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Development of in situ methods for process monitoring and control and characterization of Cu-Zn-Sn-S based thin films Battery and Energy Technology (General) - 214th ECS Meeting/PRiME 2008 Nanostructured Zinc Oxide Smart Coatings on Fibers and Textiles Nanomaterials-Based Coatings Application of Analytical Techniques to Petroleum Systems UTILIZATION OF WASTE FOR THE GENERATION OF VALUE-ADDED PRODUCTS Fundamental and Applied Nano-Electromagnetics Metal Matrix Composites Nanochemistry, Biotechnology, Nanomaterials, and Their Applications Perspective of Carbon Nanotubes Greek and Roman Textiles and Dress Encyclopedia of Interfacial Chemistry Nanomaterials and Nanofabrication for Electrochemical Energy Storage Sidney Nolan Inorganic Glasses for Photonics Proceedings of the 30th International Laser Radar Conference 2021 International Conference on Development and Application of Carbon Nanomaterials in Energetic Materials Electrochemistry of Novel Electrode Materials for Energy Conversion and Storage Research Methodologies for Beginners Carbon Nanomaterial Filled Polymer Composites for Functional Applications: Processing, Structure, and Property Relationship Catalysis for Low Temperature Fuel Cells 7th International Symposium on High-Temperature Metallurgical Processing Hydrocarbon Fluid Inclusions in Petroliferous

Basins Device and Process Technologies for MEMS and Microelectronics 2D Materials Graphene Science Handbook, Six-Volume Set Innovative Processing and Manufacturing of Advanced Ceramics and Composites II Fundamentals of Energy Storage and Conversion Nanoelectronic Device Applications Handbook Fullerenes, Nanotubes, and Carbon Nanostructures - 217th ECS Meeting POSS-Based Polymers Electrochemistry in Mineral and Metal Processing 8 (EMMP 8) A Study on Catalytic Conversion of Non-Food Biomass into Chemicals Mechatronics, Applied Mechanics and Energy Engineering Nanotechnology (General) Information Technology, Systems Research, and Computational Physics Convergence of More Moore, More than Moore and Beyond Moore Nanostructured Materials for the Detection of CBRN Analytical Archaeometry

Development of in situ methods for process monitoring and control and characterization of Cu-Zn-Sn-S based thin films

2019-06-03

in recent years kesterite cu2znsns4 czts has become an interesting alternative to copper indium gallium di selenide cigs due to its non toxic and earth abundant constituents a variety of methods is being used to fabricate kesterite thin films such as coevaporation sputtering electrodeposition spray pyrolysis and others most of them include an annealing step to stimulate elemental mixing and interdiffusion although conversion efficiencies of kesterite solar cells have increased among different research groups the record value of 12 6 set by ibm in 2014 has not been broken yet therefore experimental and theoretical studies are needed to predict the effect of the secondary phases and detrimental defects on the electronical properties of the czts based solar devices the work presented here studies non destructive techniques for in situ process control and monitoring with the aim to detect phases and phase transitions to optimize crucial processing steps such as pre annealing of metal precursors high temperature annealing and vacuum deposition of cu sn zn s based thin films the research consists of three parts in which raman spectroscopy x ray diffraction xrd and reflectometry are used to explore this objective in the first part raman spectroscopy is investigated as an in situ monitoring technique during high temperature annealing of thin films it investigates whether the

occurrence of czts can be monitored when it is created from annealing a mo cts zns layered thin film cus sns zns and cts cu sn s films are prepared by physical vapor deposition the raman scattering intensity was compared to investigate whether their specific vibrational modes can be distinguished from each other at room temperature then the cts film is annealed between 50 and 550 c in order to investigate whether cts vibrational modes can be identified at elevated temperatures and to see which transitions take place within the thin film also a czts reference film is annealed between 50 and 550 c for reference purposes the temperature dependence of the main czts modes is examined to investigate whether it can be used for in situ temperature control finally a zns layer is deposited on the unannealed cts film to obtain a mo cts zns layered film this film is used to study the conversion of cts zns into czts at elevated temperatures it was found that raman spectroscopy can successfully be used to monitor formation of czts by identifying its main vibrational mode during the annealing process the intensity of the cts modes reduces at elevated temperatures at 450 c the main czts mode at 338 cm 1 can be clearly identified the second part also focuses on high temperature annealing however in this part the focus lies on annealing of the metal precursor films it is explored whether specific alloys benefit or hinder the formation of secondary phases during formation of the czts absorber films also to what extent this influences solar cell performance in situ xrd was investigated for in situ monitoring of the pre annealing process cu poor metal precursor films are prepared by sputtering deposition the precursors are annealed at 150 c 200 c 300 c and 450 c in a three zone tube furnace the effect on the structural properties is analysed by xrd to study the formation mechanism of alloys the precursor films are then sulfurized in a three zone tube furnace the structural properties of the

