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The field of polymer nanocomposites has become essential for engineering and military industries over the last few decades as it applies to computing, sensors, biomedical microelectronics, hard coating, and many other domains.

Due to their outstanding mechanical and thermal features, polymer nanocomposite

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materials have recently been developed and now have a wide range of applications. Polymer Nanocomposites for Advanced Engineering and Military Applications provides emerging research on recent advances in the fabrication methods, properties, and applications of various nano-fillers including surface-

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modification methods and chemical functionalization. Featuring coverage on a broad range of topics such as barrier properties, biomedical microelectronics, and matrix processing, this book is ideally designed for engineers, industrialists, chemists, government officials, military professionals, practitioners,

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academicians, researchers, and students. Friction and Wear in Polymer-Based Materials discusses friction and wear problems in polymer-based materials. The book is organized into three parts. The chapters in Part I cover the basic laws of friction and wear in polymer-based materials. Topics covered include

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frictional interaction during metal-polymer contact and the influence of operating conditions on wear in polymers. The chapters in Part II discuss the structure and frictional properties of polymer-based materials; the mechanism of frictional transfer when a polymer comes into contact with polymers, metals,

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and other materials; and controlling the frictional properties of polymer materials. Part III is devoted to applications of polymer-based materials in friction assemblies. It covers composite self-lubricating materials and polymer materials for complexly loaded main friction assemblies. This work may prove

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useful to specialists interested in the problems of using polymer materials. It also aims to stimulate deeper research into the field of friction and wear in polymer-based materials.

The book "Engineering Materials and Tribology XXV" published by results of 25th International Baltic Conference of

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Engineering Materials and Tribology
(November 3-4, 2016, Riga, Latvia) and
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cover the latest findings in the fields of
advanced materials: materials for energy
and environmental applications,
biomaterials, materials characterization,
hybrid materials, functional materials and
structural materials, polymers and

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composites, ceramics, powder materials and powder metallurgy technology, coatings, surface engineering and latest researches and solutions in the area of tribology. We hope this collection will be useful for wide range of scientists and engineers in their activity.

Tribology of Natural Fiber Polymer

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Composites, Second Edition, covers the availability and processing of natural fiber polymer composites and their structural, thermal, mechanical and tribological properties and performance. Environmental concerns are driving demand for biodegradable materials such as plant-based, natural fiber-reinforced

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polymer composites. These composites are fast replacing conventional materials in many industrial applications, especially in automobiles, where tribology (friction, lubrication and wear) is an important aspect. Provides enhanced coverage on industrially relevant fiber types, such as flax, hemp, kenaf, rice, grain husk and

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pyrolyzed fibers Includes an emphasis on
modeling and the simulation of the wear

resistance of fibers Discusses the effect of

aging in various environments and

different results in wear and friction
performance

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Composites

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Self-Lubricating Composites
Polymer Nanocomposite Membranes for
Pervaporation

*This book addresses different
aspects of green biocomposite
manufacture from natural fibres*

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*and bioplastics, including the
manufacturing procedures and the
physical, mechanical, thermal and
electrical properties of green
biocomposites. Featuring
illustrations and tables that
maximize reader insights into the*

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*current research on
biocomposites, it emphasises the
role of green technology in the
manufacture of biocomposites and
analysis of properties of
biocomposites for different
applications. It is a valuable*

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*resource for researchers and
scientists in industry wanting to
understand the need for
biocomposites in the development*

*of green, biodegradable and
sustainable products for different
applications.*

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*From the Introduction:
Nanotechnology and its
underpinning sciences are
progressing with unprecedented
rapidity. With technical advances
in a variety of nanoscale
fabrication and manipulation*

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*technologies, the whole topical
area is maturing into a vibrant
field that is generating new
scientific research and a*

*burgeoning range of commercial
applications, with an annual
market already at the trillion dollar*

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threshold. The means of fabricating and controlling matter on the nanoscale afford striking and unprecedented opportunities to exploit a variety of exotic phenomena such as quantum, nanophotonic and

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nanoelectromechanical effects.

