

Metal Failures Mechanisms Analysis Prevention 2nd Edition By Mcevely Arthur J Kasivitamnuay Jirapong 2013 Hardcover

The problem of stress corrosion cracking (SCC), which causes sudden failure of metals and other materials subjected to stress in corrosive environment(s), has a significant impact on a number of sectors including the oil and gas industries and nuclear power production. Stress corrosion cracking reviews the fundamentals of the phenomenon as well as examining stress corrosion behaviour in specific materials and particular industries. The book is divided into four parts. Part one covers the mechanisms of SCC and hydrogen embrittlement, while the focus of part two is on methods of testing for SCC in metals. Chapters in part three each review the phenomenon with reference to a specific material, with a variety of metals, alloys and composites discussed, including steels, titanium alloys and polymer composites. In part four, the effect of SCC in various industries is examined, with chapters covering subjects such as aerospace engineering, nuclear reactors, utilities and pipelines. With its distinguished editors and international team of contributors, Stress corrosion cracking is an essential reference for engineers and designers working with metals, alloys and polymers, and will be an invaluable tool for any industries in which metallic components are exposed to tension, corrosive environments at ambient and high temperatures. Examines the mechanisms of stress corrosion cracking (SCC) presenting recognising testing methods and materials resistant to SCC Assesses the effect of SCC on particular metals featuring steel, stainless steel, nickel-based alloys, magnesium alloys, copper-based alloys and welds in steels Reviews the monitoring and management of SCC and the affect of SCC in different industries such as petrochemical and aerospace

The Welding Engineer's Guide to Fracture and Fatigue provides an essential introduction to fracture and fatigue and the assessment of these failure modes, through to the level of knowledge that would be expected of a qualified welding engineer. Part one covers the basic principles of weld fracture and fatigue. It begins with a review of the design of engineered structures, provides descriptions of typical welding defects and how these defects behave in structures undergoing static and cyclical loading, and explains the range of failure modes. Part two then explains how to detect and assess defects using fitness for service assessment procedures. Throughout, the book assumes no prior knowledge and explains concepts from first principles. Covers the basic principles of weld fracture and fatigue. Reviews the design of engineered structures, provides descriptions of typical welding defects and how these defects behave in structures undergoing static and cyclical loading, and explains the range of failure modes. Explains how to detect and assess defects using fitness for service assessment procedures.

One of the only texts available to cover not only how failure occurs but also examine methods developed to expose the reasons for failure, Metal Failures has long been considered the most definitive and authoritative resources in metallurgical failure analysis. Now in a completely revised edition, this Second Edition features updates of all chapters plus new coverage of elastic behavior and plastic deformation, localized necking, the phenomenological aspects of fatigue, fatigue crack propagation, alloys and coatings, tensors and tensor notations, and much more.

As one of the results of an ambitious project, this handbook provides a well-structured directory of globally available software tools in the area of Integrated Computational Materials Engineering (ICME). The compilation covers models, software tools, and numerical methods allowing describing electronic, atomistic, and mesoscopic phenomena, which in their combination determine the microstructure and the properties of materials. It reaches out to simulations of component manufacture comprising primary shaping, forming, joining, coating, heat treatment, and machining processes. Models and tools addressing the in-service behavior like fatigue, corrosion, and eventually recycling complete the compilation. An introductory overview is provided for each of these different modelling areas highlighting the relevant phenomena and also discussing the current state for the different simulation approaches. A must-have for researchers, application engineers, and simulation software providers seeking a holistic overview about the current state of the art in a huge variety of modelling topics. This handbook equally serves as a reference manual for academic and commercial software developers and providers, for industrial users of simulation software, and for decision makers seeking to optimize their production by simulations. In view of its sound introductions into the different fields of materials physics, materials chemistry, materials engineering and materials processing it also serves as a tutorial for students in the emerging discipline of ICME, which requires a broad view on things and at least a basic education in adjacent fields.

