
Book Reviews

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Volume I: Cast Iron
ISBN 978-1-4665-1108-8
832 pages

Volume II: Chromium – Heat Treatment: Regenerative
ISBN 978-1-4665-1109-5
759 pages

Volume III: Heat Treatment: Special – Molten
ISBN 978-1-4987-6266-3
759 pages

Volume IV: Nanofluids – Residual Stresses
ISBN 978-1-4987-6267-0
759 pages

Volume V: Retained – Wetting
ISBN 978-1-4987-6268-7
731 pages

Edited by Rafael Colás and George E. Totten
CRC Press, Taylor & Francis Group
6000 Broken Sound Parkway, NW
Suite 300, Boca Raton, FL 33489, USA

The first of many important works featured covering all the fundamental, theoretical, and application-related aspects of the metallurgical science, engineering, and technology of iron, steel, and their alloys.

Various topics are presented in five volumes and are going to be issued also in the electronic version. The printed version consists of 5200 pages with additional pages stating the editorial board of 32 members. Prof. Dr. Rafael Colás and Prof. Dr. George E. Totten are Editors-in-Chief. There are more than 330 authors with their contributions.

The book contains valuable information from the fields of:

- *Physical metallurgy*: Iron and steel making: iron ore direct reduction, continuous casting processes semi-solid processing, large steel ingots, metallurgical cake, direct reduced iron, steel transformation, aging, grain boundaries, transformation induced plasticity, classification and mechanism of steel transformation, superstrengthening, wetting kinematics, stability in a nanostructured bainitic steel, growth kinetics and mechanical characterisation.

- *Mechanical working*: Direct quenching structural steels, fasting system, forging technology, high carbon steel wire, patenting in the bath, hot rolled steels, modelling and stimulation of mechanical behaviour.
- *Casting*: Austempered ductile cast iron, semi-solid processing investment casting, cast iron and steel metallography, spheroidal graphite iron, steel casting tomography, thixoforming, and continuous casting process.
- *Steels and heat treating*: Carbon iron alloys, fundamentals, post welds, steels, special steels, effect on heat treatment and properties of steels, high alloyed steels, austenitic steels, dynamic strain aging, microstructure evaluation, duplex, stainless steels, ferritic-martensitic steels, cyclic softening behaviour, manganese steels, maraging steels, stainless steels, tool steels, cryogenic treatment, feature toughness, physical metallurgy of tool steels, boride layer, boroaluminised carbon steels, boronising of iron based alloys, chromising, electroless nickel-boron coatings, galvanised coatings, hardfacing, electrochemical boriding.
- *Heat treatment*: Hardening and hardenability, flame hardening, induction hardening, computer modelling of induction heating and heat treating, cryogenic treatment, tempering parameter development, carburising, plasma carbonising, carbonised steels, quenching effect, Jominy test results, microwave plasma carbonising, case hardening, nitriding, gas and plasma nitriding, nitride and nitrocarburized materials, nitriding and austenitic and ferritic nitrocarburizing, sack cyaniding.
- *Quenching and distortion*: Cooling curves, high pressure process, gas quenching and equipment design, fluids, quench factor analysis, quench processing, quench system design, polymer quenchants, quenching and tempering, brine and caustic, intensive steel quenching, simulation of quenching, quenching techniques, distortion and residual stresses, minimisation of residual stress in steel casting, weld residual stress, residual stress of thermally processed residual stresses.
- *Laser and plasma treating*: Laser transformation hardening and remelting, laser peening, plasma nitride steels, corrosion resistance by plasma post oxidation, plasma carburising, laser modification process, laser physical vapour deposition.
- *Powder metallurgy*: Powder injection moulding, sinter herding, powder metallurgy alloys, heat treatment, sintering and surface treating, plasma assisted parts manufacturing.
- *Surface degradation*: Oxidation of ferrous alloys, stress corrosion cracking, hydrogen diffusion and environmentally assisted cracking, corrosion inhibitors, coating to prevent it, structural characterisation of products, cracking of steel embrittlement, surface integrity.

The set of books is highly recommended for materials scientists and engineers, manufacturers, chemists, researchers as it provides extensive coverage of various types and state of their materials properties as well as their practical use.

