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summarizes the  
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nano-sized  
materials. The*

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*authors focus on  
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*energy; and  
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chapters are  
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*toxicologists. It also provides guidelines for agencies and government authorities to establish safe working conditions. Change and motion define and constantly reshape the world around us, on scales from the molecular to*

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*the global. In particular, the subtle interplay between chemical reactions and molecular transport gives rise to an astounding richness of natural phenomena, and often manifests itself in the emergence of intricate spatial or*

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*temporal patterns.  
The underlying  
theme of this book  
is that by “setting  
chemistry in  
motion” in a proper  
way, it is not only  
possible to  
discover a variety  
of new  
phenomena, in  
which chemical  
reactions are  
coupled with*



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*diffusion, but also to build micro-/nan oarchitectures and systems of practical importance.*

*Although reaction and diffusion (RD) processes are essential for the functioning of biological systems, there have been only a few*

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*examples of their application in modern micro- and nanotechnology. Part of the problem has been that RD phenomena are hard to bring under experimental control, especially when the system's dimensions are small. Ultimately this book will guide*

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*the reader through  
all the aspects of  
these systems -  
from*

*understanding the  
basics to practical  
hints and then to  
applications and  
interpretation of  
results. Topics*

*covered include:*

*An overview and  
outlook of both  
biological and man-*

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*made reaction-diffusion systems. The fundamentals and mathematics of diffusion and chemical reactions. Reaction-diffusion equations and the methods of solving them. Spatial control of reaction-diffusion at small scales. Micro- and nanofabrication by*

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*reaction-diffusion.*

*Chemical clocks*

*and periodic*

*precipitation*

*structures.*

*Reaction-diffusion*

*in soft materials*

*and at solid*

*interfaces.*

*Microstructuring of*

*solids using RD.*

*Reaction-diffusion*

*for chemical*

*amplification and*

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*sensing. RD in three dimensions and at the nanoscale, including nanosynthesis. This book is aimed at all those who are interested in chemical processes at small scales, especially physical chemists, chemical engineers, and*

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*material scientists.*

*The book can also be used for one-semester, graduate elective courses in chemical engineering, materials science, or chemistry classes.*

*Hybrid*

*Nanomaterials for Sustainable*

*Applications: Case*

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*approaches to production for engineering applications. Subsequent sections provide chapters on key application areas, including water purification, nanobiotechnologies, energy storage, and biomedicine, presenting*

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*approaches for sustainable application for each usage. Throughout the book, key challenges are addressed, with case studies used to support implementation and improve end applications. This is a valuable resource*

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engineering,  
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science, and  
materials  
engineering, as  
well as industrial*

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engineers, and  
R&D professionals  
with an interest in  
hybrid  
nanomaterials for a  
range of  
applications.*

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Volume 28,  
provides students,  
scientists and*

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*chemical engineers with an overview of several types of nanostructures, discusses the synthesis and characterization of nanostructures, and provides applications of nanotechnology in daily life. The book offers a foundation to green*

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*nanotechnology by  
explaining why  
green*

*nanotechnology is  
important. Covers  
biological sources  
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antioxidants, green  
nanostructures,  
mechanism,  
synthesis and  
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the risks of  
nanotechnology in  
human life and  
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properties and  
antioxidant  
potential, and their  
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medicinal and  
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comparison of  
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non-green methods*

*Uses accessible  
language, avoiding  
complex concepts  
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biology and  
chemistry*

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Implications*

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**Y: BASIC**

**CALCULATIONS**

**FOR ENGINEERS**

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technology**

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from wastewater.  
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discusses the  
rapid wastewater  
treatment  
methods using**

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emerging area of  
new science and  
technology in  
wastewater  
treatment. The  
main audiences  
for the book are**

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professionals,  
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scholars and  
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Environmental  
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and prospects  
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for medical im  
plementation,  
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of different  
structural



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dimensions (0D, 1D, 2D and 3D) for energy applications, as well as food and agricultural utilization.