absorber are analysed and correlated with structures in the precursor it is found that formation of sns2 in the absorber is proportional to the remaining sn in the pre annealed precursor also electron micrographs showed that pre annealing temperature influences grain growth and surface precipitation of sn s and zn s pre annealed absorbers at 450 c did not exhibit these phases on the surface solar devices are fabricated from the absorber films and best performing devices were obtained from pre annealed absorbers at 450 c they showed absence of sn and sns2 in respectively the precursor and absorber it could be concluded that sns2 phases are detrimental to device efficiency and that sns2 xrd peak intensity follows an inverse proportionality with device efficiency the third part explores reflectometry as a method to monitor a growing film during thermal evaporation in a physical vapor deposition pvd system a set of six czts absorbers is examined by ex situ raman spectroscopy and reflectometry to study the influence of secondary phases cus and zns on reflection spectra composition strongly influences reflection spectra and cus leaves a characteristic dip in the reflection spectrum at about 600 nm an integration method was used to analyze this phenomenon quantitatively subsequently a reflectometry setup is designed developed and integrated in the pvd system four different czts co evaporated and multi layered films are deposited structural morphological and vibrational properties are investigated the reflection spectra are monitored during deposition and time dependent reflection spectra are analyzed for characteristic aspects related to properties such as thickness band gap and phase formation cus could not be detected in the films by the integration method due to the superposition of the cus dip with developing interference fringes during film growth however in multilayered cts zns film it is found that the onset of zns deposition can be detected by

increased reflection intensity due to reduced surface roughness additionally the shifting onset of the interference fringes to lower photon energies can be used as a characteristic fingerprint during the deposition process in conclusion this work showed that raman spectroscopy xrd and reflectometry could be successfully implemented for in situ process control and monitoring of high temperature annealing and vacuum deposition of cu sn zn s based precursors and absorbers the application of these in situ techniques can lead to the optimization of thin film material properties and solar cells as such this study has paved the way for further improvement of cu sn zn s based precursors and thin film absorbers innerhalb der letzten jahre hat sich kesterit cu2znsns4 czts aufgrund seiner ungiftigen bestandteile und deren hoher verfügbarkeit zu einer interessanten alternative zu kupfer indium gallium di selenid cigs entwickelt zur herstellung von kesterit dünnschichten wird eine vielzahl von methoden verwendet wie ko verdampfung sputtern elektrodeposition spray pyrolyse und andere die meisten davon beinhalten einen temper schritt um die durchmischung und interdiffusion der elemente zu stimulieren obwohl der wirkungsgrad der kersterit solarzellen von verschiedenen forschungsgruppen erhöht wurde ist der rekordwert von ibm von 12 6 noch nicht gebrochen worden daher werden experimentelle und theoretische studien benötigt die den einfluss von fremdphasen und schädlichen defekten auf die elektronischen eigenschaften der czts solarzellen vorhersagen die vorliegende arbeit untersucht zerstörungsfreie methoden für die in situ prozesskontrolle und überwachung dabei ist das ziel entscheidende prozessschritte wie das vortempern der metall vorläufer sowie das hochtemperatur tempern und die vakuum abscheidung von cu sn zn s basierten schichten zu optimieren die untersuchung besteht

aus drei teilen in denen raman spektroskopie röntgendiffraktion xrd und reflektometrie benutzt werden um dieses ziel zu erreichen im ersten teil wird die ramanspektroskopie als in situ methode zur Überwachung des hochtemperatur temperns von dünnschichten betrachtet es wird untersucht ob das entstehen von czts beim tempern von gestapelten mo cts zns dünnschichten beobachtet werden kann cus sns zns und cts cu sn s schichten werden durch physikalische gasabscheidung hergestellt die intensität der raman streuung wurde vergleichen um zu untersuchen ob die spezifischen vibrations moden bei raumtemperatur voneinander unterschieden werden können dann werden die cts schichten zwischen 50 c und 550 c getempert um zu untersuchen ob die cts vibrations moden bei höheren temperaturen identifiziert werden können und um festzustellen welche Übergänge innerhalb der schicht auftreten außerdem wurde eine czts referenzschicht zwischen 50 c und 550 c für referenzzwecke getempert worden die temperaturabhängigkeit der czts haupt moden werden betrachtet um zu untersuche ob sie für die in situ temperaturüberwachung verwendet werden können abschließend wurde eine zns schicht auf einem nicht getemperten cts film abgeschieden um eine gestapelte mo cts zns schicht zu erhalten diese schicht wird verwendet um die umwandlung von cts zns zu czts bei erhöhten temperaturen zu untersuchen es wurde festgestellt dass raman spektroskopie erfolgreich verwendet werden kann um die bildung von czts zu überwachen indem die haupt vibrations moden während des temperns identifiziert werden die intensität der cts moden verringert sich bei höheren temperaturen bei 450 c kann die czts hauptmode bei 338 cm 1 klar identifiziert werden der zweite teil konzentriert sich ebenfalls auf das hochtemperatur tempern in diesem teil liegt der fokus allerdings auf dem tempern der metal vorläufer