With the proliferation of packaging technology, failure and reliability have become serious concerns. This invaluable reference details processes that enable detection, analysis and prevention of failures. It provides a comprehensive account of the failures of device packages, discrete component connectors, PCB carriers and PCB assemblies.

"The author writes about the need of an encyclopedia of component and equipment failures and provides it within the span of sixty six chapters... These chapters reveal the distilled quintessence of his long experience in the Indian Railways" Failure Prevention of plant and Machinery is based on the premise of "Zero-Failure performance" and the aspiration for the same. The book introduces the general features and investigative methods for determining failures of mechanical and electrical equipment. Also, it dwells on the degradation processes and highlights the failure modes and mechanisms, including the apparently trivial ones. This approach of the author, who has over 40 years of experience in maintaining a variety of maintenance engineers appreciate and solve problems like the recurrent failure of equipment due to design or maintenance defects. With this coverage, the book would be useful to reliability, plant, maintenance, electrical and mechanical engineers, and students of electrical and mechanical engineering.

Material properties -- Sheet deformation processes -- Deformation of sheet in plane stress -- Simplified stamping analysis -- Load instability and tearing -- Bending of sheet -- Simplified analysis of circular shells -- Cylindrical deep drawing -- Stretching circular shells -- Combined bending and tension of sheet -- Hydroforming.

This book serves as a comprehensive resource on various traditional, advanced and futuristic material technologies for aerospace applications encompassing nearly 20 major areas. Each of the chapters addresses scientific principles behind processing and production, production details, equipment and facilities for industrial production, and finally aerospace application areas of these material technologies. The chapters are authored by pioneers of industrial aerospace material technologies. This book has a well-planned layout in 4 parts. The first part deals with primary metal and material processing, including nano manufacturing. The second part deals with materials characterization and testing methodologies and technologies. The third part addresses structural design. Finally, several advanced material technologies are covered in the fourth part. Some key advanced topics such as "Structural Design by ASIP", "Damage Mechanics-Based Life Prediction and Extension" and "Principles of Structural Health Monitoring" are dealt with at equal length as the traditional aerospace materials technology topics. This book will be useful to students, researchers and professionals working in the domain of aerospace materials.

Micromechanisms of Fracture and Fatigue forms the culmination of 20 years of research in the field of fatigue and fracture. It discusses a range of topics and comments on the state of the art for each. The first part is devoted to models of deformation and fracture of perfect crystals. Using various atomistic methods, the theoretical strength of solids under simple and complex loading is calculated for a wide range of elements and compounds, and compared with experimental data. The connection between the onset of local plasticity in nanoindentation tests and the ideal shear strength is analysed using a multi-scale approach. Moreover, the nature of intrinsic brittleness or ductility of perfect crystal lattices is demonstrated by the coupling of atomistic and mesoscopic approaches, and compared with brittle/ductile behaviour of engineering materials. The second part addresses extrinsic sources of fracture toughness of engineering materials, related to their

microstructure and microstructurally-induced crack tortuosity. Micromechanisms of ductile fracture are also described, in relation to the fracture strain of materials. Results of multilevel modelling, including statistical aspects of microstructure, are used to explain remarkable phenomena discovered in experiments. In the third part of the book, basic micromechanisms of fatigue cracks propagation under uniaxial and multiaxial loading are discussed on the basis of the unified mesoscopic model of crack tip shielding and closure, taking both microstructure and statistical effects into account. Applications to failure analysis are also outlined, and an attempt is made to distinguish intrinsic and extrinsic sources of materials resistance to fracture. Micromechanisms of Fracture and Fatigue provides scientists, researchers and postgraduate students with not only a deep insight into basic micromechanisms of fracture behaviour of materials, but also a number of engineering applications.

