Application Notes Quantachrome

Properties and applications of high surface area materials depend on interfacial phenomena, including diffusion, sorption, dissolution, solvation, surface reactions, catalysis, and phase transitions. Among the physicochemical methods that give useful information regarding these complex phenomena, nuclear magnetic resonance (NMR) spectroscopy is the most universal, yielding detailed structural data regarding molecules, solids, and interfaces. Nuclear Magnetic Resonance Studies of Interfacial Phenomena summarizes NMR research results collected over the past three decades for a wide range of materials—from nanomaterials and nanocomposites to biomaterials, cells, tissues, and seeds. This book describes the applications of important new NMR spectroscopic methods to a variety of useful materials and compares them with results from other techniques such as adsorption, differential scanning calorimetry, thermally stimulated depolarization current, dielectric relaxation spectroscopy, infrared spectroscopy, optical microscopy, and small-angle and wide-angle x-ray scattering. The text explores the application of NMR spectroscopy to examine interfacial phenomena in objects of increasing complexity, beginning with unmodified and modified silica materials. It then describes properties of various mixed oxides with comparisons to individual oxides and also describes carbon materials such as graphite and carbon nanotubes. Chapters deal with carbon–mineral hybrids and their mosaic surface structures, and interfacial phenomena at the surface of natural and synthetics polymers. They also explore a variety of biosystems, which are much more complex, including biomacromolecules (proteins, DNA, and lipids), cells and tissues, and seeds and herbs. The authors cover trends in interfacial phenomena

investigations, and the final chapter describes NMR and other methods used in the book. This text presents a comprehensive description of a large array of hard and soft materials, allowing the analysis of the structure–property relationships and generalities on the interfacial behavior of materials and adsorbates.

Geomaterials derived from the Earth's crust and used in construction after appropriate processing are among the earliest raw materials exploited, processed and used by humans. Their numerous functional properties include accessibility, workability and serviceability, and these are explored within this volume. In modern society, sustainable use of raw materials, specifically those exploited in large volumes such as geomaterials for construction, raises questions of reducing extraction of primary resources and thus minimizing impacts on natural systems, and also employment of materials and technologies to lower emissions of deleterious substances into the atmosphere. This will be possible only if we fully understand the properties, processing and mode of use of traditional geomaterials. Although most of the papers within this volume were written by geologists, the contributions will also be of interest to those working in cultural heritage, monument conservation, civil engineering and architecture.

The development of porous materials has attracted the attention of the research community for years. Porosity characteristics have specific impacts on the material properties and materials that are applied in many areas, such as pollutant removal, CO2 capture, energy storage, catalytic oxidation and reduction processes, the conversion of biomass to biofuels, and drug delivery. Examples of porous materials are activated carbons, clays, and zeolites. The aim of this book is to collect the recent advances and progress regarding porous materials and their applications in the environmental area.

This book is a special collection of articles dedicated to the preparation and characterization of nanoporous materials, such as zeolitic-type materials, mesoporous silica (SBA-15, MCM-41, and KIT-6), mesoporous metallic oxides, metal–organic framework structures (MOFs), and pillared clays, and their applications in adsorption, catalysis, and separation processes. This book presents a global vision of researchers from international universities, research centers, and industries working with nanoporous materials and shares the latest results on the synthesis and characterization of such materials, which have given rise to the special interest in their applications in basic and industrial processes.

In this book, we have summarized recent progresses due to novel nanomaterials for sustainable water resources. Book provides a summary of the state of the art knowledge to scientists, engineers and policy makers, about recent developments due to nanotechnology for sustainable water resources arena. The advances in sustainable water resources technologies in the context of modern society's interests will be considered preferably which allow to identify grand challenges and directions for future research. The book contributors have been selected from all over the world and the essential functions of the nanotechnologies have presented rather than their anticipated applications. Moreover, up to date knowledge on economy, toxicity and regulation related to nanotechnology are presented in detail. In the end, role of nanotechnology for green and sustainable future has also been briefly debated.