schichten es wird erforscht ob bestimmte legierungen die entstehung von fremdphasen während der entstehung der czts absorberschichten begünstigen oder hemmen und welchen einfluss dies auf die leistung der solarzelle hat in situ xrd wird verwendet um die prozesse des vortemperns zu überwachen kupfer arme metall vorläufer schichten werden durch sputtern aufgetragen die vorläufer werden bei 150 c 200 c 300 c und 450 c in einem drei zonen röhren ofen getempert die auswirkungen auf die strukturellen eigenschaften werden mit xrd analysiert um den entstehungsmechanismus der legierungen zu untersuchen die vorläuferschichten werden dann in einem drei zonen röhren ofen sulfurisiert die strukturellen eigenschaften des absorbers werden analysiert und mit der struktur der vorläufer korreliert es wurde festgestellt dass die entstehung von sns2 im absorber proportional zum verbleibenden sn im vorgetemperten vorläufer ist außerdem zeigen bilder des rasterelektronenmikroskops dass die temperatur des vortemperns das kornwachstum und das abschieden von sn s und zn s an der oberfläche beeinflusst bei 450 c vorgetemperte absorber weisen keine dieser phasen an der oberfläche auf solarzellen werden aus diesen absorber schichten hergestellt und die besten zellen entstanden aus den bei 450 c vorgetemperten absorbern bei diesen traten sn und sns2 weder im vorläufer noch im absorber auf es konnte geschlussfolgert werden dass sns2 phasen schädlich für den wirkungsgrad der zellen sind und dass die intensität der sns2 xrd peaks invers proportional zum wirkungsgrad der zellen ist der dritte teil erforscht die reflektometrie als methode zur Überwachung des schichtwachstums während des thermischen verdampfens in einer anlage zur physikalischen gasabscheidung pvd ein satz aus sechs czts absorbern wird mittels ex situ raman spektroskopie und reflektometrie vermessen um den einfluss der fremdphasen cus und zns auf die

reflexionsspektren zu untersuchen die zusammensetzung beeinflusst die reflexionsspektren stark und cus hinterlässt eine charakteristische senkung bei 600 nm im reflexionsspektrum eine integrationsmethode wurde verwendet um dieses phänomen quantitativ zu analysieren anschließend wurde ein reflektometrieaufbau entworfen entwickelt und in die pvd anlage integriert vier verschiedene czts koverdampfte und mehrschicht filme wurden abgeschieden strukturelle morphologische und vibrationseigenschaften werden untersucht die reflexionsspektren werden während des abscheidens aufgenommen und zeitabhängige reflexionsspektren werden auf charakteristische aspekte im zusammenhang mit eigenschaften wie dicke bandlücke und entstehung von phasen untersucht cus konnte in den schichten mit der integrations methode wegen der Überlagerung der cus senkung mit dem entstehenden interferenzmuster nicht detektiert werden allerdings wurde in gestapelten cts zns schichten beobachtet werden dass der beginn der zns abscheidung durch eine ansteigende intensität der reflektion aufgrund der verringerten oberflächenrauigkeit detektiert werden kann zusätzlich kann die verschiebung des startpunkts der interferenzen zu niedrigeren photonenenergien als charakteristischer fingerabdruck während des abscheidungsprozesses verwendet werden zusammenfassend zeigt diese arbeit dass raman spektroskopie xrd und reflektrometrie erfolgreich als in situ prozesskontrolle und überwachung bei hochtemperatur tempern und vakuum abscheidung von cu sn zn s basierten vorläufern und absorbern realisiert werden konnten die anwendung dieser in situ techniken kann zu einer optimierung der eigenschaften von dünnschicht materialien und von solarzellen führen als solche hat diese untersuchung den weg für weitere verbesserung von cu sn zn s basierte vorläufer und dünnschicht absorber geebnet

Battery and Energy Technology (General) - 214th ECS Meeting/PRiME 2008

2009-08

the papers included in this issue of ecs transactions were originally presented in the symposium battery and energy technology joint general session held during the prime 2008 joint international meeting of the electrochemical society and the electrochemical society of japan with the technical cosponsorship of the japan society of applied physics the korean electrochemical society the electrochemistry division of the royal australian chemical institute and the chinese society of electrochemistry this meeting was held in honolulu hawaii from october 12 to 17 2008

Nanostructured Zinc Oxide

2021-08-10

nanostructured zinc oxide covers the various routes for the synthesis of different types of nanostructured zinc oxide including 1d nanorods nanowires etc 2d and 3d nanosheets nanoparticles nanospheres etc this comprehensive overview provides readers with a clear understanding of the various parameters

controlling morphologies the book also reviews key properties of zno including optical electronic thermal piezoelectric and surface properties and techniques in order to tailor key properties there is a large emphasis in the book on zno nanostructures and their role in optoelectronics zno is very interesting and widely investigated material for a number of applications this book presents up to date information about the zno nanostructures based applications such as gas sensing ph sensing photocatalysis antibacterial activity drug delivery and electrodes for optoelectronics reviews methods to synthesize tailor and characterize 1d 2d and 3d zinc oxide nanostructured materials discusses key properties of zinc oxide nanostructured materials including optical electronic thermal piezoelectric and surface properties addresses most relevant zinc oxide applications in optoelectronics such as light emitting diodes solar cells and sensors