The era of lean production and excellence in manufacturing, advancing with sustainable development, demands the rational utilization of raw materials and energy resources, adopting cleaner and environmentally-friendly industrial processes. In view of the new industrial revolution, through digital transformation, the exploitation of smart and sophisticated materials systems, the need of minimizing scrap and increasing efficiency, reliability and lifetime and, on the other hand, the pursuit of fuel economy and limitation of carbon footprint, are necessary conditions for the imminent growth in a highly competitive economy. Failure analysis is an interdisciplinary scientific topic, reflecting the opinions and interpretations coming from a systematic evidence-gathering procedure, embracing various important sectors, imparting knowledge, and substantiating improvement practices. The deep understanding of material/component role (e.g., rotating shaft, extrusion die, gas pipeline) and properties will be of central importance for fitness for purpose in certain industrial processes and applications. Finally, it is hoped and strongly believed that the accumulation of additional knowledge in the field of failure mechanisms and the adoption of the principles, philosophy, and deep understanding of failure analysis process approach will strongly promote the learning concept, as a continuously evolving process leading to personal and social progress and prosperity.

Friction, wear, and erosion are major issues in mechanical engineering and materials science, resulting in major costs to businesses operating in the automotive, biomedical, petroleum/oil/gas, and structural engineering industries. The good news is, by understanding what friction, wear, or erosion mode predominates in a mechanism or device, you can take action to prevent its costly failure. Seeing Is Believing Containing nearly 300 photos of component failures, macro- and micrographs of surface damage, and schematics on material removal mechanisms collected over 50 years of tribology consulting and research, Friction, Wear, and Erosion Atlas is a must-have quick reference for tribology professionals and laymen alike. Complete with detailed explanations of every friction, wear, and erosion process, the atlas' catalog of images is supported by a wealth of practical guidance on: Diagnosing the specific causes of part failure Identifying popular modes of wear, including rolling and impact, with a special emphasis on adhesion and abrasion Understanding manifestations of friction, such as force traces from a laboratory test rig for a variety of test couples Recognizing liquid droplet, solid particle, slurry, equal impingement, and cavitation modes of erosion Developing solutions to process-limiting problems Featuring a glossary of tribology terms and definitions, as well as hundreds of visual representations, Friction, Wear, and Erosion Atlas is both user friendly and useful. It not only raises awareness of the importance of tribology, but provides guidance for how designers can proactively mitigate tribology concerns.

Callister's Materials Science and Engineering: An Introduction promotes student understanding of the three primary types of materials (metals, ceramics, and polymers) and composites, as well as the relationships that exist between the structural elements of materials and their properties. The 10th edition provides new or updated coverage on a number of topics, including: the Materials Paradigm and Materials Selection Charts, 3D printing and additive manufacturing, biomaterials, recycling issues and the Hall effect.

Experimental Techniques in Materials and Mechanics provides a detailed yet easy-to-follow treatment of various techniques useful for characterizing the structure and mechanical properties of materials. With an emphasis on techniques most commonly used in laboratories, the book enables students to understand practical aspects of the methods and derive the maximum possible information from the experimental results obtained. The text focuses on crystal structure determination, optical and scanning electron microscopy, phase diagrams and heat treatment, and different types of mechanical testing methods. Each chapter follows a similar format: Discusses the importance of each technique Presents the necessary theoretical and background details Clarifies concepts with numerous worked-out examples Provides a detailed description of the experiment to be conducted and how the data could be tabulated and interpreted Includes a large number of illustrations, figures, and micrographs Contains a wealth of exercises and references for further reading Bridging the gap between lecture and lab, this text gives students hands-on experience using mechanical engineering and materials science/engineering techniques for determining the structure and properties of materials. After completing the book, students will be able to confidently perform experiments in the lab and extract valuable data from the experimental results.