Other sections discuss the challenges of

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lab-based  
research  
transitioning  
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use. Helps  
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researchers  
quickly learn  
and understand  
the key role

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nanotechnology  
in important  
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industry  
sectors  
Outlines the  
role  
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and more energ  
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Applications  
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nanomaterials  
and their

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impact on the  
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current and  
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applications  
of nanodevices  
in  
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engineering,  
showcasing how  
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nanotechnology  
applied to the  
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in electronic

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storage, semic  
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fuel cells,  
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equipment, and  
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art  
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**worldwide, and  
its vast  
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detailed look at  
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and explores key  
issues that must  
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applications  
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Takes a real-  
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current research  
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**applications of  
nanotechnology  
in such a way as  
to stimulate  
further research  
and development  
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applications  
Written by an all-  
star team of  
experts,  
including pioneer  
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and award-  
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researchers in  
nanotechnology  
The major  
challenge  
currently faced  
by researchers in  
nanotechnology  
is successfully  
transitioning  
laboratory  
research into

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across an array of  
research and  
engineering  
disciplines,  
Nanotechnology  
Commercialization:  
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**Processes and Products does much to help them bridge the gap between lab and marketplace. As regulations push the fossil fuel industry toward increasing standards of eco-friendliness and**

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**environmental  
sustainability,  
desulfurization  
(the removal of  
SO<sub>2</sub> from  
industrial waste  
byproducts)  
presents a new  
and unique  
challenge that  
current  
technology is not  
equipped to**

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**address.**

**Advances in  
nanotechnology  
offer exciting  
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opportunities  
poised to  
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processes.**

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**Desulfurization  
Process in  
Petroleum  
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explores recent  
developments in  
the field,  
including the use  
of nanomaterials  
for  
biodesulfurization and hydrodesulfurization. The**

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presented in this  
volume targets  
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researchers,  
educators as well  
as students at  
the  
undergraduate  
and post-  
graduate levels.  
With the**

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challenges faced  
by Mankind in the  
21st century,  
revolutionary  
new technologies  
will be the key to  
a clean, secure  
and sustainable  
energy future.  
Nanostructures  
often have  
surprising and**



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the art with  
regard to  
different aspects  
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fuel cells. Part II  
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Storage is  
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the potential use  
of nanomaterials  
in more efficient  
energy storage**

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and developing them into successful and profitable commercial ventures. It details the methodology, techniques, and pathways for technology-readiness assessment, testing protocols,

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nanoengineering,  
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combines solid  
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chemical  
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biochemistry and

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biophysics, and materials science.

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quantum theory to  
the design of new

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devices. Quantum

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explains

functionality and

structure in natural

or engineered

nanoscale systems

through quantum

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mechanisms such  
as discretisation,

superposition and

entanglement. In

the 19th century,

decades of

practice with heat

engines led to the

new science of

thermodynamics.

The understanding

of the world

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captured by  
thermodynamics is  
now part of the  
fabric of  
engineering and  
effective design  
across a vast  
range of different  
technologies.  
Thermodynamics,  
quantum  
nanoscience is an

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enabling science  
for engineering  
and design of new  
nanotechnologies.

Molecular

nanotechnology

(MNT) is a

technology based  
on the ability to  
build structures to  
complex, atomic  
specifications by

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means of  
Nanotechnology  
mechanosynthesis

. This is distinct from nanoscale materials. Based on Richard Feynman's vision of miniature factories using nanomachines to build complex products (including

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additional  
nanomachines),  
this advanced form  
of nanotechnology  
(or molecular  
manufacturing)  
would make use of  
positionally-  
controlled  
mechanosynthesis  
guided by  
molecular machine



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systems. MNT  
would involve  
combining physical  
principles  
demonstrated by  
chemistry, other  
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and the molecular  
machinery of life  
with the systems  
engineering  
principles found in

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modern  
macroscale

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engineering,  
nanotechnology,  
astrophysics,  
particle physics:  
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engineered world,  
one where the  
distinctions  
between science  
and engineering,  
technology and  
research, are fast

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disappearing. This book shows how, at the dawn of the twenty-first century, the goals of natural scientists--to discover what was not known--and that of engineers--to create what did not

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exist--are  
undergoing an  
unprecedented  
convergence.  
Sunny Y. Auyang  
ranges widely in  
demonstrating that  
engineering today  
is not only a  
collaborator with  
science but its  
equal. In concise

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laboratories and  
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electrical  
engineering, and  
in whirlwind  
histories of the  
machine tools and  
automobile  
industries and the

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rise of nuclear  
energy and  
information  
technology, her  
book presents a  
broad picture of  
modern  
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history, structure,  
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achievements, and  
social

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responsibilities; its relation to natural science, business administration, and public policies.