Smart Coatings on Fibers and Textiles

2020-03-25

smart textiles are the textiles that are sensitive to any environmental conditions and can respond accordingly using passive and active coatings to generate high sensitivity to textiles is among the most recent research trends by engineers around the world this has resulted in expansion in the application of smart textiles in various industrial fields including medicals electronics and protective clothing the aim of this special issue is to introduce the most state of the art research and review articles by distinguished

researchers in the field of smart coatings on textiles the guest editor hopes that content will be useful for researchers students and companies for continuation of research and development with the concept of smart textiles

Nanomaterials-Based Coatings

2019-05-30

nanomaterials based coatings fundamentals and applications presents the fundamental concepts and applications of nanomaterial based coatings in anticorrosion antiwear antibacterial antifungal self cleaning superhydrophobic super hard super heat resistance solar reflective photocatalytic and radar absorbing coatings it is an important resource for those seeking to understand the underlying phenomenal and fundamental mechanisms through which nanoparticles interact with polymeric and metallic matrices to create stronger coatings as nanomaterials enforced coatings are smarter stronger and more durable the information listed in this book will helps readers understand their usage and further applications highlights the latest methods in design preparation and characterization techniques for nanomaterials based coatings discusses emerging applications of nanomaterials based coatings including substrates protection sustainable energy and in the environment and healthcare assesses the major challenges in making nanomaterials based coatings more reliable and cost effective

Application of Analytical Techniques to Petroleum Systems

2020-11-10

cutting edge techniques have always been utilized in petroleum exploration and production to reduce costs and improve efficiencies the demand for petroleum in the form of oil and gas is expected to increase for electricity production transport and chemical production largely driven by an increase in energy consumption in the developing world innovations in analytical methods will continue to play a key role in the industry moving forwards as society shifts towards lower carbon energy systems and more advantaged oil and gas resources are targeted this volume brings together new analytical approaches and describes how they can be applied to the study of petroleum systems the papers within this volume cover a wide range of topics and case studies in the fields of fluid and isotope geochemistry organic geochemistry imaging and sediment provenance the work illustrates how the current state of the art technology can be effectively utilised to address ongoing challenges in petroleum geoscience

UTILIZATION OF WASTE FOR THE GENERATION OF VALUE-

ADDED PRODUCTS

2022-01-10

utilization of waste for the generation of value added products deals with various methods of bioconversion of waste to wealth the purpose of bringing out this volume is to present a conglomeration of articles comprising a variety of researches related to conversion of waste into value added products and some treatment methods the book consists of topics under broad areas of water and wastewater management to recent advances in bioenvironmental engineering the book also covers diverse technologies including bioprocess technologies encompassing production of carbon source biofuel biodiesel and food application from natural resources or from waste products

Fundamental and Applied Nano-Electromagnetics

2016-04-08

this book presents the most relevant and recent results in the study of nanoelectromagnetics a recently born fascinating research discipline whose popularity is fast arising with the intensive penetration of nanotechnology in the world of electronics applications studying nanoelectromagnetics means describing

the interaction between electromagnetic radiation and quantum mechanical low dimensional systems this requires a full interdisciplinary approach the reason why this book hosts contributions from the fields of fundamental and applied electromagnetics of chemistry and technology of nanostructures and nanocomposites of physics of nano structures systems etc the book is aimed at providing the reader with the state of the art in nanoelectromagnetics from theoretical modelling to experimental characterization from design to synthesis from dc to microwave and terahertz applications from the study of fundamental material properties to the analysis of complex systems and devices from commercial thin film coatings to metamaterials to circuit components and nanodevices the book is intended as a reference in advanced courses for graduate students and as a guide for researchers and industrial professionals involved in nanoelectronics and nanophotonics applications

Metal Matrix Composites

2018-08-15

this book is a printed edition of the special issue metal matrix composites that was published in metals

Nanochemistry, Biotechnology, Nanomaterials, and Their Applications

2018-06-26

this book presents some of the latest achievements in nanotechnology and nanomaterials from leading researchers in ukraine europe and beyond it features selected peer reviewed contributions from participants in the 5th international science and practice conference nanotechnology and nanomaterials nano2017 held in chernivtsi ukraine on august 23 26 2017 the international conference was organized jointly by the institute of physics of the national academy of sciences of ukraine ivan franko national university of lviv ukraine university of tartu estonia university of turin italy and pierre and marie curie university france internationally recognized experts from a wide range of universities and research institutions share their knowledge and key results on topics ranging from energy storage to biomedical applications this book s companion volume also addresses nanooptics nanoplasmonics and interface studies