Moreover, researchers are
elucidating new perspectives on
the electronic and optical

properties of matter because of
the way that nanoscale materials
bridge the disparate theories

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describing molecules and bulk matter. Surface phenomena also gain a greatly increased significance; even the well-known link between chemical reactivity and surface-to-volume ratio becomes a major determinant of

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physical properties, when it operates over nanoscale dimensions. Against this background, this comprehensive work is designed to address the need for a dynamic, authoritative and readily accessible source of

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information, capturing the full
breadth of the subject. Its six
volumes, covering a broad
spectrum of disciplines including
material sciences, chemistry,
physics and life sciences, have
been written and edited by an

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*outstanding team of international
experts. Addressing an extensive,
cross-disciplinary audience, each
chapter aims to cover key
developments in a scholarly,
readable and critical style,
providing an indispensable first*

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*point of entry to the literature for
scientists and technologists from
interdisciplinary fields. The work
focuses on the major classes of
nanomaterials in terms of their
synthesis, structure and
applications, reviewing*

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nanomaterials and their respective technologies in well-structured and comprehensive articles with extensive cross-references. It has been a constant surprise and delight to have found, amongst the rapidly escalating number who

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*work in nanoscience and
technology, so many highly
esteemed authors willing to
contribute. Sharing our
anticipation of a major addition to
the literature, they have also
captured the excitement of the*

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field itself in each carefully crafted chapter. Along with our painstaking and meticulous volume editors, full credit for the success of this enterprise must go to these individuals, together with our thanks for (largely) adhering to

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*the given deadlines. Lastly, we
record our sincere thanks and
appreciation for the skills and
professionalism of the numerous*

*Elsevier staff who have been
involved in this project, notably
Fiona Geraghty, Megan Palmer*

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*and Greg Harris, and especially
Donna De Weerd-Wilson who has
steered it through from its
inception. We have greatly
enjoyed working with them all, as
we have with each other.
This book covers the current*

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*advances and practices in
tribological applications of
composite materials under various
processes, presenting the
development, characterization,
and morphological properties of
composite materials in tribological*

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*applications. It covers a wide
range of subjects, extending from
fundamental research on the
tribological characteristics of
various multi-phase materials to
the final applications of
composites in wear loaded,*

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*technical components. It brings
together contributions from
researchers who discuss
innovative experimental*

*approaches and analytical
techniques, creating a reference
with comprehensive coverage of*

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*modern research techniques and
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*the potential application of
tribological composites in
biomedical, aerospace,
automotive, marines and
construction industries. This
volume will be of interest to*

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*material science researchers
working in both industry and
academia*

*Advances in Sustainable Polymer
Composites reviews recent
scientific findings on the
production and use of sustainable*

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*polymers and composites as
innovative new materials. The
book discusses the importance of
sustainable polymers in terms of
current practices and how to
address environmental and
economic issues. Attention is*

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Interface Engineering*

*focused on the physical, chemical
and electrical properties of these
composites. The book also looks at
the lifecycle of both single and
hybrid polymers and
nanocomposites, with chapters
covering the latest research*

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*findings on sustainable polymer
composites with various filler
loadings and their improvement on
compatibility. From the viewpoint
of polymer composites, this book
covers not only well-known
sustainable future trends in*

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sustainable polymers and composites, but also advanced materials produced from micro, nano and pico-scale fillers that achieve better physical and mechanical results. Features advanced materials produced from

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micro, nano and pico-scale fillers

Emphasizes the modeling and

prediction of thermal, rheological

and mechanical behavior Covers

various types of fillers and

different reinforcement agents

Focuses on all aspects of

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*fabrication, characterization and
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Sustainability approaches and
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Biomimetics, Energy Conservation
and Sustainability
Advances in Engine Tribology*

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Volume 1
Interface Engineering
Tribology of Polymer
Composites:
Characterization,
Properties, and Applications
provides an exhaustive

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overview of the latest
research, trends,
applications and future
directions of the tribology
of polymer composites.