1 Fundamentals of Engineering Tribology with Applications**by: H. Hirani****Published 2016****by Cambridge University Press, 4843/24, 2nd Floor,****Ansari Road, Daryaganj, Delhi 110002, India,****Cambridge University Press is part of the****University of Cambridge, 433pp****ISBN: 978-1-107-06387-7 Hardback**

Tribology is the study of the principles of friction, wear and lubrication of machine elements. As a branch of mechanical engineering and materials science, tribology deals with the design of fluid containment systems like seals and gaskets, and lubrication of surfaces in relative motion. The study of tribology helps in better understanding of design and maintenance of machine elements such as bearings, gears, cam-followers, hard disk drives, seals, pumps, compressors, etc. In order to calculate the load support required by bearings, there is a need to study the structure and nature of fluid flow.

This book discusses the theories and applications of hydrodynamic thrust bearings, gas (air) lubricated bearings and elasto-hydrodynamic lubrication in detail. Explaining the concepts of friction including coefficient of friction, friction instability and stick-slip motion, the book also clarifies the delusion that harder and cleaner surfaces produce better results in wear. The recent developments including online condition monitoring (an integration of moisture sensor, wear debris and oil quality sensors) and multigrid technique are also presented in the book. In addition, it provides design problems and their real-life applications for cams, followers, gears and bearings. MATLAB programs, frequently asked and multiple choice questions are interspersed throughout the book for better understanding.

This book contains the following chapters:

- introduction
- friction, wear and boundary lubrication
- lubrication of bearings
- hydrostatic and squeeze film lubrication
- elasto-hydrodynamic lubrication
- gas (air) lubricated bearings
- mixed lubrication
- tribological aspects of rolling motion
- tribological aspects of gears.

2 Ultrasonic Guided Waves in Solid Media**by: J.L. Rose****Published 2014****by Cambridge University Press****32 Avenue of the Americas, New York NY 10013-2473, USA****Cambridge University Press is part of the****University of Cambridge, 512pp****ISBN: 978-1-107-04895-9 (hardback)**

This book builds on my 1999 book, *Ultrasonic Waves in Solid Media*. Like its predecessor, this book is intended to bring people up to speed with the latest developments in the field, especially new work in ultrasonic guided waves. It is designed for students and for researchers and managers familiar with the field in order to serve as a baseline for further work already under way. I hope to journey with you to provide more breakthroughs in the understanding and application of ultrasonic guided waves. The goal is to improve the health of individuals, industries, and national infrastructures through improved methods of non-destructive evaluation (NDE). The purpose of this book is to expand on many of the topics that were introduced in my first book. Several chapters are almost the same, but there are many new fundamental topic chapters with a total emphasis in this book being directed toward the basic principles of ultrasonic guided waves. The field of ultrasonic guided waves itself is treated as a new and separate field compared to ultrasonics and other inspection disciplines as indicated in some of the efforts put forward in inspection certification by the American Society for Non-destructive Testing (ASNT) and also in code requirements in such groups as the American Society for Mechanical Engineers (ASME) and the Department of Transportation (DOT).

Guided wave concepts have been applied to examine the tubing in power plants and pipelines in chemical processing facilities and, importantly, to ensure the safety of large petroleum and gas pipelines. Because of their unique capabilities, guided wave techniques can be used to find tiny defects – over large distances, under adverse conditions, in structures with insulation and coatings, and in harsh environments.

Engineers, technicians, and students involved in ultrasonic NDE will appreciate the usefulness of this textbook. Even though the mathematics is sometimes detailed and sophisticated, the treatment can also be read by managers without a detailed understanding of the concepts. They may find this book useful as it is designed to be read from a ‘black box’ point of view so they can develop an understanding of what engineers, technicians, and students are talking about.

3 Transmission Electron Microscopy: Diffraction, Imaging, and Spectrometry**by: C.B.Carter and D.B. Williams****Publishing 2016****by Springer International Publishing Switzerland****This Springer International Publishing Switzerland imprint**

is published by Springer Nature The registered company is Springer-Verlag GmbH Berlin Heidelberg, 518pp
ISBN: 978-3-319-26649-7
DOI: 10.1007/978-3-319-26651-0
ISBN: 978-3-319-26651-0 (eBook)

Ever since 1996, when the first edition of *Transmission Electron Microscopy: A Textbook for Materials Science* (by David Williams and Barry Carter) appeared, this became the favoured and standard text for all those interested in mastering the electron microscopic examination of materials. It was, and remains, the vade mecum of choice. With its massive repository of highly relevant information and advice, teeming with attractive pedagogical accoutrements, this text gained almost instant, worldwide popularity.