Perspective of Carbon Nanotubes

2019-12-11

carbon nanotubes belong to new nanomaterials and have been known for almost 20 years but their history

is somewhat lengthier they have been identified as promising candidates for various applications high temperature preparation techniques are conventional techniques for the synthesis of carbon nanotubes using arc discharge or laser ablation but today these methods are being replaced by low temperature vapor deposition techniques since orientation alignment nanotube length diameter purity and density of carbon nanotubes can be precisely controlled the synthesis of carbon nanotubes by chemical vapor deposition on catalyst arrays leads to nanotube models grown from specific sites on surfaces the controlled synthesis of nanotubes opens up interesting possibilities in nanoscience and nanotechnologies including electrical mechanical and electromechanical properties and devices chemical functionalization surface chemistry and photochemistry molecular sensors and interfacing with moderate biological systems carbon nanotubes are used in many applications due to their unique electrical mechanical optical thermal and other properties conductive and high strength composite materials energy saving and energy conversion devices sensors visualization of field emissions and sources of radiation means for storing hydrogen and nanoscale semiconductor devices probes and interconnections are some of the many applications of carbon nanotubes

Greek and Roman Textiles and Dress

2014-09-30

twenty chapters present the range of current research into the study of textiles and dress in classical

antiquity stressing the need for cross and inter disciplinarity study in order to gain the fullest picture of surviving material issues addressed include the importance of studying textiles to understand economy and landscape in the past different types of embellishments of dress from weaving techniques to the late introduction of embroidery the close links between the language of ancient mathematics and weaving the relationships of iconography to the realities of clothed bodies including a paper on the ground breaking research on the polychromy of ancient statuary dye recipes and methods of analysis case studies of garments in spanish viennese and greek collections which discuss methods of analysis and conservation analyses of textile tools from across the mediterranean discussions of trade and ethnicity to the workshop relations in roman fulleries multiple aspects of the production of textiles and the social meaning of dress are included here to offer the reader an up to date account of the state of current research the volume opens up the range of questions that can now be answered when looking at fragments of textiles and examining written and iconographic images of dressed individuals in a range of media the volume is part of a pair together with prehistoric ancient near eastern and aegean textiles and dress an interdisciplinary anthology edited by mary harlow c cile michel and marie louise nosch

Encyclopedia of Interfacial Chemistry

2018-03-29

encyclopedia of interfacial chemistry surface science and electrochemistry seven volume set summarizes current fundamental knowledge of interfacial chemistry bringing readers the latest developments in the field as the chemical and physical properties and processes at solid and liquid interfaces are the scientific basis of so many technologies which enhance our lives and create new opportunities its important to highlight how these technologies enable the design and optimization of functional materials for heterogeneous and electro catalysts in food production pollution control energy conversion and storage medical applications requiring biocompatibility drug delivery and more this book provides an interdisciplinary view that lies at the intersection of these fields presents fundamental knowledge of interfacial chemistry surface science and electrochemistry and provides cutting edge research from academics and practitioners across various fields and global regions

Nanomaterials and Nanofabrication for Electrochemical Energy Storage

2020-11-13

electrochemical energy storage technologies play key roles for storing electricity harvested from renewable energy resources of an intermittent nature such as solar and wind and for utilizing electricity for a range of applications such as electric vehicles and flights wearable electronics and medical implants this book collects original research work on the fabrication of various nanomaterials their applications in battery

and supercapacitor technologies and the investigation of the underlying structure property performance correlation in these complex energy systems

Sidney Nolan

2020-01-07

the newest addition to the artist s materials series offers the first technical study of one of australia s greatest modern painters sidney nolan 1917 1992 is renowned for an oeuvre ranging from views of melbourne s seaside suburb st kilda to an iconic series on outlaw hero ned kelly working in factories from age fourteen nolan began his training spray painting signs on glass which was followed by a job cutting and painting displays for fayrefield hats such employment offered him firsthand experience with commercial synthetic paints developed during the 1920s and 1930s in 1939 having given up his job at fayrefield in pursuit of an artistic career nolan became obsessed with european abstract paintings he saw reproduced in books and magazines with little regard for the longevity of his work he began to exploit materials such as boot polish dyes secondhand canvas tissue paper and old photographs in addition to commercial and household paints he continued to embrace new materials after moving to london in 1953 oil based ripolin enamel is known to have been nolan s preferred paint but this fascinating study certain to appeal to conservators conservation scientists art historians and general readers with an interest in modern art reveals his equally innovative

use of nitrocellulose alkyds and other diverse materials

Inorganic Glasses for Photonics

2016-10-17

advanced textbook on inorganic glasses suitable for both undergraduates and researchers engaging style to facilitate understanding suitable for senior undergraduates postgraduates and researchers entering material science engineering physics chemistry optics and photonics fields discusses new techniques in optics and photonics including updates on diagnostic techniques comprehensive and logically structured