Covering novel methods for
the synthesis of polymer
composites and their

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properties, the book starts by reviewing the fabrication techniques, wear and frictional properties of polymer composite materials. From there, it features chapters looking at the tribological behavior and

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*properties of specific
polymer composite materials
such as synthetic fiber-
reinforced, cellulose fiber-
reinforced, wood fiber,
synthetic fiber, mineral
fiber-reinforced, and
thermosetting composites.*

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Final chapters cover the tribology of polymer nanocomposites and particulate polymer composites and their metal coatings. Applied examples spanning a wide range of industries are emphasized in

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each chapter. Demonstrates

Wear Of Bulk Materials And
the potential of polymer
composites and their

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applications Covers novel

Interface Engineering
methods for the synthesis of
polymer composites and their
properties Reviews the

fabrication techniques, wear

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and frictional properties of
polymer composite materials
To have unimaginably
outstanding useful
properties (physical,
mechanical, electrical,
optical, chemical, and
magnetic) in a single

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*material design is a highly
challenging task in the
material science community,
which can be achieved
through nanocomposites.
These nanocomposites can be
produced from all
conventional materials,*

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*which include polymers,
metals/alloys, and ceramics,
by modifying their internal
structures. Due to
modification of the
structures of all kinds of
conventional materials, at
either the nano or ultra-*

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fine level, the materials exhibit superior performance, which is a boon for all fields of science. In general, nanocomposite materials can be manufactured by solid-state processing techniques,

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liquid metallurgy, ex-situ
and in-situ powder
metallurgy, and other basic
science synthesis routes.
Furthermore, the possibility
of making environmentally
friendly materials is also
possible with

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*nanotechnology. Therefore,
to investigate and
demonstrate developments in
the field of nanocomposites,
this book is targeted at all
the scientific personnel
working in this field.
Polymer composites are*

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*materials in which the
matrix polymer is reinforced
with organic/inorganic
fillers of a definite size
and shape, leading to
enhanced performance of the
resultant composite. These
materials find a wide number*

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of applications in such
diverse fields as
geotextiles, building,
electronics, medical,
packaging, and automobiles.
This first systematic
reference on the topic
emphasizes

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*the characteristics and
dimension of this
reinforcement. The authors
are leading researchers in
the field from
academia, government,
industry, as well as private
research institutions across*

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the globe, and adopt a
practical approach here,
coveringsuch aspects as the
preparation,
characterization, properties
andtheory of polymer
composites. The book begins
by discussing the state of

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the art, new challenges, and
opportunities of various
polymer composite systems.
Interfacial characterization
of the composites is
discussed in detail, as
is the macro- and
micromechanics of the

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composites. Structure-
property relationships in
various composite systems
are explained with the help
of theoretical models, while
processing techniques for
various macro- to
nanocomposite systems and

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the influence of processing parameters on the properties of the composite are reviewed in detail. The characterization of microstructure, elastic, viscoelastic, static and dynamic mechanical,

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thermal,
tribological, rheological,
optical, electrical and
barrier properties
are highlighted, as well as
their myriad applications.
Divided into three volumes:
Vol. 1. Macro- and

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Wear Of Bulk Materials And
Nanocomposites; and Vol. 3.
Coatings Tribology And
Biocomposites.

This book deals with the new and now-expanding field of friction, wear, and other surface-related mechanical phenomena for polymers.

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Polymers have been used in various forms such as bulk, films, and composites in applications where their friction, wear resistance, and other surface-related properties have been effectively utilized. There

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are also many examples in which polymers have performed extremely well, such as in tyres, shoes, brakes, gears, bearings, small moving parts in electronics and MEMS, cosmetics/hair products, and

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*artificial human joints.
Around the world, much
research is currently being
undertaken to develop new
polymers, in different
forms, for further enhancing
tribological performance and
for finding novel*

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*applications. Keeping in
view the importance of
tribology of polymers for
research and technology as
well as the vast literature
that is now available in
research papers and review
articles, this timely book*

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Interface Engineering
brings together a wealth of
research data for an
understanding of the basic
principles of the subject.