This book contains 17 papers from the Controlled Processing of Nanoparticle-based Materials and Nanostructured Films; Nanotechnology for Energy, Healthcare, and Industry; and Nanolaminated Ternary Carbides and Nitrides (MAX Phases) symposia

held during the 2010 Materials Science and Technology (MS&T'10) meeting, October 17-21, 2010, Houston, Texas. Topics include: Direct Manufacturing; Low Dimension Nanomaterials; Processing and Sintering; Thin Films; Nanolaminated Ternary Carbides and Nitrides (MAX Phases); and Novel Nanomaterial Approaches.

This book constitutes the refereed proceedings of the 5th International Conference on Digital Heritage, EuroMed 2014, held in Limassol, Cyprus, in November 2014. The 84 full and 51 short papers presented were carefully reviewed and selected from 438 submissions. They focus on the interdisciplinary and multi-disciplinary research concerning cutting edge cultural heritage informatics, -physics, chemistry and engineering and the use of technology for the representation, documentation, archiving, protection, preservation and communication of Cultural Heritage knowledge.

Over 7,300 total pages ... Just a sample of the contents: Title : Multifunctional Nanotechnology Research Descriptive Note : Technical Report,01 Jan 2015,31 Jan 2016 Title : Preparation of Solvent-Dispersible Graphene and its Application to Nanocomposites Descriptive Note : Technical Report Title : Improvements To Micro Contact Performance And Reliability Descriptive Note : Technical Report Title : Delivery of Nanotethered Therapies to Brain Metastases of Primary Breast Cancer Using a Cellular Trojan Horse Descriptive Note : Technical Report,15 Sep 2013,14 Sep 2016 Title : Nanotechnology-Based Detection of Novel microRNAs for Early Diagnosis of Prostate Cancer Descriptive Note : Technical Report,15 Jul 2016,14 Jul 2017 Title : A

Federal Vision for Future Computing: A Nanotechnology-Inspired Grand Challenge Descriptive Note : Technical Report Title : Quantifying Nanoparticle Release from Nanotechnology: Scientific Operating Procedure Series: SOP C 3 Descriptive Note : Technical Report Title : Synthesis, Characterization And Modeling Of Functionally Graded Multifunctional Hybrid Composites For Extreme Environments Descriptive Note : Technical Report,15 Sep 2009,14 Mar 2015 Title : Equilibrium Structures and Absorption Spectra for SixOy Molecular Clusters using Density Functional Theory Descriptive Note : Technical Report Title : Nanotechnology for the Solid Waste Reduction of Military Food Packaging Descriptive Note : Technical Report,01 Apr 2008,01 Jan 2015 Title : Magneto-Electric Conversion of Optical Energy to Electricity Descriptive Note : Final performance rept. 1 Apr 2012-31 Mar 2015 Title : Surface Area Analysis Using the Brunauer-Emmett-Teller (BET) Method: Standard Operating Procedure Series: SOP-C Descriptive Note : Technical Report,30 Sep 2015,30 Sep 2016 Title : Stabilizing Protein Effects on the Pressure Sensitivity of Fluorescent Gold Nanoclusters Descriptive Note : Technical Report Title : Theory-Guided Innovation of Noncarbon Two-Dimensional Nanomaterials Descriptive Note : Technical Report,14 Feb 2012,14 Feb 2016 Title : Deterring Emergent Technologies Descriptive Note : Journal Article Title : The Human Domain and the Future of Army Warfare: Present as Prelude to 2050 Descriptive Note : Technical Report Title : Drone Swarms Descriptive Note : Technical Report,06 Jul 2016,25 May 2017 Title : OFFSETTING TOMORROW'S