The second edition, published in 2009, contained many new features, prompted primarily by the growth of the subject and the arrival of a range of powerful additional variants of transmission electron microscopy (TEM). It had become fully apparent at that time that TEM is not just a widely useful investigative tool, but also, in its most modern form, a near complete chemical and structural laboratory, from which a multitude of properties pertaining to condensed matter may be extracted.

This text is a companion volume to *Transmission Electron Microscopy: A Textbook for Materials Science* by Williams and Carter. The aim is to extend the discussion of certain topics that are either rapidly changing at this time or that would benefit from the more detailed discussion than space allowed in the primary text. World-renowned researchers have contributed chapters in their area of expertise, and the editors have carefully prepared these chapters to provide a uniform tone and treatment for this exciting material. The book features an unparalleled collection of colour figures showcasing the quality and variety of chemical data that can be obtained from today's instruments, as well as key pitfalls to avoid. As with the previous TEM text, each chapter contains two sets of questions, one for self-assessment and a second more suitable for homework assignments. Throughout the book, the style follows that of Williams & Carter even when the subject matter becomes challenging – the aim is always to make the topic understandable by first-year graduate students and others who are working in the field of materials science. Topics covered include sources, in-situ experiments, electron diffraction, digital micrograph, waves and holography, focal-series reconstruction and direct methods, STEM and tomography, energy-filtered TEM (EFTEM) imaging, and spectrum imaging. The range and depth of material make this companion volume essential reading for the budding microscopist and a key reference for practising researchers using these and related techniques.

The book contains the following chapters:

- electron sources
- in situ and operando
- electron diffraction and phase identification
- convergent-beam electron diffraction: symmetry and large-angle patterns
- electron crystallography, charge-density mapping, and nanodiffraction
- digital micrograph

- electron waves, interference, and coherence
- electron holography
- focal-series reconstruction
- direct methods for image interpretation
- imaging in STEM
- electron tomography
- EFTEM
- calculating EELS
- diffraction and X-ray excitation.

4 Handbook of Modern Sensors: Physics, Designs, and Applications

by: Jacob Fraden

Published 2016

by Springer Cham Heidelberg New York Dordrecht London

Springer International Publishing, 5th Edition,

Switzerland 2004, 2010, 2016

American Institute of Physics 1993, 1997, 758pp

ISBN: 978-3-319-19302-1

ISBN: 978-3-319-19303-8 (eBook)

DOI: 10.1007/978-3-319-19303-8

This book presents a comprehensive and up-to-date account of the theory (physical principles), design, and practical implementations of various sensors for scientific, industrial and consumer applications. This latest edition focuses on the sensing technologies driven by the expanding use of sensors in mobile devices. These new miniature sensors will be described, with an emphasis on smart sensors which have embedded processing systems. The chapter on chemical sensors has also been expanded to present the latest developments.

Digital systems, however complex and intelligent they may be, must receive information from the outside world that is generally analogue and not electrical. Sensors are interface devices between various physical values and the electronic circuits that 'understand' only a language of moving electrical charges. In other words, sensors are the eyes, ears, and noses of silicon chips.

This book contains the following chapters:

- data acquisition
- transfer functions
- sensor characteristics
- physical principles of sensing
- optical components of sensors
- interface electronic circuits

- detectors of humans
- presence, displacement, and level
- velocity and acceleration
- force and strain
- pressure sensors
- flow sensors
- microphones
- humidity and moisture sensors
- light detectors
- detectors of ionising radiation
- temperature sensors
- chemical and biological sensors
- materials and technologies.

Unlike other books on sensors, the *Handbook of Modern Sensors* is organised according to the measured variables (temperature, pressure, position, etc.). This book is a reference text for students, researchers interested in modern instrumentation (applied physicists and engineers), sensor designers, application engineers and technicians whose job it is to understand, select and/or design sensors for practical systems.