Contents: Bulk
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Fillers The Sliding Wear of
Polypropylene and Its
Blends Brake Friction
Materials Polymer
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Contacts AFM Testing of
Polymeric Resist Films for
Nanoimprint Lithography and
other papers Readership:
Engineering professionals
working on polymers for
designing bearing materials;

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managers and researchers in
materials laboratories;
graduate students in the
area of materials/tribology.
Keywords: Polymer; Tribology; W
ear; Friction; Scratching
Features: Covers, for the
first time, all areas of

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polymer tribology (bulk,
films, composites, and
applications) in one
comprehensive book Describes
new applications for
polymers, such as in
microscale and nanoscale
machines where surface

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*properties or tribology play
a crucial role in the
durability and performance
of the machine. Compiles
various works in this area
into one volume, and
includes opinions or
contributions from some of*

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*the world's leading
authorities in this
field* Reviews: "This book
brings together a vast
wealth of research data and
a fundamental understanding
of the basic principles in
this important research

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Infrared Engineering*

*area. Those working in the
field of polymer tribology
will find it helpful in
learning about the most
recent developments. Those
new to the area will find
its many chapters on the
fundamentals of polymer*

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tribology very
instructive."IEEE Electrical
Insulation Magazine
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Composite Materials
Recent Evolutions
Preparation,
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Applications
Green Biocomposites
Vibration of Functionally
Graded Beams and Plates
Environmental concerns are
driving demand for bio-
degradable materials such

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as plant-based natural fiber
reinforced polymer
composites. These
composites are fast
replacing conventional
materials in many
applications, especially in

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automobiles, where
tribology (friction,
lubrication and wear) is
important. This book covers
the availability and
processing of natural fiber
polymer composites and

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their structural, thermal,
mechanical and, in
particular, tribological
properties. Chapter 1
discusses sources of natural
fibers, their extraction and
surface modification. It also

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reviews the thermal,
structural, mechanical,
spectroscopic and
morphological properties of
unmodified and chemically
modified natural fibers such
as sisal, jute, wood, bamboo

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and cotton together with
their potential applications.
Chapter 2 gives a brief
introduction to the tribology
of polymer composites and
the role of fiber
reinforcement and fillers in

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modifying their tribological
properties. Further chapters
discuss the chemical
composition, physical
structure, mechanical
properties and tribological
behaviour of polymer

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composites reinforced with
sisal, jute, cotton and
bamboo fibers. The
tribological behaviour of
wood polymer composites
(WPCs) is also discussed.
Tribology of natural fibre

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polymer composites is a
useful reference guide for
engineers, scientific and
technical personnel involved
in the development of
natural fiber composites. In
particular it will give an

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insight into mechanical
properties and failure
mechanisms in situations
where wear, lubrication and
friction are a problem.

Examines the availability
and processing of natural

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fiber composites and their
structural, thermal,
mechanical and tribological
properties Explores sources
of natural fibers, their
extraction and surface
modification as well as

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properties of chemically
modified natural fibers

Provides an overview of the
tribology of polymer
composites and the role of
fiber reinforcement and
fillers in modifying

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comprehensive study of all
important aspects of
tribology. It covers issues
and their remedies adopted
by researchers working on
automobile systems. The
book is broadly divided in to

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three sections, viz. (i) new materials for automotive applications, (ii) new lubricants for automotive applications, and (iii) impact of surface morphologies for automotive applications. The

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rationale for this division is to provide a comprehensive and categorical review of the developments in automotive tribology. The book covers tribological aspects of engines, and also

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discusses influence of new
materials, such as natural
fibers, metal foam materials,
natural fiber reinforced
polymer composites, carbon
fiber/silicon nitride polymer
composites and aluminium

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matrix composites. The book
also looks at grease
lubrication, effectiveness
and sustainability of
solid/liquid additives in
lubrication, and usage of
biolubricants. In the last

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section the book focuses on
brake pad materials, shot
peening method, surface
texturing, magnetic

rheological fluid for smart
automobile brake and clutch
systems, and application of

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tribology in automobile systems. This book will be of interest to students, researchers, and professionals from the automotive industry.