ADVERSARY IN A CONTESTED ENVIRONMENT: DEFENDING EXPEDITIONARY ADVANCE BASES IN 2025 AND BEYOND Descriptive Note : Technical Report Title : A Self Sustaining Solar-Bio-Nano Based Wastewater Treatment System for Forward Operating Bases Descriptive Note : Technical Report,01 Feb 2012,31 Aug 2017 Title : Radiation Hard and Self Healing Substrate Agnostic Nanocrystalline ZnO Thin Film Electronics Descriptive Note : Technical Report,26 Sep 2011,25 Sep 2015 Title : Modeling and Experiments with Carbon Nanotubes for Applications in High Performance Circuits Descriptive Note : Technical Report Title : Radiation Hard and Self Healing Substrate Agnostic Nanocrystalline ZnO Thin Film Electronics (Per5 E) Descriptive Note : Technical Report,01 Oct 2011,28 Jun 2017 Title : High Thermal Conductivity Carbon Nanomaterials for Improved Thermal Management in Armament Composites Descriptive Note : Technical Report Title : Emerging Science and Technology Trends: 2017-2047 Descriptive Note : Technical Report Title : Catalysts for Lightweight Solar Fuels Generation Descriptive Note : Technical Report,01 Feb 2013,31 Jan 2017 Title : Integrated Real-Time Control and Imaging System for Microbiorobotics and Nanobiostructures Descriptive Note : Technical Report,01 Aug 2013,31 Jul 2014

Ordered mesoporous silica (OMS) materials are a family of silica nanomaterials with pores ranging in size from 2 to 50 nm which are arranged periodically within the silica matrix. They have expanding applications in various fields of research, such as drug

delivery, adsorption, separation and catalysis. COK-12 is an OMS produced by the soft-templating method, using the block copolymer P123 as a structure-directing agent. The synthesis takes place at room temperature under mild reaction conditions. In comparison with the most widely known OMS, the synthesis of COK-12 is more time efficient, inexpensive and environmentally friendly, yielding a material analogous to the well-known SBA-15. This thesis encompasses investigations regarding the production of the ordered mesoporous silica material (OMS) known as COK-12, in terms of upscaling of the synthesis and tailoring of the size and shape of its characteristic hexagonal pore structure. Batch upscaling of the synthesis yielded a material with nearly identical properties to that of the original COK-12. Upscaling of the COK-12 synthesis was also studied in continuous mode. The installation and operation of a continuous COK-12 production unit was carried out with the aim to determine the possibility of large-scale production of COK-12 with consistent material properties. COK-12 was produced in continuous mode by varying the time of aging of the COK-12 slurry and the flow rate of the feed streams, yielding materials with properties nearly identical to those of the original COK-12. COK-12 was used as a support for the Na_2WO_4-Mn/SiO_2 catalyst for the oxidative coupling of methane reaction in various forms (powder, granular produced by pressing and monolithic), showing promising results comparable to the enhanced activity of the catalyst supported on the SBA-15. The advantage of using COK-12 over other OMS materials is that the facile nature of

COK-12 synthesis makes it a viable candidate for industrial production of the Na2WO4-Mn/SiO2 catalyst, if paired with appropriate pelletizing and preparation method. The introduction of hexane and polypropylene glycol (PPG) as micellar swelling agents into the original COK-12 synthesis was studied in order to tailor the mesoporous structure of the system. Hexane was used as a micelle expander and as an agent to produce silica mesocellular foams, with “ink-bottle” shaped pores with a larger diameter than that of the original COK-12. By adding PPG into the synthesis, the shift of the mesostructure of COK-12 from 2D hexagonal to a multilamellar vesicular configuration was studied, resulting in the progressive formation of this type of material with increasing concentration of PPG. The flexibility of the COK-12 synthesis in terms of upscaling and tailoring of the mesostructure was examined throughout this work, with an aim to contribute to the existing and expanding knowledge regarding more versatile, sustainable and possibly industrial OMS production. Ordered Mesoporous Silica (OMS) gehört zu der Familie der Silica-Nanomaterialien mit periodisch angeordneten Mesoporen im Größenbereich zwischen 2 und 50 nm. Diese werden zunehmend in unterschiedlichen Forschungsfeldern wie Medikamentenfreisetzung, Adsorption, Separation und Katalyse eingesetzt. COK-12 ist ein OMS, das über eine Soft-Templating-Methode unter Nutzung des Blockcopolymers P123 als strukturbestimmenden Zusatz erzeugt wird. Die Synthese erfolgt bei Raumtemperatur unter milden Reaktionsbedingungen. Im Vergleich zu den am weitesten bekannten