5 Progress in Ultrafast Intense Laser Science

**by: K. Yamanouchi, L. Roso, R. Li, D. Mathur and D. Normand
Published 2015**

**by Springer International Publishing Switzerland, Volume XII
Springer Cham Heidelberg New York Dordrecht London, 758pp
ISSN: 0172-6218**

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ISBN: 978-3-319-23657-5 (eBook)

DOI: 10.1007/978-3-319-23657-5

The purpose of this series is to provide comprehensive up-to-date monographs in both well-established disciplines and emerging research areas within the broad fields of chemical physics and physical chemistry. The books deal with both fundamental emphases. They are aimed primarily at researchers and graduate students in chemical physics and related fields.

As in previous volumes of PUILS, each chapter of this book begins with an introductory part, in which a clear and concise overview of the topic and its significance is given, and moves on to a description of the authors' most recent research results. All chapters are peer-reviewed. The papers of this 12th volume cover a diverse range of the interdisciplinary research field, and the topics may be grouped into four categories:

atoms, molecules, and clusters interacting in the intense laser field, laser-induced filamentation and laser propagation, laser–plasma interaction and application, and ultrafast photo-induced processes of organic materials.

This book contains the following chapters:

- image-based closed-loop control of molecular dynamics: controlling strong-field dissociative-ionisation pathways
- classical trajectory methods for simulation of laser-atom and laser-molecule interaction
- nonadiabatic molecular alignment and orientation
- dynamics of atomic clusters under intense femtosecond laser pulses
- backward lasing of femtosecond plasma filaments
- propagation of ultrashort, long wavelength laser pulses
- dense matter states produced by laser pulses
- laser-plasma particle sources for biology and medicine
- observation of ultrafast photoinduced dynamics in strongly correlated organic materials.

6 Ancient Engineers' Inventions: Precursors of the Present

by: C. Rossi and F. Russo

Published 2017

**by Springer International, 2nd Edition, Gewerbstrasse 11,
6330 Cham, Switzerland, 2009, 2017**

This Springer imprint is by Springer Nature, xxpp

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Library of Congress Control Number: 2016948286

This book series aims to establish a welldefined forum for Monographs and Proceedings on the History of Mechanism and Machine Science (MMS). The series publishes works that give an overview of the historical developments, from the earliest times up to and including the recent past, of MMS in all its technical aspects.

This technical approach is an essential characteristic of the series. By discussing technical details and formulations and even reformulating those in terms of modern formalisms the possibility is created not only to track the historical technical developments but also to use past experiences in technical teaching and research today. In order to do so, the emphasis must be on technical aspects rather than a purely historical focus, although the latter has its place too.

Furthermore, the series will consider the republication of out-of-print older works with English translation and comments.

The book series is intended to collect technical views on historical developments of the broad field of MMS in a unique frame that can be seen in its totality as an Encyclopaedia of the History of MMS but with the additional purpose of archiving and teaching the History of MMS. Therefore the book series is intended not only for researchers of the History of Engineering but also for professionals and students who are interested in obtaining a clear perspective of the past for their future technical works. The books will be written in general by engineers but not only for engineers.

7 Properties and Characterization of Modern Materials

by: A. Öchsner and H. Altenbach

Published 2017

by Springer Science+Business Media Singapore 2017,

This Springer imprint is by Springer Nature, 452pp

ISSN: 1869-8433

ISSN: 1869-8441 (electronic)

ISBN: 978-981-10-1601-1

ISBN: 978-981-10-1602-8 (e-book)

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Library of Congress Control Number: 2016943428

The success of materials in technical applications as well as their safety during operation depends on robust characterisation and/or prediction methods which provide reliable material properties. This becomes more and more important because engineering materials are used closer and closer to their limit to increase the performance of any machines and structures. To increase the engineering value of a material, components are designed under the consideration of their multi-physical properties and functions which requires a much more comprehensive investigation and characterisation of these materials. The materials covered in this monograph range from metal-based groups such as lightweight alloys and advanced high-strength steels to modern titanium alloys. Furthermore, a wide range of polymers and composite materials (e.g., with micro- and nanoparticles or fibres) is covered. The properties that are covered range from classical mechanical characterisation related, for example, to wear, creep, fatigue, and crack growth over specific surface properties to dielectric and electrochemical values. As in all fields of modern engineering, the process is many times accompanied by numerical simulation and optimisation.