Conjugated Polymers for

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Devices describes the
synthesis and
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conjugated polymeric
materials and their key
applications, including
active electrode materials
for electrochemical
capacitors and lithium-ion
batteries, along with new

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ideas of functional materials
for next-generation high-
energy batteries, a
discussion of common
design procedures, and the
pros and cons of conjugated
polymers for certain

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applications. The book's
emphasis lies in the
underlying electronic
properties of conjugated
polymers, their
characterization and
analysis, and the evaluation

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of their effectiveness for
utilization in energy and
electronics applications.
This book is ideal for
researchers and
practitioners in the area of
materials science, chemistry

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synthesis and
functionalization of
conjugated polymers and
their composites Reviews
important photovoltaics

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applications of conjugated
polymeric materials,
including their use in energy
storage, batteries and

optoelectronic devices

Discusses conjugated
polymers and their

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application in electronics for
sensing, bioelectronics,
memory, and more
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Polymer Composites,
Nanocomposites
Challenges and New
Solutions

Engineering Materials and
Tribology XXV

This book comprehensively covers

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the different topics of wood polymer composite materials mainly synthesis methods for the composite materials, various characterization techniques to study the superior properties and insights on potential advanced

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applications. It also discusses the chemistry, fabrication process, properties, applications, recycling and life cycle assessment of wood polymer composites. This is a useful reference source for both engineers and researchers working

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in composite materials science as
well as the students attending
materials science, physics,
chemistry and engineering courses.

Friction and Wear of Polymers

This handbook is a collection of
authoritative information in the new

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and expanding field of polymer tribology. It brings together various research topics in the field of polymer tribology in a single

volume, and provides relevant data in polymer tribology for research and industrial applications. The

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book's chapters are written by active, world-renowned researchers in the field. Subjects covered in this book range from the fundamentals of polymer tribology to highly applied topics such as machine element design (bearing and

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gears), hip prosthetic and
microsystems applications. Readers
in the field of tribology, in general,
and polymer tribology, in particular,
will find it very useful as it covers
nearly all aspects of polymer
tribology. Academics creating new

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courses based on polymer tribology
will also find this book's

comprehensive coverage valuable.

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This book provides recent

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information on nanocomposites tribology. Chapter 1 provides information on tribology of bulk polymer nanocomposites and nanocomposite coatings. Chapter 2 is dedicated to nano and micro PTFE for surface lubrication of

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carbon fabric reinforced
polyethersulphone composites.

Chapter 3 describes Tribology of
MoS₂ -based nanocomposites.

Chapter 4 contains information on
friction and wear of Al₂O₃ -based
composites with dispersed and

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agglomerated nanoparticles.

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Finally, chapter 5 is dedicated to
wear of multi-scale phase

reinforced composites. It is a useful
reference for academics, materials
and physics researchers, materials,
mechanical and manufacturing

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engineers, both as final
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researchers, materials, mechanical
and manufacturing engineers, both
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Interface Engineering
Multifunctionality of Polymer
Composites

Handbook Of Polymer Tribology

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Polymer Tribology

Tribology covers the fundamentals of tribology and the tribological response of all types of materials, including metals, ceramics, and polymers. The book

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*provides a solid scientific foundation
without relying on extensive
mathematics, an approach that will
allow readers to formulate appropriate
solutions when faced with practical
problems. Topics considered include
fundamentals of surface topography*

