Computational Explorations In Magnetron Sputtering

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Permanent Magnetism
Recent Advances in Technology Research and Education

HEATH PARSONS

Bibliography of Lewis Research Center Technical Publications Announced in 1992 Springer Science & Business Media
Gears are machine elements used in most engineering applications, mainly in the automotive and aerospace industries. When designing gear drives, the available standardised procedures are usually used for that purpose. However, the available computational methods are also often applied to obtain the load capacity of gears considering different fatigue design approaches (i.e. the stress-life approach, the strain-life approach and the fatigue crack growth approach). This book consists of five chapters. The first chapter introduces the reader to the fundamental magnitudes of gear drives concerning cylindrical gear pairs, bevel gear pairs, and worm gear pairs. The second chapter explains the theoretical background of the load capacity of gears; surface pitting load capacity and tooth root load capacity are described in detail. The third chapter focuses on the strength analyses of metal gears. Chapters four and five describe the strength analyses of sintered and polymer gears, including some typical practical examples.
Government Reports Announcements & Index Springer
This book discusses fundamental studies involving the history, modelling, simulation, experimental work, and applications on high-entropy materials. Topics include data-driven and machine-learning approaches, additive-manufacturing techniques, computational and analytical methods, such as density functional theory and multifractal analysis, mechanical behavior, high-throughput methods, and irradiation effects. The types of high-entropy materials consist of alloys, oxides, and ceramics. The book then concludes with a discussion on potential future applications of these novel materials.
Fundamentals of Electric Propulsion William Andrew
One of the first books to approach magnetism from a metal physics perspective, Permanent Magnetism presents research ideas that are being translated into commercial reality for ferrite and Nd-Fe-B magnets, and follows the discovery of interstitial, intermetallic materials. Written by well-known authors, the book contains a comprehensive yet concise treatment of the fundamental theory underlying permanent magnetism and illustrates applications with modern, permanent magnetic materials, including ceramics and intermetallic compounds. Each chapter contains worked examples to reinforce applications and the appendices include detailed mathematics and tabular data on material properties.
Nanotechnology-Enabled Sensors Woodhead Publishing
A unified treatment of nonlinear continuum analysis and finite element techniques.
Experimental and Computational Methods for Strength Analyses of Gears Springer Science & Business Media
High-Entropy Alloys, Second Edition provides a complete review of the current state of the field of high entropy alloys (HEA). Building upon the first edition, this fully updated release includes new theoretical understandings of these materials, highlighting recent developments on modeling and new classes of HEAs, such as Eutectic HEAs and Dual phase HEAs. Due to their unique properties, high entropy alloys have attracted considerable attention from both academics and technologists. This book presents the fundamental knowledge, the spectrum of various alloy systems and their characteristics, key focus areas, and the future scope of the field in terms of research and technological applications. Provides an up-to-date, comprehensive understanding on the current status of HEAs in terms of theoretical understanding and modeling efforts Gives a complete idea on alloy design criteria of various classes of HEAs developed so far Discusses the microstructure property correlations in HEAs in terms of structural and functional properties Presents a comparison of HEAs with other multicomponent systems, like intermetallics and bulk metallic glasses
Nanostructured Coatings Springer Science & Business Media
This book delivers practical insight into a broad range of fields related to hard coatings, from their deposition and characterization up to the hardening and deformation mechanisms allowing the interpretation of results. The text examines relationships between structure/microstructure and mechanical properties from fundamental concepts, through types of coatings, to characterization techniques. The authors explore the search for coatings that can satisfy the criteria for successful implementation in real mechanical applications.
Nonlinear Continuum Mechanics for Finite Element Analysis Springer Nature
This Special Issue gathers 14 original research papers to disseminate new data on phytochemicals from vegetables and fruits, which are recommended for their health-promoting properties. Epidemiological, toxicological and nutritional studies suggest an association between fruit and vegetable consumption and lower incidence of chronic diseases, such as coronary heart problems, cancer, diabetes, and Alzheimer’s disease. In this Special Issue the following topics have been addressed: (i) the protective roles, antioxidant and others bioactivities such as genotoxic and antigenotoxic effects in the Drosophila melanogaster animal genetic model and pro-apoptotic capacities against cancer processes, including cytotoxicity and clastogenic DNA activity, using an in vitro human cancer model (HL-60 cell line, (ii), new sustainable approaches based on near-infrared spectroscopy to determine the quality, (iii) broad-scale metabolomic investigation for the development of functional food and, (iv) processing techniques that can modify the initial nutritional and antioxidant content of fruits, vegetables, and additives. In summary, the information in this Special Issue will be interesting for researchers in this field and the general public interested in the relationship between vegetables and health.
Semiconductor Gas Sensors Springer Science & Business Media
This book presents selected contributions to the 16th International Conference on Global Research and Education Inter-Academia 2017 hosted by Alexandru Ioan Cuza University of Iași, Romania from 25 to 28 September 2017. It is the third volume in the series, following the editions from 2015 and 2016. Fundamental and applied research in natural sciences have led to crucial developments in the ongoing 4th global industrial revolution, in the course of which information technology has become

