Electrochemical Society"The

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**cast of editors and authors is
excellent, the text is, in
general, easily readable and
understandable, well
documented, and well
indexed those who purchase
the book will be sa
Despite the fact that chemical**

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applications of ultrasound are now widely acknowledged, a detailed presentation of inorganic systems covering nano-particles, catalysis, aqueous chemistry of metallic solutions and their redox characteristics, both from a

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**theoretical and experimental
perspective has eluded
researchers of this field.**

**Theoretical and Experimental
Sonochemistry Involving
Inorganic Systems fills this
gap and presents a concise
and thorough review of this**

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**fascinating area of
Sonochemistry in a single
volume.**

**Ultrasonic irradiation and the
associated sonochemical and
sonophysical effects are
complementary techniques
for driving more efficient**

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**chemical reactions and yields.
Sonochemistry—the chemical
effects and applications of
ultrasonic waves—and
sustainable (green) chemistry
both aim to use less
hazardous chemicals and
solvents, reduce energy**

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**consumption, and increase
product selectivity. A
comprehensive collection of
knowledge, Handbook on
Applications of Ultrasound
covers the most relevant
aspects linked to and linking
green chemistry practices to**

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**environmental sustainability
through the uses and
applications of ultrasound-
mediated and ultrasound-
assisted biological,
biochemical, chemical, and
physical processes. Chapters
are presented in the areas of:**

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**Medical applications Drug and
gene delivery Nanotechnology
Food technology Synthetic
applications and organic
chemistry Anaerobic digestion
Environmental contaminants
degradation Polymer
chemistry Industrial**

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syntheses and processes
Reactor design
Electrochemical systems
Combined
ultrasound–microwave
technologies While the
concepts of sonochemistry
have been known for more

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than 80 years, in-depth understanding of this phenomenon continues to evolve. Through a review of the current status of chemical and physical science and engineering in developing more environmentally friendly

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**and less toxic synthetic
processes, this book
highlights many existing
applications and the
enormous potential of
ultrasound technology to
upgrade present industrial,
agricultural, and**

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environmental processes.
Engineering Solution
**One-dimensional
Nanostructures for PEM Fuel
Cell Applications
Sonochemistry for
Sustainability
Hydrogen, Biomass and
Bioenergy**

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**Power Ultrasound in
Electrochemistry
Organic Sonochemistry
Sonochemistry**

Energy Aspects of Acoustic
Cavitation and Sonochemistry:
Fundamentals and Engineering

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covers topics ranging from fundamental modeling to up-scaled experiments. The book relates acoustic cavitation and its intrinsic energy balance to macroscopic physical and chemical events that are analyzed from an energetic

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perspective. Outcomes are directly projected into practical applications and technological assessments covering energy consumption, thermal dissipation, and energy efficiency of a diverse set of applications in mixed phase

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synthesis, environmental remediation and materials chemistry. Special interest is dedicated to the sonochemical production of hydrogen and its energetic dimensions. Due to the sensitive energy balance that

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governs this process, this is seen as a "green process" for the production of future energy carriers. Provides a concise and detailed description of energy conversion and exchange within the single acoustic cavitation bubble and bubble population,

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accompanying physical and
chemical effects Features a
comprehensive approach that is
supported by experiments and the
modeling of energy concentration
within the sonochemical reactor,
jointly with energy dissipation and

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damping phenomenon Gives a clear
definition of energy efficiency
metrics of industrial sono-processes
and their application to the main
emergent industrial fields
harnessing acoustic cavitation and
sonochemistry, notably for the

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production of hydrogen

This second edition of the highly successful dictionary offers more than 300 new or revised terms. A distinguished panel of electrochemists provides up-to-date, broad and authoritative coverage of

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3000 terms most used in electrochemistry and energy research as well as related fields, including relevant areas of physics and engineering. Each entry supplies a clear and precise explanation of the term and provides