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and contact, friction, lubrication, and wear. The book also presents up-to-date discussions on the treatment of wear in the design process, tribological applications of surface engineering, and materials for sliding and rolling bearings. Tribology will be valuable to

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*engineers in the field of tribology,
mechanical engineers, physicists,
chemists, materials scientists, and
students. Features Provides an excellent
general introduction to the friction,
wear, and lubrication of materials
Presents a balanced comparison of the*

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*tribological behavior of metals,
ceramics, and polymers Includes
discussions on tribological applications
of surface engineering and materials for
sliding and rolling bearings Emphasizes
the scientific foundation of tribology
Discusses the treatment of wear in the*

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design process Uses SI units throughout and refers to U.S., U.K., and other European standards and material designations

These proceedings gather a selection of peer-reviewed papers presented at the 7th International Conference on

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Fracture Fatigue and Wear (FFW
Wear Of Bulk Materials And
on 9–10 July 2018. The contributions,
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prepared by international scientists and
engineers, cover the latest advances in
and innovative applications of fracture
mechanics, fatigue of materials,

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*tribology and wear of materials. The
book is intended for academics,*

*including graduate students and
researchers, as well as industrial*

*practitioners working in the areas of
fracture fatigue and wear.*

Tribology is the study of friction, wear

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and lubrication. Recently, the concept of “green tribology” as “the science and technology of the tribological aspects of ecological balance and of environmental and biological impacts” was introduced. The field of green tribology includes tribological technology that mimics living

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nature (biomimetic surfaces) and thus is expected to be environmentally friendly, the control of friction and wear that is of importance for energy conservation and conversion, environmental aspects of lubrication and surface modification techniques, and tribological aspects of

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green applications such as wind-power turbines or solar panels. This book is the first comprehensive volume on green tribology. The chapters are prepared by leading experts in their fields and cover such topics as biomimetics, environmentally friendly lubrication,

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*tribology of wind turbines and
renewable sources of energy, and
ecological impact of new technologies of
surface treatment.*

*Tribology of Polymeric Nanocomposites
provides a comprehensive description of
polymeric nanocomposites, both as bulk*

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*materials and as thin surface coatings,
and provides rare, focused coverage of
their tribological behavior and potential
use in tribological applications.*

*Providing engineers and designers with
the preparation techniques, friction and
wear mechanisms, property information*

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*and evaluation methodology needed to
select the right polymeric nanocomposites
for the job, this unique book also
includes valuable real-world examples
of polymeric nanocomposites in action in
tribological applications. Provides a
complete reference to polmer*

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*nanocomposite material use in tribology
Wear Of Bulk Materials And
from preparation through to selection
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and use. Explains the theory through
Interface Engineering
examples of real-world applications,
keeping this high-level topic practical
and accessible. Includes contributions
from more than 20 international*

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*tribology experts to offer broad yet
detailed coverage of this fast-moving
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*Friction and Wear of Polymers
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A one-stop resource for researchers and developers alike, this book covers a plethora of nanocomposite properties

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and their enhancement mechanisms.

With contributors from industry as well
as academia, each chapter elucidates in
detail the mechanisms to achieve a
certain functionality of the polymer
nanocomposite, such as improved
biodegradability, increased chemical
resistance and tribological

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performance. Special emphasis is laid on the interdependence of the factors that affect the nanocomposite properties such that readers obtain the information necessary to synthesize the polymer materials according to the requirements of their respective applications.