deeply embedded in industrial management, research and innovation – and just as deeply in education and everyday life. Materials science and nanotechnology, plasma and solid state physics, photonics, electrical and electronic engineering, robotics and metrology, signal processing, e-learning, intelligent and soft computing have long since been central research priorities for the Inter-Academia Community (I-AC) – a body comprising 14 universities and research institutes from Japan and Central/East-European countries that agreed, in 2002, to coordinate their research and education programs so as to better address today's challenges. The book is intended for use in academic, government, and industrial R&D departments as a reference tool in research and technology education. The 42 peer-reviewed papers were written by more than 119 leading scientists from 14 countries, most of them affiliated to the I-AC.

High-Entropy Alloys Springer Science & Business Media

This textbook provides advanced undergraduates and graduates with up-to-date coverage of space physics from the Sun to the interstellar medium. Clear explanations of physical processes are presented alongside major new discoveries gained from space missions. End-of-chapter problems and specially developed computer-based exercises allow students to put the theory into practice.

High Power Impulse Magnetron Sputtering Springer

In this valuable work, all aspects of the reactive magnetron sputtering process, from the discharge up to the resulting thin film growth, are described in detail, allowing the reader to understand the complete process. Hence, this book gives necessary information for those who want to start with reactive magnetron sputtering, understand and investigate the technique, control their sputtering process and tune their existing process, obtaining the desired thin films.

Ionized Physical Vapor Deposition Cambridge Scholars Publishing

This book provides a cohesive overview of innovations, advances in processing and characterization, and applications for high entropy alloys (HEAs) in performance-critical and non-performance-critical sectors. It covers manufacturing and processing, advanced characterization and analysis techniques, and evaluation of mechanical and physical properties. With chapters authored by a team of internationally renowned experts, the volume includes discussions on high entropy thermoelectric materials, corrosion and thermal behavior of HEAs, improving fracture resistance, fatigue properties and high tensile strength of HEAs, HEA films, and more. This work will be of interest to academics, scientists, engineers, technologists, and entrepreneurs working in the field of materials and metals development for advanced applications. Features Addresses a broad spectrum of HEAs and related aspects, including manufacturing, processing, characterization, and properties Emphasizes the application of HEAs Aimed at researchers, engineers, and scientists working to develop materials for advanced applications T.S. Srivatsan, PhD, Professor of Materials Science and Engineering in the Department of Mechanical Engineering at the University of Akron (Ohio, USA), earned his MS in Aerospace Engineering in 1981 and his PhD in Mechanical Engineering in 1984 from the Georgia Institute of Technology (USA). He has authored or edited 65 books, delivered over 200 technical presentations, and authored or co-authored more than 700 archival publications in journals, book chapters, book reviews, proceedings of conferences, and technical reports. His RG score is 45 with a h-index of 53 and Google Scholar citations of 9000, ranking him to be among the top 2% of researchers in the world. He is a Fellow of (i) the American Society for Materials International, (ii) the American Society of Mechanical Engineers, and (iii) the American Association for Advancement of Science. Manoj Gupta, PhD, is Associate Professor of Materials at NUS, Singapore. He is a former Head of Materials Division of the Mechanical Engineering Department and Director Designate of Materials Science and Engineering Initiative at NUS, Singapore. In August 2017, he was highlighted among the Top 1% Scientists of the World by the Universal Scientific Education and Research Network and in the Top 2.5% among scientists as per ResearchGate. In 2018, he was announced as World Academy Championship Winner in the area of Biomedical Sciences by the International Agency for Standards and Ratings. A multiple award winner, he actively collaborates/visits as an invited researcher and visiting and chair professor in Japan, France, Saudi Arabia, Qatar, China, the United States, and India.