Metal Failures Mechanisms, Analysis, Prevention John Wiley & Sons

Failure analysis has grown enormously in its scope and utility in recent years. Developments in materials characterization techniques have made the job of a failure analyst easier and more precise, but it still requires not only a strong background in materials science and engineering, but also practical experience--or at least a strong understandin

Billions of dollars are spent annually for the replacement of corroded structures, machinery, and components. Premature failure of bridges or structures due to corrosion can also result in human injury, loss of life, and collateral damage. Written by an authority in corrosion science, Fundamentals of Corrosion: Mechanisms, Causes, and Preventative Methods comprehensively describes the causes of corrosion—and the means to limit or prevent it. Engineers, designers, architects, and all those involved with the selection of construction materials will relish a reference that provides such a thorough yet basic illustration of the causes, prevention, and control of corrosion. This reference explores: Mechanisms and forms of corrosion Methods of attack on plastic materials Causes of failure in protective coatings, linings, and paints Development of new alloys with corrosion-resistant properties Exposure to the atmosphere is one of the largest problems and biggest causes of corrosion that engineers and designers face in construction. It has been further estimated that the cost of protection against atmospheric corrosion accounts for approximately half the total cost of all corrosion protection methods. This book places special emphasis on atmospheric exposure and presents vital information regarding the design of structures, automobiles, household plumbing, manufacturing equipment, and other entities, as well as the effects of de-icing chemicals on highways and bridges.

This text introduces the important aspects associated with the failure analysis of engineering components; and provides a treatment of both macroscopic and microscopic observations of fracture surfaces. --

Handbook of Materials Failure Analysis: With Case Studies from the Chemicals, Concrete and Power Industries provides an in-depth examination of materials failure in specific situations, a vital component in both developing and engineering new solutions. This handbook covers analysis of materials failure in the chemical, power, and structures arenas, where the failure of a single component can result in devastating consequences and costs. Material defects, mechanical failure as a result of improper design, corrosion, surface fracture, and other failure mechanisms are described in the context of real world case studies involving steam generators, boiler tubes, gas turbine blades, welded structures, chemical conversion reactors and more. This book is an indispensable reference for engineers and scientists studying the mechanisms of failure in these fields. Introduces readers to

modern analytical techniques in materials failure analysis Combines foundational knowledge with current research on the latest developments and innovations in the field Includes many compelling case studies of materials failure in chemical processing plants, concrete structures, and power generation systems

Detailed analyses of failures of material components have proved to be valuable in many ways; by preventing further failures, by assessing the validity of designs and the selection of materials, by uncovering shortcomings in the processing of the materials involved through characterizations of defects, and by revealing problems introduced during the manufacture or fabrication of the component. Increased recognition of the value of performing failure analyses has caused the field to develop into a very active area of technical endeavor. Failure analysis has been employed in numerous different technical disciplines and has proven beneficial. The increased activity has caused many new and improved methods for performing these analyses to be developed. Among these are many methods which can be characterized as generally belonging to the field of metallography. In recognition of the important role that metallography plays in the performance of failure analyses, the absence of a text that specifically discusses this subject, and the belief that communication of information on the subject would be of technical interest, The American Society for Metals and The International Metallographic Society co sponsored a symposium. The intent was to bring together world-recognized authorities working in various aspects of the failure analysis and metallographic fields to share methods they use, results they have obtained, and the purposes to which they utilized these results. The symposium, entitled "Metallography in Failure Analysis", was held in Houston, Texas, USA, July 17-18, 1977.

Handbook of Materials Failure Analysis: With Case Studies from the Aerospace and Automotive Industries provides a thorough understanding of the reasons materials fail in certain situations, covering important scenarios, including material defects, mechanical failure as a result of improper design, corrosion, surface fracture, and other environmental causes. The book begins with a general overview of materials failure analysis and its importance, and then logically proceeds from a discussion of the failure analysis process, types of failure analysis, and specific tools and techniques, to chapters on analysis of materials failure from various causes. Later chapters feature a selection of newer examples of failure analysis cases in such strategic industrial sectors as aerospace, oil & gas, and chemicals. Covers the most common types of materials failure, analysis, and possible solutions