OMS-Materialien ist die Synthese von COK-12 zeiteffizient, günstig und umweltfreundlich. Dabei wird ein OMS-Material analog zu dem bereits etablierten SBA-15 erzeugt. Die vorliegende Dissertation umfasst die Synthese eines als COK-12 bekannten OMS-Materials, dem Scale-Up der Synthese sowie die Anpassung und Modifizierung der ursprünglich hexagonal-angeordneten Mesoporen bezüglich Porengrößen und Porenform. Das diskontinuierliche Scale-Up im Batchprozess führt zu nahezu identischen Materialeigenschaften im Vergleich zu dem ursprünglichen COK-12. Ein Scale-Up der COK-12-Synthese wurde zusätzlich im kontinuierlichen Prozess erprobt. Dessen Installation und Operation wurde mit dem Ziel durchgeführt, um die Möglichkeit einer Produktion von großen Mengen an COK-12 mit einheitlichen Materialeigenschaften zu validieren. Durch eine Variation der Alterungszeit als auch der Fließrate der Lösungen konnte COK-12 im kontinuierlichen Prozess mit nahezu identischen Eigenschaften wie das ursprüngliche COK-12 erzeugt werden. COK-12 wurde erfolgreich in verschiedenen Formen (Pulver, Pressgranulate und Monolithe) als Trägermaterial für Na2WO4-Mn/SiO2-Katalysatoren für die Oxidative Kopplung von Methan eingesetzt. Die resultierenden Aktivitäten ist sind vergleichbar mit denen des auf SBA-15-geträgerten Katalysators Der Vorteil der Nutzung von COK-12 im Vergleich zu anderen OMS-Materialien liegt in der vergleichsweise simplen COK-12-Synthese, weshalb es ein interessanter Kandidat für eine mögliche industrielle Produktion des Na2WO4-Mn/SiO2-Katalysators ist, wenn wenn geeignete Pelletierungs- und

Herstellungsmethoden angewendet werden. Die Zugabe von Hexan und Polypropylenglykol (PPG) zur Aufweitung der Mizellen in der ursprünglichen COK-12-Synthese wurde untersucht, um die mesoporöse Struktur des Systems zu variieren. Hexan wurde eingesetzt zur Aufweitung der Mizellen und als Hilfsmittel zur Produktion mesozellulärer Silica-Schäume mit „ink-bottle“-förmigen Poren sowie vergrößertem Porendurchmesser im Vergleich zu denen des ursprünglichen COK-12. Durch die Zugabe von PPG in die Synthese verändert sich die Mesoporenstruktur der ursprünglichen hexagonalen 2D-Struktur zu einer multilamellaren vesikulären Anordnung, die mit zunehmender PPG-Konzentration verstärkt wird. Die Flexibilität der COK-12-Synthese wurde in dieser Arbeit in Bezug auf ein Scale-Up und eine Porenmodifikation weitreichend untersucht, mit dem Ziel das existierende Wissen in Bezug auf eine vielseitige, nachhaltige sowie eine potentielle Industrieproduktion der COK-12-Synthese zu entwickeln.

The growth of interest in newly developed porous materials has prompted the writing of this book for those who have the need to make meaningful measurements without the benefit of years of experience. One might consider this new book as the 4th edition of "Powder Surface Area and Porosity" (Lowell & Shields), but for this new edition we set out to incorporate recent developments in the understanding of fluids in many types of porous materials, not just powders. Based on this, we felt that it would be prudent to change the title to "Characterization of Porous Solids and Powders: Surface Area,

Porosity and Density". This book gives a unique overview of principles associated with the characterization of solids with regard to their surface area, pore size, pore volume and density. It covers methods based on gas adsorption (both physi and chemisorption), mercury porosimetry and pycnometry. Not only are the theoretical and experimental basics of these techniques presented in detail but also, in light of the tremendous progress made in recent years in materials science and nanotechnology, the most recent developments are described. In particular, the application of classical theories and methods for pore size analysis are contrasted with the most advanced microscopic theories based on statistical mechanics (e.g. Density Functional Theory and Molecular Simulation). The characterization of heterogeneous catalysts is more prominent than in earlier editions; the sections on mercury porosimetry and particularly chemisorption have been updated and greatly expanded.