Liquid Cell Electron Microscopy CRC Press

Armor plays a significant role in the protection of warriors. During the course of history, the introduction of new materials and improvements in the materials already used to construct armor has led to better protection and a reduction in the weight of the armor. But even with such advances in materials, the weight of the armor required to manage threats of ever-increasing destructive capability presents a huge challenge. Opportunities in Protection Materials Science and Technology for Future Army Applications explores the current theoretical and experimental understanding of the key issues surrounding protection materials, identifies the major challenges and technical gaps for developing the future generation of lightweight protection materials, and recommends a path forward for their development. It examines multiscale shockwave energy transfer mechanisms and experimental approaches for their characterization over short timescales, as well as multiscale modeling techniques to predict mechanisms for dissipating energy. The report also considers exemplary threats and design philosophy for the three key applications of armor systems: (1) personnel protection, including body armor and helmets, (2) vehicle armor, and (3) transparent armor. Opportunities in Protection Materials Science and Technology for Future Army Applications recommends that the Department of Defense (DoD) establish a defense initiative for protection materials by design (PMD), with associated funding lines for basic and applied research. The PMD initiative should include a combination of computational, experimental, and materials testing, characterization, and processing research conducted by government, industry, and academia.

Reactor Core Materials Springer Science & Business Media

This thesis is devoted towards physical vapor deposition (PVD) of thin films of transition-metal (TM) diborides, focused on the material system TiBx, Ti1-xAlxB2-y and CrBx. The metal diborides are a large family of compounds with both metallic and ceramic properties, due to its bonding nature being a mix of covalent and ionic bonds. Their characteristics include, e.g., good mechanical, electrical and thermal properties, while an improved oxidation and corrosion resistance are currently sought after. Furthermore, while the ideal composition of these diborides is TMB2, i.e. with a B to metal ratio of 2, the stoichiometry in the PVD deposited films typically diverges from this ratio. TiBx is often reported to be overstoichiometric, with x well above 2. One of the most known and commonly used member of the TM diboride family is TiBx, primarily used in hard-coating applications such as tools for machining Al. However, the material displays a fracture toughness and oxidation resistance that ideally needs to be improved. The films presented in this thesis were

deposited by high power impulse magnetron sputtering (HiPIMS) and direct current magnetron sputtering (DCMS). Using both methods facilitates an improved control of both microstructure and composition, and hence the materials properties. With HiPIMS, understoichiometric TiBx films were grown and it was shown that these films can match and even exceed the overstoichiometric counterpart, deposited with DCMS, in terms of mechanical properties. The hardness and fracture toughness for TiB1.43 films were measured at 43.9±0.9 GPa and 4.2±0.1 MPa√m, compared to TiB2.70 films at 37.7±0.8 GPa and 3.1±0.1 MPa√m. Furthermore, the understoichiometric films significantly improve the oxidation resistance. Air annealing of TiB1.43, TiB2.20, and TiB2.70 films at 400 °C showed an average oxidation rate of 2.9±1.5, 7.1±1.0, and 20.0±5.0 nm/h, respectively, explained by the microstructural difference between over- and understoichiometric material. In TiBx films where x > 2, there is a B-rich tissue phase in the grain boundaries which is suggested to enhance oxidation. The hydroscopic nature of B2O3 causes more rapid oxidation and evaporation thus providing an easy oxidation pathway in B-rich regions. However, understoichiometric films where x < 2 do not show any significant boundary phases. Instead, the B deficiency is presented as planar defects with Ti-rich stacking faults. Hence the absence of the B-rich tissue phase has strongly contributed to increasing the oxidation resistance. Oxidation resistance and mechanical properties were also investigated for understoichiometric Ti1-xAlxB2-y coatings with varying Ti:Al and B:M ratios, obtained from both HiPIMS and DCMS depositions. Al alloying of the TM diboride TiBx significantly enhances the oxidation resistance. However, incorporating too much Al is at the expense of the excellent hardness seen in the pure TiBx, going from 46.2±1.1 GPa to 22.6±1.1 GPa for Ti0.9Al0.1B1.3 and Ti0.3Al0.7B1.3, respectively. Hence, a reduction in the Al content is needed to retain the mechanical properties. The boundary phase in this material consists of a Ti1-xAlxB2-y tissue phase, rich in either Al or B depending on the x and y values. An improved oxidation resistance in Ti1-xAlxB2-y was seen with reduced Al and B content, proposed to be due to absence of tissue phase in the grain boundaries, in line with the observations for TiBx. The oxide scale thickness of Ti0.9Al0.1B1.3 and Ti0.9Al0.1B1.9 after air annealing at 600 °C for 10 h was measured to be 205 nm and 320 nm, respectively. Moreover, the trends indicate a reduced oxidation rate as the oxide scale grows thicker. A systematical study of DCMS deposited CrBx coatings, 1.90 ≤ x 2.08, was also performed, motivated by CrBx being a material of interest for providing potential corrosion resistance. All films, irrespectable of the deposition conditions, exhibited (001) texture, with epitaxial growth observed when increasing temperature from 500 °C to 900 °C. Higher density (5.2 g/cm3) and smoother surfaces was seen in films grown at lower pressure, 5 mTorr (0.67 Pa), compared to higher pressure, 20 mTorr (2.67 Pa), and was explained by less gas scattering leading to more energetic particles impinging on the surface. CrBx film composition show no apparent dependence on substrate temperature, and has a slight dependence on deposition pressure for the samples deposited at 900 °C, with reduced B content for increasing pressure. Overstoichiometric CrB2.08 films showed the presence of large B-rich inclusions, and B deficiency in CrB1.90 films presented as planar defects with Cr-rich stacking faults, similar to understoichiometric TiBx. The thorough investigations of all the systems in this thesis are aimed towards improving the understanding of the correlation between the thin film synthesis process and the resulting composition and microstructure, which in turn dictates the properties of thin films. A particular emphasis is put on