Provides the most up-to-date and balanced coverage of failure analysis, combining foundational knowledge, current research on the latest developments, and innovations in the field Ideal accompaniment for those interested in materials forensic investigation, failure of materials, static failure analysis, dynamic failure analysis, fatigue life prediction, rotorcraft, failure prediction, fatigue crack propagation, bevel pinion failure, gasketless flange, thermal barrier coatings Presents compelling new case studies from key industries to demonstrate concepts Highlights the role of site conditions, operating conditions at the time of failure, history of equipment and its operation, corrosion product sampling, metallurgical and electrochemical factors, and morphology of failure Aircraft Sustainment and Repair is a one-stop-shop for practitioners and researchers in the field of aircraft sustainment, adhesively bonded aircraft joints, bonded composites repairs, and the application of cold spray to military and civil aircraft. Outlining the state-of-the-art in aircraft sustainment, this book covers the use of quantitative fractography to determine the in-service crack length versus flight hours curve, the effect of intergranular cracking on structural integrity and the structural significance of corrosion. The book additionally illustrates the potential of composite repairs and SPD applications to metallic airframes. Covers corrosion damage assessment and management in aircraft structures Includes a key chapter on U.S. developments in the emerging field of supersonic particle deposition (SPD) Shows how to design and assess the potential benefits of both bonded composite repairs and SPD repairs to metallic aircraft structures to meet the damage tolerance requirements inherent in FAA ac 20-107b and the U.S. Joint Services

Understanding why and how failures occur is critical to failure prevention, because even the slightest breakdown can lead to catastrophic loss of life and asset as well as widespread pollution. This book helps anyone involved with machinery reliability, whether in the design of new plants or the maintenance and operation of existing ones, to understand why process equipment fails and thereby prevent similar failures. This book is an update and expansion of topics covered in Guidelines for Mechanical Integrity Systems (2006). The new book is consistent with Risk-Based Process Safety and Life Cycle approaches and includes details on failure modes and mechanisms. Also, example testing and inspection programs is included for various types of equipment and systems. Guidance and examples are provided for selecting and maintaining critical safety systems.

Complete Investigative Toolkit for Metal Failure-Design or Process Whether the problem is corrosion on the working surfaces of valuable or life-essential machinery, breakdowns in linchpin equipment, or life-threatening faults in air- or spacecraft, the causes must be found so that future disasters may be prevented. Metallurgy of Failure Analysis puts the tools for finding the answers in your hands. A complete guide to all types of metal failure, both design and process, it features: coverage of faults due to casting, forging, welding, machining, and heat treatment; analysis of the concepts and mechanisms of fatigue, stress corrosion, hydrogen embrittlement, and more; remedial measure for corrosion, overload, fatigue, and wear; investigative procedures including destructive, nondestructive, and fractographic analysis.

This book reports on original theoretical and experimental findings related to a number of cutting-edge topics in mechanics and mechanical engineering, such as structure modelling and computation; design methodology and manufacturing processes; mechanical behaviour of materials; fluid mechanics and energy; and heat and mass transfer. It includes a selection of papers presented at the 4th Tunisian Congress on Mechanics, CoTuMe'2018, held in Hammamet, Tunisia, on October 13-15, 2018. Thanks to the good balance of theory and practical findings, it offers a timely snapshot for researchers and industrial communities alike, and a platform to facilitate communication and collaboration between the two groups.

Nuts-and-bolts guide to designing printed circuit assemblies Want to build circuit boards for today's smaller, faster electronics applications? This how-to tutorial puts a PCA design roadmap at your fingertips--valuable whether you're neophyte just starting out or an experienced designer, engineer or a manager associated with the electronics industry, as printed circuit assemblies are key building blocks in almost every commodity made today with any electronics content. In this unique one-stop design guide you'll find complete coverage of electrical and mechanical design considerations as you explore: design process flow; the latest design methods and tools; circuit board layout; documentation; more.