The *9th International Conference on Advanced Computational Engineering and Experimenting, ACE-X 2015*, was held in Munich, Germany, from 29 June to 2 July, 2015, with a strong focus on computational based and supported engineering. This conference served as an excellent platform for the engineering community to meet with each other and to exchange the latest ideas. This volume contains 34 revised and extended research articles written by experienced researchers participating in the conference. Well-known experts present their research on metallic and polymer-based materials.

8 Fracture Mechanics**by: N. Perez****Published 2017****by Springer International Publishing AG Switzerland 2004, 2017****This Springer imprint is by Springer Nature, 478pp****ISBN: 978-3-319-24997-1****ISBN: 978-3-319-24999-5 (e-book)****DOI: 10.1007/978-3-319-24999-5**

This second edition of the book retains all the features of the previous edition while new ones are added. The main work in this edition includes refining text in each chapter, expansion of some sections in several chapters, and the addition of examples, problems, and new sections, such as conformal mapping and mechanical behaviour of wood.

The purpose of this book is to present, in a closed form, analytical methods in deriving stress and strain functions related to Fracture Mechanics. This book contains a compilation of work available in the literature in a scatter form and, to a certain extent, selected experimental data of many researchers to justify the theoretical fracture mechanics models in solving crack problems. It is a self-contained and detailed book for the reader (senior and graduate students, and engineers) involved in the analysis of failure using a mathematical approach for designing against fracture. However, it is important that the reader understands the concept of modelling, problem-solving and interpreting the meaning of mathematical solution for a particular engineering problem or situation. Once this is accomplished, the reader should be able to think mathematically, foresee metallurgically the significance of microstructural parameters on properties, analyse the mechanical behaviour of materials, and recognise realistically how dangerous a crack is in a stressed structure, which may fail catastrophically.

A solution manual is available for educators or teachers upon the consent of the book publisher. Also, all images, pictures, or data taken from reliable sources are included in this book for educational purposes and academic support only.

The book contains the following chapters

- theory of elasticity
- introduction to fracture mechanics
- linear-elastic fracture mechanics
- linear-elastic field equations
- crack tip plasticity
- the energy principle
- elastic-plastic fracture mechanics
- mixed-mode fracture mechanics
- fatigue crack growth
- fracture toughness correlations.

9 A Brief History of Mechanical Engineering**by: U.S. Dixit, M. Hazarika and J. P. Davim****Published 2017****by Springer International Publishing Switzerland 2017, 178pp****ISSN: 2195-0911****ISSN: 2195-092X (electronic)****ISBN: 978-3-319-42914-4****ISBN: 978-3-319-42916-8 (eBook)****DOI: 10.1007/978-3-319-42916-8**

Mechanical engineering is concerned with reducing or eliminating physical effort of humans or domestic animals with the help of tools and/or machines. In that sense, mechanical engineering has been in existence almost since the primitive man was born on the Earth; tools in very crude form must have been used by the primitive man. The wheel was invented a few millennia before Christ, and theory of lever was proposed a few centuries before Christ. However, up to 19th century, the distinction between science and engineering was blurred. Different disciplines of engineering did not have separate identity. Mechanical engineering emerged as a separate strong discipline of engineering in the 19th century. Today, mechanical engineering is flourishing along with its offspring like production engineering, industrial engineering, manufacturing engineering, mechatronics, automobile engineering, and aerospace engineering. In spite of it, most of the persons are not familiar with the history of mechanical engineering. There are very few books on this topic, and they have been written a few decades ago. Since then, a lot of changes have taken place in mechanical engineering with the general development of technology in various fields particularly in electronics and computer science. At the same time, growing industrialisation and population have put tremendous pressure on environment forcing us to think about the issue of sustainability. A book on the history of mechanical engineering narrating the development of this discipline since the times immemorial till modern age is the need of the hour.

The book contains the following chapters:

- What is mechanical engineering?
- landmark revolutionary inventions in mechanical engineering
- history of mechanics
- history of thermodynamics and heat transfer
- manufacturing through ages
- the emergence of production and industrial engineering
- history of mechatronics
- future of mechanical engineering.

This book will be useful for the professional and budding engineers for getting a general knowledge of the subject and familiarity with its history. It will also be helpful for school-level students planning to take up mechanical engineering as a profession. Finally, the book may be useful for anyone interested to know about mechanical engineering. The book may be adopted for a one-semester course on the history of mechanical engineering. It can also serve as a reference book for a course introducing the mechanical engineering.