Proceedings of the 30th International Laser Radar Conference

2024-01-27

this volume presents papers from the biennial international laser radar conference ilrc the world s leading event in the field of atmospheric research using lidar with growing environmental concerns to address such as air quality deterioration stratospheric ozone depletion extreme weather events and changing climate the lidar technique has never been as critical as it is today to monitor alert and help solve current

and emerging problems of this century the 30th occurrence of the ilrc unveils many of the newest results and discoveries in atmospheric science and laser remote sensing technology the 30th ilrc conference program included all contemporary ilrc themes leveraging on both the past events legacy and the latest advances in lidar technologies and scientific discoveries with participation by young scientists particularly encouraged this proceedings volume includes a compilation of cutting edge research on the following themes new lidar techniques and methodologies measurement of clouds and aerosol properties atmospheric temperature wind turbulence and waves atmospheric boundary layer processes and their role in air quality and climate greenhouse gases tracers and transport in the free troposphere and above the upper mesosphere and lower thermosphere synergistic use of multiple instruments and techniques networks and campaigns model validation and data assimilation using lidar measurements space borne lidar missions instruments and science ocean lidar instrumentation techniques and retrievals and past present and future synergy of heterodyne and direct detection lidar applications in addition special sessions celebrated 50 years of lidar atmospheric observations since the first ilrc comprising review talks followed by a plenary discussion on anticipated future directions

2021 International Conference on Development and Application of

Carbon Nanomaterials in Energetic Materials

2022-05-16

this book features selected papers presented at the 2021 international conference on development and application of carbon nanomaterials in energetic materials it discusses the latest progress in the field of advance carbon nanomaterials in energetic materials including the structural design theoretical calculation synthesis properties and applications of carbon materials it also presents the new technology and applications of advanced carbon nanomaterials in energetic materials it can be used as a reference book for researchers in energetic materials and related fields it is also be useful for undergraduates and postgraduates studying these topics

Electrochemistry of Novel Electrode Materials for Energy Conversion and Storage

2008-05

the papers included in this issue of ecs transactions were originally presented in the symposium electrochemistry of novel electrode materials for energy conversion and storage held during the 211th

meeting of the electrochemical society in chicago il from may 6 to 11 2007

Research Methodologies for Beginners

2017-03-31

this textbook introduces the general points of view of research methodology in the scientific and engineering fields of studies and presents an overview of the technical and professional communication needed for article publication in journals it comprises several practice exercises that will give beginners the confidence to move on the communicative activities every chapter provides problem sets that will help readers check their understanding of each concept the book will also help readers formulate specific research topics research questions and hypotheses conduct literature reviews relevant to the research topics develop applicable research methodologies and write and present their research outlining the key elements of the proposed projects it is very useful for students and researchers opting for a course on research methodology and for seminars at undergraduate and graduate levels

Carbon Nanomaterial Filled Polymer Composites for Functional

Applications: Processing, Structure, and Property Relationship

2022-03-11

this book is a printed edition of the special issue catalysis for low temperature fuel cells that was published in catalysts

Catalysis for Low Temperature Fuel Cells

2018-03-23

the technology operation energy environmental analysis and future development of the metallurgical industries utilizing high temperature processes are covered in the book the innovations on the extraction and production of ferrous and nonferrous metals alloys and refractory and ceramic materials the heating approaches and energy management and the treatment and utilizations of the wastes and by products are the topics of special interests this book focuses on the following issues high efficiency new metallurgical process and technology fundamental research of metallurgical process alloys and materials preparation direct reduction and smelting reduction coking new energy and environment utilization of solid slag wastes and complex ores characterization of high temperature metallurgical process

7th International Symposium on High-Temperature Metallurgical Processing

2016-12-01

hydrocarbon fluid inclusions in petroliferous basins trains readers to detect hydrocarbon fluid inclusions hcfis in sedimentary rocks particularly the wafer preparation techniques to visualize hcfis its distinction from aqueous inclusions petrographic approaches to hcfis microthermometric observations on hcfis fluorescence emission spectra and raman spectra of hcfis and their interpretations for the petroleum industry the book features case studies from the mumbai and kerala konkan basins of the western offshore of india two representative basins where new non destructive fluid inclusion techniques were tested this book is essential reading for students of petroleum geology and those working in exploration in the oil and gas industry helps readers to identify hydrocarbon fluid inclusions hcfis in sedimentary basins covers how to determine the oil window api gravity and chemical constituents in hcfis includes case studies on key offshore basins

Hydrocarbon Fluid Inclusions in Petroliferous Basins

2021-06-24

two dimensional 2d materials have attracted a great deal of attention in recent years due to their potential applications in gas chemical sensors healthcare monitoring biomedicine electronic skin wearable sensing technology and advanced electronic devices graphene is one of today s most popular 2d nanomaterials alongside boron nitrides molybdenum disulfide black phosphorus and metal oxide nanosheets all of which open up new opportunities for future devices this book provides insights into models and theoretical backgrounds important properties characterizations and applications of 2d materials including graphene silicon nitride aluminum nitride zno thin film phosphorene and molybdenum disulfide