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references to the most useful reviews, books and original papers to enable readers to pursue a deeper understanding if so desired. Almost 600 figures and illustrations elaborate the textual definitions. The "Electrochemical Dictionary" also

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contains biographical entries of people who have substantially contributed to electrochemistry. From reviews of the first edition: 'the creators of the Electrochemical Dictionary have done a laudable job to ensure that each definition

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included here has been defined in precise terms in a clear and readily accessible style' (The Electric Review) 'It is a must for any scientific library, and a personal purchase can be strongly suggested to anybody interested in

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electrochemistry' (Journal of Solid
State Electrochemistry) 'The text is
readable, intelligible and very well
written' (Reference Reviews)

Hydrogen Electrochemical
Production presents different
avenues of hydrogen production for

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energy applications, including current developments and future perspectives, using an interdisciplinary approach. Part of the Hydrogen Energy and Fuel Cell Primers series, the volume synthesizes information from many

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sources, making it a useful reference for industry professionals, researchers and graduate students. The book examines various methods, explaining their advantages and limitations. The water electrolysis reaction and systems are explored

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from different points of view, including an assessment of state-of-the-art technologies. Alternatives to water for feeding the electrolysis cell anode and for electrochemical hydrogen production (such as alcohol or other compounds from

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biomass) are discussed. Explores current technology developments and future perspectives of hydrogen production for energy applications Examines the state-of-the art technology in electrolysis reaction and systems and discusses the

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advantages and limitations of various methods Covers alternatives to water for feeding electrolysis cell anode, including alcohol and other compounds from biomass

This comprehensive reference and handbook covers all aspects of

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ultrasound for analytical applications. Besides classical extraction techniques, it also provides an overview of ultrasound applications and devotes two chapters to proteomics and polymer technology. From the contents: *

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Common ultrasonic devices *
Elemental speciation * On-line
applications * Accelerated
extraction of semivolatile and
volatile organics * The ultrasonic
bath vs. the ultrasonic probe *
Liquid-liquid, liquid-solid and solid-

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liquid extraction * Solid-phase
(micro)extraction * Stir bar sorptive
extraction * Sonochemistry for
organic and inorganic synthesis *
Electrochemical applications *
Applications to polymer science *
Power ultrasound meets proteomics

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Of great interest to researchers in academia and industry, as well as analytical and natural products chemists, and those working in trace analysis.

Micro-Optics and Energy
Piezoelectric Transducers and

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Recent Advances in High-
Temperature PEM Fuel Cells
Electrochemical Production of
Metal Powders
Novel and Conventional
Technologies

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Hydrogen Electrochemical
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Production

*This book provides informative,
useful, and stimulating reading on the
topic of organic sonochemistry – the
core of ultrasound-based applications.
Given the increasing interest in new*

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*and improved technologies, allied to
their green and sustainable character
(not always a valid premise), there is a
great attraction for organic chemists
to apply these protocols in synthesis
and process chemistry. Unfortunately,
as with other enabling technologies,*

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*many researchers new to the field
have received a simple and dishonest
message: just switch on! Therefore a
significant portion of sonochemical
syntheses lack reproducibility*

*(surprisingly cavitation control and/or
ultrasonic parameters are omitted)*

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and the actual role of sonication remains uncertain. While this book does not provide a detailed description of fundamentals, the introductory remarks highlight the importance of cavitation effects and their experimental control. It presents a

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number of concepts of sonochemical
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reactivity and empirical rules with
pertinent examples, often from
classical and recent literature. It then
focuses on scenarios of current
interest where organic chemistry, and
synthesis in particular, may benefit*

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*from sonication in terms of both
chemical and mechanical activation.*

*The “sustainable corner” of this field
is largely exemplified through
concepts like atom economy,
renewable sources, wasteless
syntheses, and benign solvents as*

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*reaction media. This book is useful
for both researchers and graduate*

*students, especially those familiar
with the field of sonochemistry and
applications of ultrasound in general.*