Auyang uses case studies such as the development of the F-117A Nighthawk and Boeing 777 aircraft, as well as



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the experiences of  
engineer-scientists

such as Oliver

Heaviside, engine

er-entrepreneurs

such as Henry

Ford and Bill

Gates, and

engineer-

managers such as

Alfred Sloan and

Jack Welch to give

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readers a clear sense of engineering's essential role in the future of scientific research.

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addresses the  
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level managerial,

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across such an

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maintenance.

--Louis L.

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world as well as

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concern for

environment. The

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are critically

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energy efficient  
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metals,  
nanoparticles,  
cryogels and  
bentonites for the  
removal of the  
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from wastewater.  
Water pollution is  
mainly caused by  
contaminants and  
can cause severe



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Engineers,  
American  
Academy of***

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Engineers***

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***Engineering***

***Progress***

***(AIChE***

***magazine),***

***Environmental***

***Management***

***(A&WMA),***

***Chemical***



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***Engineering  
News (ACS)***

***Special***

***Features: ·***

***Develops an  
understanding  
of nanotechnol  
ogy for  
practicing  
engineers and  
scientists in  
environmental***

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***and industrial fields.***

***Provides an overview using illustrative example problems and solutions that are arranged as an orderly and logical progression,***

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***but they can  
also stand on  
their own.***

***Focuses on  
problems,  
which are  
often the best  
way to learn a  
subject.***

***Addresses the  
needs of both  
the***

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***environmental  
engineer/scien  
tist in industry  
and students  
in  
environmental  
studies.***

***Bridges the  
gap between  
the developing  
industry of na  
nomanufacturi***

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***ng and the  
existing  
understanding  
of  
environmental  
issues. Serves  
as both a text  
for students  
and a  
reference for  
those already  
in industry.***

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***According to  
Howard Beim,  
a chemistry  
professor at  
the US  
Merchant  
Marine  
Academy: This  
is certain to  
become the  
pace setter in  
the field, a***

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***text to benefit  
both students  
of all technical  
disciplines and  
practicing  
engineers and  
researchers. •***

***According to  
John  
McKenna,  
President and  
CEO of ETS,***

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***Inc.: Dr.  
Theodore has  
covered most  
of the  
important nan  
otechnology  
subject matter  
in this  
proposed work  
though simple,  
easy to follow  
problems. •***



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***According to  
Rita D'Aquino,  
Senior Editor  
of Chemical  
Engineering  
Progress: ...  
this superb  
basic  
calculations  
workbook ... is  
practical,  
informative,***

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***and forward-  
looking.... This  
book applies ...  
theoretical,  
complex, non-  
traditional or  
otherwise  
abstract  
technical  
concepts to  
real-world  
industrial***

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***dilemmas, and  
design[s]***

***practical***

***solutions --***

***essentially***

***methodologies***

***-- that can be***

***adapted to***

***solve other***

***problems. •***

***According to***

***Peter T.***

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***Belmonte,  
Director of  
Environmental  
Engineering  
for SUEZ  
Energy  
Generation: At  
a minimum  
this book is a  
must for  
management  
personnel and***

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***decision makers. Non-management personnel will also find this book useful to stay ahead in industry.***

***Engineers of any discipline will find this book***

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Nanotechnology

***extremely  
useful. About  
The Book: This  
book contains  
almost 200  
solved  
problems  
relating to nan  
otechnology.  
These  
problems are  
divided in four***

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**sections:**

**Chemistry**

**Fundamentals  
and Principles,  
Particle**

**Technology,**

**Applications,  
and**

**Environmental  
Concerns. In  
addition to the  
solved**

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***examples,  
each section  
contains  
overview  
coverage of  
the subject  
matter. A key  
feature of the  
book is that  
the solutions  
can be  
presented in a***



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***stand-alone  
manner, and  
the problems  
are laid out to  
develop the  
reader's  
understanding  
of the  
subjects.***

***Nanotechnolo  
gy and  
Biosensors***

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Nanotechnology

***shows how nanotechnology is used to create affordable, mass-produced, portable, small sized biosensors to directly monitor environmental pollutants. In***

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Nanotechnology

***addition, it  
provides  
information on  
their  
integration  
into  
components  
and systems  
for mass  
market  
applications in  
food analysis,***

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***environmental  
monitoring***