Device and Process Technologies for MEMS and Microelectronics

2005

graphene is the strongest material ever studied and can be an efficient substitute for silicon this six volume handbook focuses on fabrication methods nanostructure and atomic arrangement electrical and optical properties mechanical and chemical properties size dependent properties and applications and

industrialization there is no other major reference work of this scope on the topic of graphene which is one of the most researched materials of the twenty first century the set includes contributions from top researchers in the field and a foreword written by two nobel laureates in physics volumes in the set k20503 graphene science handbook mechanical and chemical properties isbn 9781466591233 k20505 graphene science handbook fabrication methods isbn 9781466591271 k20507 graphene science handbook electrical and optical properties isbn 9781466591318 k20508 graphene science handbook applications and industrialization isbn 9781466591332 k20509 graphene science handbook size dependent properties isbn 9781466591356 k20510 graphene science handbook nanostructure and atomic arrangement isbn 9781466591370

2D Materials

2019-10-09

contains collection of papers from the below symposia held during the 10th pacific rim conference on ceramic and glass technology pacrim10 june 2 7 2013 in coronado california 2012 novel green and strategic processing and manufacturing technologies polymer derived ceramics and composites advanced powder processing and manufacturing technologies synthesis and processing of materials using electric fields currents

Graphene Science Handbook, Six-Volume Set

2016-04-26

the papers included in this issue of ecs transactions were originally presented in the symposium fundamentals of energy storage and conversion held during the 213th meeting of the electrochemical society in phoenix arizona from may 18 to 23 2008

Innovative Processing and Manufacturing of Advanced Ceramics and Composites II

2014-02-19

nanoelectronic device applications handbook gives a comprehensive snapshot of the state of the art in nanodevices for nanoelectronics applications combining breadth and depth the book includes 68 chapters on topics that range from nano scaled complementary metal oxide semiconductor cmos devices through recent developments in nano capacitors and algaas gaas devices the contributors are world renowned experts from academia and industry from around the globe the handbook explores current research into potentially disruptive technologies for a post cmos world these include nanoscale advances in current mosfet cmos

technology nano capacitors for applications such as electronics packaging and humidity sensors single electron transistors and other electron tunneling devices quantum cellular automata and nanomagnetic logic memristors as switching devices and for memory graphene preparation properties and devices carbon nanotubes cnts both single cnt and random network other cnt applications such as terahertz sensors interconnects and capacitors nano system architectures for reliability nanowire device fabrication and applications nanowire transistors nanodevices for spintronics the book closes with a call for a new generation of simulation tools to handle nanoscale mechanisms in realistic nanodevice geometries this timely handbook offers a wealth of insights into the application of nanoelectronics it is an invaluable reference and source of ideas for anyone working in the rapidly expanding field of nanoelectronics

Fundamentals of Energy Storage and Conversion

2008-11

the papers included in this issue of ecs transactions were originally presented in the symposia molecular and supramolecular chemistry of fullerenes and carbon nanotubes carbon nanotubes and nanostructures fundamental properties and processes carbon nanotubes and nanostructures applications and devices and nanostructures for energy conversion held during the 217th meeting of the electrochemical society in vancouver canada from april 25 to 30 2010

Nanoelectronic Device Applications Handbook

2017-11-22

the combination of functional polymers with inorganic nanostructured compounds has become a major area of research and technological development owing to the remarkable properties and multifunctionalities deriving from their nano and hybrid structures in this context polyhedral oligomeric silsesquioxanes posss have increasing importance and a dominant position with respect to the reinforcement of polymeric materials although posss were first described in 1946 by scott these materials however have not immediately been successful if we consider that starting from 1946 and up to 1995 we find in the literature 85 manuscripts regarding posss which means that less than two papers per year were published over 50 years since 1995 we observe an exponential growth of scientific manuscripts concerning posss it is changing from an annual average of 20 manuscripts for the period 1995 2000 to an annual average of about 400 manuscripts with an increase of 2800 the introduction of posss inorganic nanostructures into polymers gives rise to polymer nanostructured materials pnms with interesting mechanical and physical properties thus representing a radical alternative to the traditional filled polymers or polymer compositions

Fullerenes, Nanotubes, and Carbon Nanostructures - 217th ECS Meeting

2010-10

this issue of ecs transactions contains papers on electrochemical aspects of concentrating and extracting base precious and light metals from their ores and secondary materials and associated energy and environmental considerations both fundamental and applied work is covered with emphasis on recent progress in 1 mineral flotation 2 hydrometallurgy 3 electrowinning and refining 4 environmental technologies associated with mineral and metal processing 5 electrochemical methods for secondary metal production and 6 recovery of metals from wastes