*However, it is also of interest to a
broader audience as it discusses the*

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*fundamentals, techniques, and
experimental skills necessary for
scientists wishing to initiate the use of
ultrasound in their domain of
expertise.*

*Nanoscale Electrochemistry focuses
on challenges and advances in*

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*electrochemical nanoscience at
solid-liquid interfaces, highlighting
the most prominent developments of
the last decade. Nanotechnology has
had a tremendous effect on the
multidisciplinary field of
electrochemistry, yielding new*

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fundamental insights that have broadened our understanding of interfacial processes and stimulating new and diverse applications. The book begins with a tutorial chapter to introduce the principles of nanoscale electrochemical systems and

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*emphasize their unique behavior
compared with their*

macro/microscopic counterparts.

*Building on this, the following three
chapters present analytical
applications, such as sensing and
electrochemical imaging, that are*

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*familiar to the traditional
electrochemist but whose extension to
the nanoscale is nontrivial and reveals
new chemical information. The
subsequent three chapters present
exciting new electrochemical
methodologies that are specific to the*

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*nanoscale, including "single
entity"-based methods and surface-
enhanced electrochemical
spectroscopy. These techniques, now
sufficiently mature for exposition,
have paved the way for major
developments in our understanding of*

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solid-liquid interfaces and continue to
push electrochemical analysis toward
atomic-length scales. The final three
chapters address the rich overlap
between electrochemistry and
nanomaterials science, highlighting
notable applications in energy*

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conversion and storage. This is an important reference for both academic and industrial researchers who are seeking to learn more about how nanoscale electrochemistry has developed in recent years. Outlines the major applications of nanoscale

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*electrochemistry in energy storage,
spectroscopy and biology Summarizes
the major principles of nanoscale
electrochemical systems, exploring
how they differ from similar system
types Discusses the major challenges
of electrochemical analysis at the*

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nanoscale

The aim of this handbook is to summarize the recent development in the topic of ultrasonics and sonochemistry, especially in the areas of functional materials and processing applications. This handbook will

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benefit the readers as a full and quick technical reference with a high-level historic review of technology, detailed technical descriptions and the latest practical applications. This handbook is divided into five main sections: fundamentals of ultrasonics and

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sonochemistry, biomaterials, food processing, catalysts, wastewater remediation. Each section and chapter is written by reputable international scholars and industrial experts. The handbook comprehensively covers the

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*fundamentals of sonochemistry along
with key applications. The handbook
strives to be a self-contained, easily-
understandable reference that will
also include up to date knowledge
based on research articles. This
handbook serves to provide a quick*

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*and reliable knowledge for new
comers from chemistry,*

*bioengineering, food processing,
environmental engineering, in both
academia and in industrial fields.*

*One-dimensional Nanostructures for
PEM Fuel Cell Applications provides*

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*a review of the progress made in 1D
catalysts for applications in polymer
electrolyte fuel cells. It highlights the
improved understanding of catalytic
mechanisms on 1D nanostructures
and the new approaches developed for
practical applications, also including*

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*a critical perspective on current
research limits. The book serves as a
reference for the design and
development of a new generation of
catalysts to assist in the realization of
successful commercial use that have
the potential to decarbonize the*

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domestic heat and transport sectors.

In addition, a further

*commercialization of this technology
requires advanced catalysts to address
major obstacles faced by the
commonly used Pt/C nanoparticles.*

The unique structure of one-

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dimensional nanostructures give them advantages to overcome some drawbacks of Pt/C nanoparticles as a new type of excellent catalysts for fuel cell reactions. In recent years, great efforts have been devoted in this area, and much progress has been achieved.