***and health***

***diagnostics. N***

***anotechnology***

***has led to a***

***dramatic***

***improvement***

***in the***

***performance,***

***sensitivity and***

***selectivity of***

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***biosensors. As  
metal-oxide  
and carbon na  
nostructures,  
gold and  
magnetite  
nanoparticles,  
and the  
integration of  
dendrimers in  
biosensors  
using nanotec***

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***hnology have  
contributed  
greatly in  
making  
biosensors  
more effective  
and affordable  
on a mass-  
market level,  
this book  
presents a  
timely***

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***resource on  
the topic.***

***Highlights nanotechnology-based approaches to the detection of enzyme inhibitors, direct enzymatic and microbial***

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***detection of  
metabolites,  
and nutrients  
using  
biosensors  
Includes  
examples on  
how nanotech  
nology has  
lead to  
improvements  
in the***



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***construction  
of portable,  
selective and  
sensitive  
biosensing  
devices Offers  
thorough  
coverage of bi  
omarker/biose  
nsor  
interaction for  
the rapid***

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***detection of  
toxicants and  
pollutants***

***The book  
describes the  
basic  
principles of  
transforming n  
ano-  
technology  
into nano-  
engineering***

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***with a  
particular  
focus on  
chemical  
engineering  
fundamentals.  
This book  
provides vital  
information  
about  
differences  
between***

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***descriptive  
technology  
and  
quantitative  
engineering  
for students as  
well as  
working  
professionals  
in various  
fields of nanot  
echnology.***

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***Besides  
chemical  
engineering  
principles, the  
fundamentals  
of nanotechnol  
ogy are also  
covered along  
with detailed  
explanation of  
several  
specific***

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***nanoscale  
processes from  
chemical  
engineering  
point of view.***

***This  
information is  
presented in  
form of  
practical  
examples and  
case studies***

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***that help the  
engineers and  
researchers to  
integrate the  
processes  
which can  
meet the  
commercial  
production. It  
is worth  
mentioning  
here that, the***

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***main  
challenge in  
nanostructure  
and  
nanodevices  
production is  
nowadays  
related to the  
economic  
point of view.  
The  
uniqueness of***



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***this book is a  
balance  
between  
important  
insights into  
the synthetic  
methods of na  
no-structures  
and  
nanomaterials  
and their  
applications***

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***with chemical  
engineering  
rules that  
educates the  
readers about  
nanoscale  
process  
design,  
simulation,  
modelling and  
optimization.  
Briefly, the***

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***book takes the  
readers***

***through a***

***journey from***

***fundamentals***

***to frontiers of***

***engineering of***

***nanoscale***

***processes and***

***informs them***

***about***

***industrial***

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***perspective  
research  
challenges,  
opportunities  
and synergism  
in chemical  
Engineering  
and nanotechn  
ology.***

***Utilising this  
information  
the readers***

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***can make  
informed  
decisions on  
their career  
and business.  
Nanotechnolo  
gy Commercial  
ization  
Nanotechnolo  
gy and  
Biosensors  
An***

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***Introduction  
to Green Nano  
technology  
Nanotechnolo  
gy in  
Aerospace and  
Structural  
Mechanics  
Nanotechnolo  
gy for  
Electronic  
Applications***

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***Nanotechnology in  
Industrial  
Wastewater  
Treatment***

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Thomson Reuters  
CPCI-S (WoS). The  
highly successful AMN  
conference series is the  
flagship of the New  
Zealand MacDiarmid  
Institute; a virtual**

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**centre of research  
excellence named after  
New Zealand's 3rd  
Nobel Laureate,  
Professor Alan  
MacDiarmid. The  
conference offers a  
broad interdisciplinary  
overview of advanced  
materials and  
nanotechnology, and  
provides an exciting  
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**exciting advances in  
the field. The 55 peer-  
reviewed papers cover  
topics that are related  
to nanotechnology,  
advanced materials,  
nanoelectronics,  
superconductors,  
spintronics,  
nanoparticles,  
microfluidics,  
advanced sensors,  
photovoltaics and  
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**where research is and will be focused in the future. These areas are: bioseparations; particle science and design; nanotechnology; and reaction engineering. The aim of the book is to provide academic and R&D researchers with an overview of the main areas of technical development**

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**presents a detailed overview of the rationale involved in the choice of materials for regeneration of different tissues and the future directions in this fascinating area of materials science with specific chapters on regulatory challenges & ethics; tissue engineered medical products.**