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This and its companion Volume 2 document the proceedings of the International Symposium on Physicochemical Aspects of Polymer Surfaces held under the auspices of the American Chemical Society in New York City, August 23-28, 1981. This event was sponsored by the Division of

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Surface Engineering

Colloid and Surface Chemistry and the Divisions of Organic Coatings and Plastics Chemistry, and Industrial and Engineering Chemistry were the

cosponsors. The study of polymer surfaces is important from both fundamental and applied points of view. The applications of polymers are legion and

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wheresoever polymers are used, their surface characteristics, inter alia, are of great concern and importance; and the areas where polymers find applications range from microelectronics to prosthetics. In the last decade or so, the availability of various sophisticated surface analytical

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**techniques, particularly ESCA, has
been a boon in enhancing our
knowledge of polymer surfaces. This
Symposium was designed to bring
together scientists and technologists
interested in all aspects of polymer
surfaces, to provide a forum for
discussion of various ramifications of**

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poly mer surfaces, to discover the latest developments, to provide an opportunity for cross-pollination of ideas, and to highlight areas which are in a state of rapid development and those which need intensified efforts. If the comments from attendees is any barometer of the success of an event,

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then this Symposium was a grand success and the above objectives were amply fulfilled.

This book deals with the new and now-expanding field of friction, wear, and other surface-related mechanical phenomena for polymers. Polymers have been used in various forms such as

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bulk, films, and composites in applications where their friction, wear resistance, and other surface-related properties have been effectively utilized. There are also many examples in which polymers have performed extremely well, such as in tyres, shoes, brakes, gears, bearings, small moving parts in

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electronics and MEMS, cosmetics/hair products, and artificial human joints.

Around the world, much research is currently being undertaken to develop new polymers, in different forms, for further enhancing tribological performance and for finding novel applications. Keeping in view the

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importance of tribology of polymers for research and technology as well as the vast literature that is now available in research papers and review articles, this timely book brings together a wealth of research data for an understanding of the basic principles of the subject.

This highlights ongoing research efforts

on different aspects of polymer nanocomposites and explores their potentials to exhibit multi-functional properties. In this context, it addresses both fundamental and advanced concepts, while delineating the parameters and mechanisms responsible for these potentials. Aspects

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considered include embrittlement/toughness; wear/scratch behaviour; thermal stability and flame retardancy; barrier, electrical and thermal conductivity; and optical and magnetic properties. Further, the book was written as a coherent unit rather than a collection of chapters on

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different topics. As such, the results, analyses and discussions presented herein provide a guide for the development of a new class of multi-functional nanocomposites. Offering an invaluable resource for materials researchers and postgraduate students in the polymer composites field, they

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approach to ceramic matrix

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composites, focusing on the
latest advances and
materials developments. As
advanced ceramics and
composite materials are
increasingly utilized as
components in batteries, fuel

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cells, sensors, high-
temperature electronics,
membranes and high-end
biomedical devices, and in
seals, valves, implants, and
high-temperature and wear
components, this book

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researchers and graduate students in ceramic science, engineering and ceramic composites technology, and engineers and scientists in the aerospace, energy, building and construction,

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research, enabling the
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latest applications for CMCs

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presenting state-of-the-art
discussion of this exciting
and rapidly developing field,
thus key enabling
technologies for future
applications. The text will
enable engineers and

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materials scientists to achieve multifunctionality in their own products using different types of polymer matrices and various nano- and micro-sized fillers and reinforcements, including,

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but not limited to, carbon nanotubes and graphene. In addition, technologies for the integration of active materials such as shape memory alloys are discussed. The latest

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developments in a wide
range of applications,
including
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electronics, construction,
medical engineering, and
future trends are discussed,

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making this book an essential reference for any researcher or engineer hoping to stay ahead of the curve in this high-potential area. Provides information on composites and their

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Discusses polymer
nanocomposites composed
of a family of polymeric
materials whose properties
are capable of being tailored
to meet specific applications.

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Membranes for
Pervaporation assesses
recent applications in the
pervaporation performance
of polymer nanocomposites
of different length scales.
The book discusses the

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effects of a range of nanofillers, their dispersion, the effect of different polymers, and organic and inorganic nanomaterials in the pervaporation process. In addition, the book explores

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how the different properties
of a variety of
nanocomposite materials
make them better for use in
different types of liquids,
while also discussing the
challenges of using different

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nanocomposites for this purpose effectively and safely. In particular, polymer nanocomposites for g nanoscale dispersion, filler/polymer interactions, and morphology are

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addressed. This is an
important reference source
for materials scientists,
chemical engineers and
environmental engineers
who want to learn more
about how polymer

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nanocomposites are being
used to make the
pervaporation separation
process more effective.