In recent years the topic of environmental management has become very common. In sustainable development conditions, central and local governments much more often notice the need of acting in ways that diminish negative impact on environment. Environmental management may take place on many different levels - starting from global level, e.g. climate changes, through national and regional level (environmental policy) and ending on micro level. This publication shows many examples of environmental management. The diversity of presented aspects within environmental management and approaching the subject from the perspective of various countries contributes greatly to the development of environmental management field of research.

This critical volume examines the different methods used for the synthesis of a great number of photocatalysts, including TiO2, ZnO and other modified semiconductors, as well as characterization techniques used for determining the optical, structural and morphological properties of the semiconducting materials. Additionally, the authors discuss photoelectrochemical methods for determining the light activity of the photocatalytic semiconductors by means of measurement of properties such as band gap energy, flat band potential and kinetics of hole and electron transfer. Photocatalytic Semiconductors: Synthesis, Characterization and Environmental Applications provide an overview of the semiconductor materials from first- to third-generation photocatalysts and their applications in wastewater treatment and water disinfection. The book further presents economic and toxicological aspects in the production and application of photocatalytic materials.

This volume contains the proceedings of the Second International Symposium on Transition Metal Catalyzed Polymerizations held in 1986. The papers provide a broad-based perspective covering recent scientific and technological advances in Ziegler-Natta and metathesis polymerization, including olefin, diene, and acetylene polymerization, and copolymerization. The emphasis on reaction kinetics of polymerizations in different reagent and catalyst environments makes this volume of interest to both academic and industrial researchers.

Photocatalytic SemiconductorsSynthesis, Characterization, and Environmental ApplicationsSpringer

This book highlights some of the latest advances in nanotechnology and nanomaterials from leading researchers in Ukraine, Europe, and beyond. It features contributions from participants in the 6th International Science and Practice Conference Nanotechnology and Nanomaterials

(NANO2018) in Kiev, Ukraine on August 27-30, 2018 organized by the Institute of Physics of the National Academy of Sciences of 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 nanooptics, energy storage and biomedical applications. This book's companion volume also addresses topics such as materials properties, behavior, and synthesis.

Catalytic Naphtha Reforming, Second Edition presents modern, crystal-clear explanations of every aspect of this critical process for generating high-octane reformate products for gasoline blending and production of benzene, toluene, and xylene (BTX) aromatics. The book details the chemistry of naphtha reforming, the preparation and characterization of catalysts, and the very latest commercial technologies and industrial applications. With more than 300 tables and figures, it addresses the development of new catalysts and revamp process improvements propelled by regulations on sulfur, benzene, and oxygenate content in gasoline and refinery pressure to maximize utilization of existing assets.

Offering a materials science point of view, the author covers the theory and practice of adsorption and diffusion applied to gases in microporous crystalline, mesoporous ordered, and micro/mesoporous amorphous materials. Examples used include microporous and mesoporous molecular sieves, amorphous silica, and alumina and active carbons, akaganeites, prussian blue analogues, metal organic frameworks and covalent organic frameworks. The use of single component adsorption, diffusion in the characterization of the adsorbent surface, pore volume, pore size distribution, and the study of the parameters characterizing single component transport processes in porous materials are detailed.

Experimental investigations for the modelling of anhydritic swelling claystones

Zeolites are hydrated aluminosilicate minerals of the family of microporous solids. According to the US Geological Survey, there are about 40 naturally occurring zeolites, forming in sedimentary and volcanic rocks. The most commonly mined forms include clinoptilolite, chabazite and mordenite. There are over 200 synthetic zeolites. For their abundance, natural and synthetic zeolites are widely used in the industry, agriculture, water treatment, wastewater treatment and as dietary supplements to treat diarrhea, autism, cancer and other. This book Zeolites and Their Applications deals with several aspects of zeolite morphology, synthesis and applications. The book is divided into three sections and structured into nine chapters. The first section includes the introductory chapter, the second section explains mineralogy, morphology and synthesis of zeolites and the third section focuses on the different applications of both natural and synthetic zeolites. So, in this book, the readers will obtain updated information on mineralogy, morphology, synthesis and application of zeolites. Scientists from different scientific fields reported in this book their findings.