POSS-Based Polymers

2019-12-19

the topic of this thesis is catalytic conversion of non food abundant and renewable biomass such as cellulose and chitin to chemicals in biorefinery chemical transformation of polymers to valuable compounds has attracted worldwide interest for building sustainable societies first the current situation of this hot research

area has been summarized well in the general introduction of the thesis which helps readers to become familiar with this topic next the author explains high yielding production of glucose from cellulose by using an alkali activated carbon as a catalyst resulting in a yield of glucose as high as 88 which is one of the highest yields ever reported the characterization of carbon materials has indicated that weak acid sites on the catalyst promote the reaction which is markedly different from reported catalytic systems that require strong acids in addition the first catalytic transformation of chitin with retention of n acetyl groups has been developed the combination of mechanocatalytic hydrolysis and thermal solvolysis enables the production of n acetylated monomers in good yields of up to 70 the catalytic systems demonstrated in this thesis are unique in the fields of both chemistry and chemical engineering and their high efficiencies can contribute to green and sustainable chemistry in the future meanwhile mechanistic studies based on characterization thermodynamics kinetics and model reactions have also been performed to reveal the roles of catalysts during the reactions the results will be helpful for readers to design and develop new catalysts and reaction systems

Electrochemistry in Mineral and Metal Processing 8 (EMMP 8)

2010-04

collection of selected peer reviewed papers from the 2013 international conference on mechatronics applied

mechanics and energy engineering mamee 2013 july 27 29 2013 singapore the 107 papers are grouped as follows chapter 1 material engineering chapter 2 applied mechanics flow and thermal engineering chapter 3 researches of manufacturing technologies and processing chapter 4 energy engineering chapter 5 engineering researches in construction chapter 6 mechatronics and automation chapter 7 information technologies and computational procedures in engineering researches and design chapter 8 related topics

A Study on Catalytic Conversion of Non-Food Biomass into Chemicals

2016-01-13

the papers included in this issue of ecs transactions were originally presented in the symposium nanotechnology general session held during the 212th meeting of the electrochemical society in washington dc from october 7 to 12 2007

Mechatronics, Applied Mechanics and Energy Engineering

2013-09-03

this book highlights a broad range of modern information technology tools techniques investigations and

open challenges mainly with applications in systems research and computational physics divided into three major sections it begins by presenting specialized calculation methods in the framework of data analysis and intelligent computing in turn the second section focuses on application aspects mainly for systems research while the final section investigates how various tasks in the basic disciplines mathematics and physics can be tackled with the aid of contemporary it methods the book gathers selected presentations from the 3rd conference on information technology systems research and computational physics itsrcp 18 which took place on 2 5 july 2018 in krakow poland the intended readership includes interdisciplinary scientists and practitioners pursuing research at the interfaces of information technology systems research and computational physics

Nanotechnology (General)

2008-03

the era of sustainable and energy efficient nanoelectronics and nanosystems has come the research and development on scalable and 3d integrated diversified functions together with new computing architectures is in full swing besides data processing data storage new sensing modes and communication capabilities need the revision of process architecture to enable the heterogeneous co integration of add on devices with cmos the new defined functions and paradigms open the way to augmented nanosystems the

choices for future breakthroughs will request the study of new devices circuits and computing architectures and to take new unexplored paths including as well new materials and integration schmes this book reviews in two sections including seven chapters essential modules to build diversified nanosystems based on nanoelectronics and finally how they pave the way to the definition of nanofunctions for augmented nanosystems

Information Technology, Systems Research, and Computational Physics

2019-04-17

this book includes topics in nanophysics nanotechnology nanomaterials sensors biosensors security systems and cbrn agents detection there have been many significant advances in the past two years and some entirely new directions of research are just opening up recent developments in nanotechnology and measurement techniques now allow experimental investigation of the physical properties of nanostructured materials the book presents new methods for the detection of chemical biological radiological and nuclear cbrn agents using chemical and biochemical sensors identification protection and decontamination are the main scientific and technological responses for the modern challenges of cbrn agents

Convergence of More Moore, More than Moore and Beyond Moore

2021-02-15

analytical archaeometry describes this interesting and challenging field of research on the border between natural sciences chemistry spectroscopy biology geology and humanities archaeology art history conservation sciences it fills the gap between these two areas whilst focussing on the analytical aspects of this research field the first part of the book studies the main analytical techniques used in this research field the second part expands from the different types of materials usually encountered and the final part is organised around a series of typical research questions the book is not only focussed on archaeological materials but is also accessible to a broader lay audience overall the book is clearly structured and gives insight into different approaches to the study of analytical providing extensive discussion on a wide range of techniques materials questions and applications due to the advances in analytical instrumentation and applications in this field it is important to have all this information merged together academics as well as professionals in archaeology art history museum labs and conservation science will find this an invaluable reference source ensuring the reader is provided with the latest progress in this research field

Nanostructured Materials for the Detection of CBRN

2018-07-11

Analytical Archaeometry

2016-01-13

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