Optimization of Polymer
Nanocomposite Properties
Green Tribology

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and scientists understand and use
the special properties of cutting-
edge polymer nanocomposites.

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begins with an overview of key technologies and processes. Each chapter then examines a different property (structural, mechanical, thermal, flammability, ablation, and electrical) and explains relevant commercial and industrial

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applications. Examples for a wide variety of usage include applications for spacecraft and defense vehicles, medical and dental implants, flame-retardant and conductive polymers for additive manufacturing, and fire-

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fabrics. Coverage
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characterization•Mechanical,
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applications, part of the book is also devoted to the friction and wear of metal-based composites and rubber compounds. The data are represented in the form of 277 figures, diagrams and photographs, and 68 tables. The author index

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covers more than 670 references,
and the subject index more than
1,000 keywords. The book will be of
particular interest to: those involved
in research on some aspects of
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materials engineering applications, epoxy composites are highly relevant to the work of engineers and scientists in many fields.

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and straightforward summary of the most recent developments in the area of epoxy composites. The book emphasizes their preparation, characterization and applications, providing a complete understanding of the correlation of rheology, cure

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and engineering applications where the proper selection of fiber, filler, and polymer can be tailored for particular application. The primary objective of this book is to broaden the knowledge of tribology of polymer composites in a new

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dimension for Industry 4.0. For instance, the book covers polymer composites used as self-lubricating material used in the automotive industry and other manufacturing equipment to reduce the effect of energy loss due to friction and

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wear. This book is of interest to researchers and industrial practitioners who work in the field of tribology of polymer composites, manufacturing equipment and production engineering.

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In most tribological applications, liquid or grease based lubricants are used to facilitate the relative motion of solid bodies to minimize friction and wear

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between interacting
surfaces. The challenges
for liquid lubricants
arise in extreme
environmental
conditions, such as very
high or low

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temperatures, vacuum,
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radiation, and extreme

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contact pressure. At
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these conditions, solid
lubricants may be the
alternative choice which
can help to decrease

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friction and wear
without incorporating
liquid lubricants.

Challenges with solid
lubricants are to
maintain a continuous
supply of solid

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lubricants on the
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contact surfaces to act
as lubricous layer
between two sliding
surfaces. Such a
continuous supply of
solid lubricant is more

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easily maintained in the
case of liquid
lubricants when compared
to solid lubricants. The
most innovative
development to ensure a
continuous supply of

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solid lubricant to the contact surface during sliding is to introduce solid lubricant as reinforcement into the matrix of one of the sliding components.

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Composite materials are
engineered or naturally
occurring materials
which contain two or
more distinct

constituents with

significantly different

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chemical, physical and mechanical properties. Composites consist of reinforcement and matrix (metal, polymer and ceramics). Among various reinforcements, recent

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emerging material, solid
lubricant, is found to
have many favorable
attributes such as good
self-lubricant property.
Self-lubrication is the
ability of material to

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transfer embedded solid
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lubricants to the
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contact surface to
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decrease wear rate and
friction in the absence
of an external
lubricant. Self-

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lubricating metal matrix
composites (SLMMCs) are
an important category of
engineering materials
that are increasingly
replacing a number of
conventional materials

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in the automotive,
aerospace, and marine
industries due to
superior tribological
properties. In SLMsCs,
solid lubricant
materials including

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carbonous materials,
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molybdenum disulfide
(MoS₂), and hexagonal
boron nitride (h-BN) are
embedded into the metal
matrices as
reinforcements to

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manufacture a novel
material with attractive
self-lubricating
properties. Several
studies have been
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of self-lubricating materials. This book fills that gap to have a reference book about self-lubricating materials and their properties to help

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