John E. Kinsella, Dean ofthe College of Agricultural and Environmental Sciences at the University of California-Davis, passed away on May 2, 1993, at the age of 55. In August 1995, fonner students and post-doctoral fellows of Dr. Kinsella met at the American Chemical Society National Meeting in Chicago to convene a Symposium on Food Proteins and Lipids to honor Dr. Kinsella's enonnous contribution to the field of food science and nutrition. This book is a collection of papers presented at that symposium. A native of Ireland, Dr. Kinsella received his bachelor's degree in agricultural sciences in 1961 from the University of Dublin. He received his master's degree in biology in 1965 and a doctorate in food chemistry in 1967 from

Pennsylvania State University. He joined the Food Science faculty at Cornell University in 1967. While at Cornell, he served as Chair of the Department of Food Science from 1977-1985 and Director of the Institute of Food Science from 1980-1987. He was designated Liberty Hyde Bailey Professor of Food Biochemistry in 1981, a Fulbright Fellow in 1983, and was selected as the General Foods Distinguished Professor of Food Science in 1984. He was named a Leading Professor in the State University of New York, the highest professorial honor in the SUNY system. In 1990 he joined the University of California at Davis as Dean of the College of Agricultural and Environmental Sciences. Dr.

Effective Depositions is a comprehensive, practical guide through every stage of the deposition process. It concisely covers the law of depositions and related discovery issues and gives you a clear, thorough understanding of the process and its practical challenges and pitfalls so that you can make the best use of the opportunities the process offers. It contains numerous case studies and clearly-explained examples, in addition to models, sample forms and checklists.

The book compiles scientific articles describing advances in nanomaterial synthesis and their application in water remediation. The publications treat diverse problems such as dye degradation, heavy metal ion, as well as radioactive element capture and sequestration. There are 10 original research articles and one review article. The latter proposes graphene/CNT and Prussian blue nanocomposites for radioactive 137-cesium extraction from aqueous media. All reports thoroughly characterize the nanomaterials post-synthesis and describe their catalytic, photocatalytic, or ion exchange activities in contaminated water. The dyes studied in the collection are azo dyes, i.e. methylene blue and orange, rhodamine B, phenolic dyes viz. bromophenol blue, and other dyes with sulfonyl groups. Extraction of radioactive elements,

including cationic 137Cs+ and anionic 125I?, is also investigated. The omnipresence of ZnO nanoparticles in everyday products and their effects in wastewater are also evaluated. Layered double hydroxide are capable of capturing Ag ions, which then has a catalytic effect on dye degradation. The nanomaterials considered are varied, viz., graphene, CNT, Prussian blue, nanoporous carbon, layered double hydroxides, magnetite, ferrites, organic powders, polymer membranes, bacteria, and inorganic nanomaterials such as MnO and Ag. The book targets an interdisciplinary readership.

An eclectic mix of studies on chemical and electrochemical behaviour of membrane surfaces. The book looks at membranes - both organic and inorganic - from a host of different perspectives and in the context of many diverse disciplines. It explores the behaviours of both synthetic and biological membranes, employing physical, chemical and physiochem

Recent Progress in Mesostructured Materials is a selection of oral and poster communications presented during the 5th International Mesostructured Materials Symposium (5th IMMS2006). Authorized by International Mesostructured Material Association (IMMA) and hosted by the Fudan University, China. The scope of this involved field covers both traditional inorganic mesostructured molecular sieves and mesostructured materials like organic polymers, metals, organic-inorganic nanocomposites, and ordered mesoporous carbons, the hot topics in chemistry, crystallization, structure, liquid crystalline, catalysis and materials science. This symposium provided a forum for the presentation of the most novel development and knowledge in the science and technology of mesostructured materials. Papers presented cover a wide range of topics that include synthesis, structure determination, characterisation, modelling, and application in catalysis, adsorption, biochemistry and advanced material

sciences. * This highly visual book is a must for readers looking to stay up-to-date on mesostructure science * A selection of more than 200 oral and poster papers, covering research aspects/developing trends of mesostructured materials * An important reference for those working in the material science, catalysis and biotechnology fields