control of composition. I den här avhandlingen fokuserar jag på beläggningar av tunna filmer, dvs. tunna lager av material som läggs på en yta för att ge ytan vissa specifika egenskaper. Jag genomför metodiska analyser av de filmer jag får från två olika beläggningsmetoder; ”high-power impulse magnetron sputtering” (HiPIMS) och den mer konventionella metoden ”directcurrent magnetron sputtering” (DCMS). Dessa metoder skiljer sig främst åt i antal parametrar man kan variera för att kontrollera processen som styr vilket material som bildas, där HiPIMS är den metod med flest parametrar. Anledningen till att HiPIMS inte har sett ett större användningsområde till dags dato är att det är en relativt ny process jämfört med DCMS, och på grund av den komplexitet som tillkommer när man utökar mängden tillväxtparametrar. För båda processerna är en grundläggande förståelse av både processen och materialet önskvärt för att få ett optimerat material, med specifika önskade egenskaper. Material i fokus i denna avhandling är TiBx, Ti1-xAlxB2-y och CrBx, även kallade övergångsmetall-diborider, där Ti står för titan, Al för aluminium, Cr för krom, B för bor, och x/y står för variabler i sammansättningen av materialet. Dessa diborider bär med sig unika egenskaper från respektive element och innehåller en blandning av kovalenta bindningar och jon-bindningar. Beroende på sammansättningen av atomer så kan vi se olika mekaniska, elektriska och termiska egenskaper samt olika grad av oxidering- och eroderings-resistans. TiBx är till exempel välkänt för sina tillämpningar inom skärande bearbetning, men har inte lika lovande egenskaper när det kommer till beständighet mot oxidering. Det här är delvis en konsekvens av att man idag kommersiellt använder sig främst av DCMS för tillväxt av dessa beläggningar, då denna metod typiskt genererar överstökiometriska tunna filmer av TiBx (x > 2), vilket i sin tur påverkar beständigheten mot oxidering negativt. Med hjälp av HiPIMS kan man kontrollera stökiometrin av filmen i större grad, och kan således generera understökiometrisk TiBx (x < 2) som jag visar på har bättre mekaniska egenskaper, bland annat högre hårdhet, bättre brottseghet och förbättrad beständighet mot oxidering, kontra den överstökiometriska motsvarigheten. Hur mikrostrukturen i överstökiometriska TiBx filmer ser ut är välkänt, där överflödigt B ansamlas i korngränserna och bilder en s.k. ”B-rik vävnadsfas”. Jag har påvisat hur motsvarande mikrostruktur ser ut för understökiometrisk TiBx filmer, något som fram tills nu varit okänt. I dessa faser saknas vävnadsfas i korngränserna, och istället hittas överskottet av Ti som plandefekter i de kolumnära TiB2-strukturerna i filmen. Jag visar på att avsaknaden av vävnadsfas i korngränserna tydligt förbättrar beständigheten mot oxidering, vilket troligtvis beror på att just korngränserna, och deras innehåll, agerar som en katalys for oxidering. På samma sätt undersöker jag hur materialsystemet Ti1-xAlxBy-2 beter sig med varierande Ti:Al förhållande och även B:M förhållande (bor till metall), i filmer skapade med både DCMS och HiPIMS. Målet med inkluderingen av Al är just att förbättra beständighet mot oxidering, och samtidigt bevara de åtråvärda mekaniska egenskaperna som filmer av TiBx har. Korngränserna i det här materialet består av en vävnadsfasblandning, rik på antingen Al eller B, beroende på förhållandet mellan x och y i Ti1-xAlxBy-2. Jag visar på att en reducering av denna vävnadsfas även här förbättrar beständigheten mot oxidering. Det påvisas genom att reducera Al- och B-innehållet i filmerna, vilket minskar vävnadsfasen i korngränserna, och således förbättras beständigheten mot oxidering. En systematisk undersökning av tunna filmer av CrBx, belagda med DCMS, har genomförts, då detta är ett materialsystem med potential för beständighet mot korrosion. Både lätt över- och