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Provides a review of 1D catalysts for applications in polymer electrolyte fuel cells Presents an ideal reference for the design and development of a new generation of catalysts to assist in the realization of successful commercial use Highlights the

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*progress made in recent years in this
emerging field*

*Handbook of Green Chemistry and
Technology*

Sensors for Energy Devices

*Modern Electrosynthetic Methods in
Organic Chemistry*

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Electrochemical Dictionary
Handbook on Applications of
Ultrasound

Modern Electrosynthetic Methods in Organic Chemistry introduces readers to new ways of making materials and compounds using low waste processes, employing energy from

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electricity rather than chemical reagents. It explores electro-organic synthesis, which offers clean synthesis tools as well as unusual reaction intermediates and reaction types. Despite applications previously remaining niche, due to the advent of microfluidic reactors this book is a

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must-read for industry professionals and academics alike. It targets specific areas of recent progress and development in the field that show high novelty and potential, at the same time inviting a wider range of applications in green and clean technology. Key Features: Offers

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clean synthesis tools Targets areas of
recent progress and development

Addresses the most recent advances
in the field

This book provides an overview of
electrodeposition of nanomaterials
from principles to modern concepts for
advanced materials in science and

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technology. Electrochemical deposition or electrodeposition is explained for fabrication and mass production of functional and nanostructured device materials. The present book spans from principles to modern insights and concepts. It gives a comprehensive overview of the

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electrochemistry of materials, which is useful as basic information to understand concepts used for nanostructuring of electrodeposited materials, reviews the electrodeposition constituents, thermodynamics and kinetics of electrodeposition, electrochemical and

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instrumental assessment techniques and other physical factors affecting the electrodeposition mechanisms. A wide variety of nanostructured materials and related concepts and applications are explained with respect to nanocrystals, nanocrystalline films, template-based nanostructures,

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nanocomposite films, nanostructures on semiconductors, multilayers, mesoporous films, scanning microscopical probe assisted fabrication and galvanic replacement. This book is useful for researchers in materials science, engineering technologists and graduate students. It

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can also be used as a textbook for
undergraduates and graduate students
studying related disciplines.

Electroless Nickel Plating:

Fundamentals to Applications provides
a complete and actualized view of
electroless nickel plating, thus greatly
improving the accessibility of

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knowledge on the subject. It touches upon all aspects of electroless nickel, from the fundamentals (including thermodynamics of electroless plating, bath chemistry, and substrate preparation) to more applied areas of the field such as bath replenishment, composite coatings, post-treatments,

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polyalloys, graded and multilayer
coatings, ultrasound assistance,
applications, and properties.

Contributed to by a variety of
international authors to ensure
different points of view and interests
are addressed, this book stands as the
first complete and updated state-of-the-

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art text on electroless nickel in the
twenty-first century. It also serves as
the first technical book with a strong
emphasis on nickel-boron. It also
focuses on environmental aspects.
Including cutting-edge content
presented sufficiently extensive to be
directly useful to the practitioner, this

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book is aimed at materials scientists, metallurgists, and other professionals working with electroless nickel plating. Power ultrasound has been used for many years in two specific industrial areas: cleaning and plastic welding. Over the last ten years an increasing interest has been shown in its potential

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for use over a much wider range of chemistry and processing which has been grouped together under the general title of sonochemistry. Most of these uses depend on the generation of acoustic cavitation in liquid media but this text, while underlining the importance of the physics and

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mathematics of cavitation, mainly concentrates on applications of the technology. After an introduction to the topic and some historical background to the uses of power ultrasound the general principles of acoustic cavitation are explored including some background physics, bubble dynamics

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and factors which influence cavitation. The remainder of the book incorporates a series of applications of sonochemistry which illustrate the types of physical and chemical effects of ultrasonically induced cavitation which will interest chemists and engineers alike. Amongst the major

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topics included are chemical synthesis, environmental protection and remediation of water, sewage and soils, polymer synthesis and processing, electrochemistry including both analytical and synthetic aspects and plating. The final chapter reviews the range of ultrasonic equipment

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available in the laboratory and the progress made towards the scale-up of sonochemistry. The level is introductory to semi-advanced and no topic has been taken to a particularly specialist level since it is intended that this should be of general interest to readers with a scientific background.