Metal fatigue is an essential consideration for engineers and researchers looking at factors that cause metals to fail through stress, corrosion, or other processes. Predicting the influence of small defects and non-metallic inclusions on fatigue with any degree of accuracy is a particularly complex part of this. Metal Fatigue: Effects of Small Defects and Nonmetallic Inclusions is the most trusted, detailed and comprehensive guide to this subject available. This expanded second edition introduces highly important emerging topics on metal fatigue, pointing the way for further research and innovation. The methodology is based on important and reliable results and may be usefully applied to other fatigue problems not directly treated in this book. Demonstrates how to solve a wide range of specialized metal fatigue problems relating to small defects and non-metallic inclusions. Provides a detailed introduction to fatigue mechanisms and stress concentration. This

edition is expanded to address even more topics, including low cycle fatigue, quality control of fatigue components, and more.

This book contains analysis of reasons that cause products to fail. General methods of product failure evaluation give powerful tools in product improvement. Such methods, discussed in the book, include practical risk analysis, failure mode and effect analysis, preliminary hazard analysis, progressive failure analysis, fault tree analysis, mean time between failures, Wohler curves, finite element analysis, cohesive zone model, crack propagation kinetics, time-temperature collectives, quantitative characterization of fatigue damage, and fracture maps. Methods of failure analysis are critical to for material improvement and they are broadly discussed in this book. Fractography of plastics is relatively a new field which has many commonalities with fractography of metals. Here various aspects of fractography of plastics and metals are compared and contrasted. Fractography application in studies of static and cycling loading of ABS is also discussed. Other methods include SEM, SAXS, FTIR, DSC, DMA, GC/MS, optical microscopy, fatigue behavior, multiaxial stress, residual stress analysis, punch resistance, creep-rupture, impact, oxidative induction time, craze testing, defect analysis, fracture toughness, activation energy of degradation. Many references are given in this book to real products and real cases of their failure. The products discussed include office equipment, automotive compressed fuel gas system, pipes, polymer blends, blow molded parts, layered, cross-ply and continuous fiber composites, printed circuits, electronic packages, hip implants, blown and multilayered films, construction materials, component housings, brake cups, composite pressure vessels, swamp coolers, electrical cables, plumbing fittings, medical devices, medical packaging, strapping tapes, balloons, marine coatings, thermal switches, pressure relief membranes, pharmaceutical products, window profiles, and bone cements.

This book covers recent advancement methods used in analysing the root cause of engineering failures and the proactive suggestion for future failure prevention. The techniques used especially non-destructive testing such X-ray are well described. The failure analysis covers materials for metal and composites for various applications in mechanical, civil and electrical applications. The modes of failures that are well explained include fracture, fatigue, corrosion and high-temperature failure mechanisms. The administrative part of failures is also presented in the chapter of failure rate analysis. The book will bring you on a tour on how to apply mechanical, electrical and civil engineering fundamental concepts and to understand the prediction of root cause of failures. The topics explained comprehensively the reliable test that one should perform in order to investigate the cause of machines, component or material failures at the macroscopic and microscopic level. I hope the material is not too theoretical and you find the case study, the analysis will assist you in tackling your own failure investigation case.

Now in its eleventh edition, DeGarmo's Materials and Processes in Manufacturing has been a market-leading text on manufacturing and manufacturing processes courses for more than fifty years. Authors J T. Black and Ron Kohser have continued this book's long and distinguished tradition of exceedingly clear presentation and highly practical approach to materials and processes, presenting mathematical models and analytical equations only when they enhance the basic understanding of the material. Completely revised and updated to reflect all current practices, standards, and materials, the eleventh edition has new coverage of additive manufacturing, lean engineering, and processes related to ceramics, polymers, and plastics.