understökiometriska filmer växtes, och fick sin mikrostruktur och lokala sammansättning undersökt. Alla filmer påvisade en (001) textur, med epitaxiell tillväxt när temperaturen ökade från 500 C° till 900 C°. Högre densitet (~5.2 g/cm3) och jämnare ytor sågs för filmer belagda vid lägre tryck, 5 mTorr (0.67 Pa), jämfört med högre tryck, 20 mTorr (2.67 Pa). Kompositionen för CrBx filmerna påvisade inte ett temperaturberoende, men visade ett marginellt beroende på beläggningstryck för prover växta vid 900 C°. Även observerat för understökiometriska CrB1.90 filmer är att underskottet av B presenteras som plandefekter med Cr-rika plan i de kolumnära CrB2- strukturerna i filmen, precis som i understökiometrisk TiBx. I överstökiometriska CrB2.08 filmer så visades stora inneslutningar av ansamlat B.

Hydrogen in Metals: Application-oriented properties Cambridge University Press

This thoroughly updated new edition includes an entirely new team of contributing authors with backgrounds specializing in the various new applications of sputtering technology. It forms a bridge between fundamental theory and practical application, giving an insight into innovative new materials, devices and systems. Organized into three parts for ease of use, this Handbook introduces the fundamentals of thin films and sputtering deposition, explores the theory and practices of this field, and also covers new technology such as nano-functional materials and MEMS. Wide varieties of functional thin film materials and processing are described, and experimental data is provided with detailed examples and theoretical descriptions. A strong applications focus, covering current and emerging technologies, including nano-materials and MEMS (microelectrolmechanical systems) for energy, environments, communications, and/or bio-medical field. New chapters on computer simulation of sputtering and MEMS completes the update and insures that the new edition includes the most current and forward-looking coverage available All applications discussed are supported by theoretical discussions, offering readers both the "how" and the "why" of each technique 40% revision: the new edition includes an entirely new team of contributing authors with backgrounds specializing in the various new applications that are covered in the book and providing the most up-to-date coverage available anywhere

Annual Report Elsevier

Tribocorrosion causes the degradation or alteration of materials through the combined action of corrosion and wear. It limits the performance and life-time of installations, machines and devices with moving parts, and controls certain manufacturing processes such as chemical–mechanical polishing. The effects of tribocorrosion are most pronounced on passive metals which owe their corrosion resistance to a thin protecting oxide film. Most corrosion-resistant engineering alloys belong to this category.This book provides an introduction to the developing field of tribocorrosion and an overview of the latest research. Part one reviews basic notions of corrosion and tribology, before presenting the most recent results on the growth and structure of passive oxide films. Tribocorrosion mechanisms under fretting, sliding and erosion conditions, respectively, are then discussed. Part two focuses on methods for measuring and preventing tribocorrosion. It includes chapters on electrochemical techniques, the design of tribocorrosion test equipment, data evaluation and the optimisation of materials' properties for tribocorrosion systems. Part three presents a selection of tribocorrosion problems in engineering and medicine. Three chapters address the tribocorrosion of medical implants including test methods and clinical implications. Other chapters examine tribocorrosion issues in nuclear power plants, marine environments, automotive cooling circuits, elevated-temperature metal working and chemical–mechanical polishing.With its distinguished editors and international team of expert contributors Tribocorrosion of passive metals and coatings is an invaluable reference tool for engineers and researchers in industry and academia confronted with tribocorrosion problems. Comprehensively reviews current research on the tribocorrosion of passive metals and coatings, with particular reference to the design of tribocorrosion test equipment, data evaluation and the optimisation of materials' properties for tribocorrosion systems Chapters discuss tribocorrosion mechanisms under fretting, sliding and erosion conditions before focussing on methods for measuring and preventing tribocorrosion Includes a comprehensive selection of tribocorrosion problems in engineering and medicine, such as the tribocorrosion of medical implants, and tribocorrosion issues in nuclear power plants, marine environments, automotive cooling circuits and elevated-temperature metal working