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Applications**

**New Materials and  
Modern Techniques  
Handbook of Research  
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Applications of  
Nanotechnology in  
Biomedicine,  
Chemistry, and  
Engineering  
A Roadmap to Taking  
Nanoproducts from  
Laboratory to Market**



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**Nano-food**

**Engineering**

**Particle Level**

**Chemical Engineering**

**CAD Using Arno**

**Vigen Scrunched Cube**

**(AVSC)**

**The realms of**

**aerospace and**

**structural mechanics**

**have been**

**revolutionized due to**

**a plethora of**

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**technological advances. These two important sectors most notably have been impacted by the advancement of nanotechnology and have introduced potential groundbreaking changes for lightweight, high strength, and**

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**improved electronic  
properties of  
nanomaterials.**

**Nanotechnology in  
Aerospace and  
Structural  
Mechanics aims to  
provide a collection  
of innovative  
research on the latest  
development of  
materials and  
methods for**

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**designing smart and intelligent devices for use in the field of space research and structural mechanics. It provides a thorough study of the fabrication and control of mechanical systems required for the successful**

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**application of  
nanotechnology in  
aerospace and  
structural  
engineering. While  
highlighting topics  
including  
nanomaterial  
properties, aerospace  
electronics, and  
polymer  
nanocomposites, this  
book is ideally**

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**designed for  
engineers,  
researchers,  
students, and  
academicians with  
interests in the fields  
of civil engineering,  
mechanical  
engineering,  
aerospace  
engineering, and  
nanoscience.**

**This volume brings**

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**together innovative research, new concepts, and novel developments in the application of new tools for chemical engineers. It presents significant research, reporting on new methodologies and important applications in the field of chemical**

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**engineering.**

**Highlighting**

**theoretical**

**foundations, real-**

**world cases, and**

**future directions,**

**this book covers**

**selected topics in a**

**variety of areas,**

**including:**

**chemoinformatics**

**and computational**

**chemistry advanced**



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**dielectric materials  
nanotechniques**

**polymer composites**

**It also presents**

**several advanced**

**case studies. The**

**topics discussed in**

**this volume will be**

**valuable for**

**researchers,**

**practitioners,**

**professionals, and**

**students of**

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**chemistry material  
and chemical  
engineering.**

**Particle Level  
Chemical**

**Engineering CAD**

**brings tools to  
visualize and  
calculate where every  
particle settles,  
moves, and all the  
forces. Join the team  
learning this**

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**breakthrough  
technology that  
makes chemical  
engineering and  
nanotechnology  
visual and easy to  
build on screen.**

**Nanotechnology has  
the potential to  
revolutionize the  
agricultural and food  
industry with new  
tools for the**

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**molecular treatment  
of diseases, rapid  
disease detection,  
enhancing the ability  
of plants to absorb  
nutrients etc.**

**Nanotechnology  
combines solid state  
physics, chemistry,  
electrical  
engineering,  
chemical  
engineering,**

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**biochemistry and  
biophysics, and  
materials science. It  
is a highly  
interdisciplinary  
area meaning that it  
involves ideas  
integrated from  
many traditional  
discipline.**

**Nanotechnology (NT)  
is the production and  
use of materials with**

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Nanotechnology

**purposely engineered features close to the atomic or molecular scale. NT deals with putting things together atom by atom and with structures so small they are invisible to the naked eye. It provides the ability to create materials, devices and systems**

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**with fundamentally new functions and properties. The promise of NT is enormous. It has implications for almost every type of manufacturing process and product. Nanomaterials have extremely small size which having at least one dimension 100**

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**nm or less.**

**Nanomaterials can be nanoscale in one dimension (e.g. surface films), two dimensions (e.g. strands or fibres), or three dimensions (e.g. particles). They can exist in single, fused, aggregated or agglomerated forms with spherical,**



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**tubular, and  
irregular shapes.**

**Common types of  
nanomaterials  
include nanotubes,  
dendrimers,  
quantum dots and  
fullerenes.**

**Nanoparticle  
research is currently  
an area of intense  
scientific research,  
due to a wide variety**

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**of potential applications in biomedical, optical, and electronic fields. Nanoparticles are of great scientific interest as they are effectively a bridge between bulk materials and atomic or molecular structures. A bulk material should have**

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**constant physical properties regardless of its size, but at the nano-scale this is often not the case.**

**This book introduces the reader to the world of**

**nanotechnology by giving them in-depth details of different aspects of the field.**

**Trends and Future**

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**Applications**  
Nanotechnology