Applied Engineering Failure Analysis: Theory and Practice provides a point of reference for engineering failure analysis (EFA) cases, presenting a compilation of case studies covering a 35-year period, from the 1970s to 2012. This period spans the era from the time when slide rules were used routinely for engineering calculations, and when hard-copy photographs taken by film cameras were pasted onto typewritten sheets to make reports, to the present time when all these functions have become much less onerous through computer assistance. The cases are drawn from such diverse fields as mechanical engineering, metallurgy, mining, civil/structural engineering, electrical power systems, and radiation damage; the last two topics are quite scarce in current publications. It includes theoretical content that deals with useful topics in basic theory, material properties, failure mechanisms, EFA methodology, and applications. It provides high-quality illustrations throughout, which greatly helps to promote the understanding of the failure characteristics described. This book offers an integrated approach that serves as a useful first reference in the above topics, for undergraduate and postgraduate students, as well as for practicing engineers. The book provides a hands-on approach to EFA, which helps the user to develop an understanding of potential failure situations, to explore the consequences, and to better understand how to solve similar problems; it also helps users to develop their own techniques for most other engineering failure problems. The authors include a section on technical report writing, which will assist failure investigators in getting their findings across. They also present simple engineering calculations that may serve as illustrative examples, and typical problems and solutions are included at the end of each chapter.

This open access book summarizes the results of the European research project "Twin-model based virtual manufacturing for machine tool-process simulation and control" (Twin-Control). The first part reviews the applications of ICTs in machine tools and manufacturing, from a scientific and industrial point of view, and introduces the Twin-Control approach, while Part 2 discusses the development of a digital twin of machine tools. The third part addresses the monitoring and data management infrastructure of machines and manufacturing processes and numerous applications of energy monitoring. Part 4 then highlights various features developed in the project by combining the developments covered in Parts 3 and 4 to control the manufacturing processes applying the so-called CPSs. Lastly, Part 5 presents a complete validation of Twin-Control features in two key industrial sectors: aerospace and automotive. The book offers a representative overview of the latest trends in the manufacturing industry, with a focus on machine tools.

comprehensive coverage of both the "how" and "why" of metal failures Metal Failures gives engineers the intellectual tools and practical understanding needed to analyze failures from a structural point of view. Its proven methods of examination and analysis enable investigators to:

- * Reach correct, fact-based conclusions on the causes of metal failures
- * Present and defend these conclusions before highly critical bodies
- * Suggest design improvements that may prevent future failures

Analytical methods presented include stress analysis, fracture mechanics, fatigue analysis, corrosion science, and nondestructive testing. Numerous case studies illustrate the application of basic principles of metallurgy and failure analysis to a wide variety of real-world situations. Readers learn how to investigate and analyze failures that involve:

- * Alloys and coatings
- * Brittle and ductile fractures
- * Thermal and residual stresses
- * Creep and fatigue
- * Corrosion, hydrogen embrittlement, and stress-corrosion cracking

This useful professional reference is also an excellent learning tool for senior-level students in mechanical, materials, and civil engineering.

This text is an unbound, three hole punched version. Fundamentals of Materials Science and Engineering: An Integrated Approach, Binder Ready Version, 5th Edition takes an integrated approach to the sequence of topics – one specific structure, characteristic, or property type is covered in turn for all three basic material types: metals, ceramics, and polymeric materials. This presentation permits the early introduction of non-metals and supports the engineer's role in choosing materials based upon their characteristics. Using clear, concise terminology that is familiar to students, Fundamentals presents material at an appropriate level for both student comprehension and instructors who may not have a materials background. This text is an unbound, three hole punched version. Access to WileyPLUS sold separately.

Handbook of Materials Failure Analysis: With Case Studies from the Oil and Gas Industry provides an updated understanding on why materials fail in specific situations, a vital element in developing and engineering new alternatives. This handbook covers analysis of materials failure in the oil and gas industry, where a single failed pipe can result in devastating consequences for people, wildlife, the environment, and the economy of a region. The book combines introductory sections on failure analysis with numerous real world case studies of pipelines and other types of materials failure in the oil and gas industry, including joint failure, leakage in crude oil storage tanks, failure of glass fibre reinforced epoxy pipes, and failure of stainless steel components in offshore platforms, amongst others. Introduces readers to modern

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analytical techniques in materials failure analysis Combines foundational knowledge with current research on the latest developments and innovations in the field Includes numerous compelling case studies of materials failure in oil and gas pipelines and drilling platforms

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