High-Entropy Materials: Theory, Experiments, and Applications Springer Science & Business Media

Introduction to Thermoelectricity is the latest work by Professor Julian Goldsmid drawing on his 55 years experience in the field. The theory of the thermoelectric and related phenomena is presented in sufficient detail to enable researchers to understand their observations and develop improved thermoelectric materials. The methods for the selection of materials and their improvement are discussed. Thermoelectric materials for use in refrigeration and electrical generation are reviewed. Experimental techniques for the measurement of properties and for the production of thermoelements are described. Special emphasis is placed on nanotechnology which promises to yield great improvements in the efficiency of thermoelectric devices. Chapters are also devoted to transverse thermoelectric effects and thermionic energy conversion, both techniques offering the promise of important applications in the future.

Photovoltaic and Photoactive Materials National Academies Press

Nanotechnology provides tools for creating functional materials, devices, and systems by controlling materials at the atomic and molecular scales and making use of novel properties and phenomena. Nanotechnology-enabled sensors find applications in several fields such as health and safety, medicine, process control and diagnostics. This book provides the reader with information on how nanotechnology enabled sensors are currently being used and how they will be used in the future in such diverse fields as communications, building and facilities, medicine, safety, and security, including both homeland defense and military operations.

Combinatorial Materials Synthesis Linköping University Electronic Press

This book provides a systematic and comprehensive description of high-entropy alloys (HEAs). The authors summarize key properties of HEAs from the perspective of both fundamental understanding and applications, which are supported by in-depth analyses. The book also contains computational modeling in tackling HEAs, which help elucidate the formation mechanisms and properties of HEAs from various length and time scales.

Cathodic Arcs John Wiley & Sons

High Power Impulse Magnetron Sputtering: Fundamentals, Technologies, Challenges and Applications is an in-depth introduction to HiPIMS that emphasizes how this novel sputtering technique differs from conventional magnetron processes in terms of both discharge physics and the

resulting thin film characteristics. Ionization of sputtered atoms is discussed in detail for various target materials. In addition, the role of self-sputtering, secondary electron emission and the importance of controlling the process gas dynamics, both inert and reactive gases, are examined in detail with an aim to generate stable HiPIMS processes. Lastly, the book also looks at how to characterize the HiPIMS discharge, including essential diagnostic equipment. Experimental results and simulations based on industrially relevant material systems are used to illustrate mechanisms controlling nucleation kinetics, column formation and microstructure evolution. Includes a comprehensive description of the HiPIMS process from fundamental physics to applications Provides a distinctive link between the process plasma and thin film communities Discusses the industrialization of HiPIMS and its real world applications

Scientific and Technical Aerospace Reports CRC Press

Boron Nitride Nanotubes in Nanomedicine compiles, for the first time in a single volume, all the information needed by researchers interested in this promising type of smart nanoparticles and their applications in biomedicine. Boron nitride nanotubes (BNNTs) represent an innovative and extremely intriguing class of nanomaterials. After introducing BNNTs and explaining their preparation and evaluation, the book shows how the physical, chemical, piezoelectric and biocompatibility properties of these nanotubes give rise to their potential uses in biomedicine. Evidence is offered (from both in vitro and in vivo investigations) for how BNNTs can be useful in biomedical and nanomedicine applications such as therapeutic applications, tissue regeneration, nanovectors for drug delivery, and intracellular nanotransducers. Covers a range of promising biomedical BNNT applications Provides great value not just to academics but also industry researchers in fields such as materials science, molecular biology, pharmacology, biomedical engineering, and biophysical sciences Offers evidence for how BNNTs can be useful in biomedical and nanomedicine applications such as therapy, tissue regeneration, nanovectors for drug delivery, and intracellular nanotransducers Incorporates, for the first time in a single volume, all the information needed by researchers interested in this promising type of smart nanoparticles and their applications in biomedicine