Co 2 Adsorption And Desorption Studies For Zeolite 4a

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Springer Nature
This book comprises the refereed proceedings of the International Conferences, MAS and ASNT 2012, held in conjunction with GST 2012

on Jeju Island, Korea, in November/December 2012. The papers presented were carefully reviewed and selected from numerous submissions and focus on the various aspects of modeling and simulation, and automotive science and technology. **Supercapacitive Swing Adsorption of Carbon Dioxide** John Wiley & Sons This book provides a detailed description of metal-complex functionalized carbon allotrope forms, including classic (such as graphite), rare (such as M- or T-carbon), and nanoforms (such as carbon nanotubes, nanodiamonds, etc.). Filling a void in the nanotechnology literature, the book presents chapters generalizing the synthesis, structure, properties, and applications of all known carbon allotropes. Metal-complex composites of carbons are described, along with several examples of their preparation and characterization, soluble metal-complex carbon composites, cost-benefit data, metal complexes as precursors of carbon allotropes, and applications. A lab manual on the synthesis and characterization of carbon allotropes and their metal-complex composites is

included. Provides a complete description of all carbon allotropes, both classic and rare, as well as carbon nanostructures and their metal-complex composites; Contains a laboratory manual of experiments on the synthesis and characterization of metal-complex carbon composites; Discusses applications in diverse fields, such as catalysis on supporting materials, water treatment, sensors, drug delivery, and devices.

Methane and Carbon Dioxide Adsorption Capacity Estimation and Modeling on Coals

BiblioGov

The objective of this work was to evaluate the fundamentals of the currently available CO2 separation technologies and provide a solution for the efficient capture of carbon dioxide from various point source emitting industries. In order to realize a robust approach to advancing the solution to this global issue, the versatility of the process to the range of compounds contained within the stream(s) to be processed must be maintained. It is clear that adsorption, membrane, and aqueous amine based processes are all capable. However, only aqueous amine scrubbing appears economically viable at the

current stage of development. In order to challenge this, and potentially drive the separation costs lower, this work centered on hybridizing aqueous amine chemistry and dry adsorption based separations to produce a novel nano-porous material capable of efficient removal of CO2 from flue gas (5% CO2 balance N2 with moisture). In order to combine aqueous amine scrubbing with dry adsorption, a few approaches were considered and evaluated. These included, amine impregnation within the vast pore volume of PE-MCM-41, surface grafting of various amino silane compounds, and finally, a novel approach of volume based amine functionalizati on (3D grafting). Application of pore-expanded MCM-41 (PE-MCM-41) mesoporous silica coated with 3-[2-(2-aminoethyl-amino)ethyla mino]propyltri methoxysilane (TRI) has been extensively examined for the adsorption of CO2 from N2. A systematic study of the amine loading as a function of the relative amounts of TRI and water used during the grafting procedure, and the temperature of the grafting reaction was

carried out. Extremely high levels of active amine content were achieved using prehydrated silica surfaces at grafting temperatures below reflux in order to facilitate thermally controlled water-aided surface polymerization of the aminosilanes. Abstract iii The CO2 adsorption capacities and rates were determined for all materials as a function of the amount of TRI and water per gram of support added to the grafting mixture. The optimal TRI grafted PE-MCM-41 adsorbent exhibited a 2.65 mmol/g adsorption capacity at 25 °C and 1.0 atm for a dry 5% CO2 in N2 feed mixture, which exceeded all literature reported values, for both meso- and microporous materials under the conditions used in this study. Further, the apparent adsorption and desorption rates with the amine functionalized materials were exceedingly high. When considering the grafted amine quantity, the adsorption capacity and rate were found to be mutually dependent on each other, exhibiting an apparent optimal combination. In comparison to zeolite 13X, the optimally loaded TRI-PE-MCM-41 was far superior in terms of dynamic adsorption

and desorption performance. These results were further enhanced when the adsorbents were challenged with a humid stream of 5% CO2/N2. The TRIPE-MCM-41 exhibited a 10% increase in CO2 adsorption capacity, whereas the 13X zeolite did not retain any significant CO2 adsorption capacity. The novel concept of an internally variably staged permeator was introduced. A theoretical model was developed and used as the basis for simulation studies. The advantage of the internal variably staged design was shown to permit a very high extent of separation similar to a two stage permeator for purity, while maintaining similar flux rates as per a single stage permeator. This IVSP concept has also taken existing membrane materials and mechanically translated their process performance to a higher level. As such, the unit should prove effective for front end process stream cleanup requirements prior to an adsorption process with the novel TRI-PE-MCM-41 nano-porous adsorbent.

Modelling, Design, Control and Integration

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Zeolite scientists, whether they are working in synthesis, catalysis,

characterization or application development, use the Atlas of Zeolite Framework Types as a reference. It describes the main features of all of the confirmed zeolite framework structures, and gives references to the relevant primary structural literature. Since the last edition 34 more framwork types have been approved and are described in this new edition. A further new feature will be that characteristic building units will be listed for each of the framework types. Zeolites and their analogs are used as desiccants, as water softeners, as shape-selective acid catalysts, as molecular sieves, as concentrators of radioactive isotopes, as blood clotting agents, and even as additives to animal feeds. Recently, their suitability as hosts for nanometer spacing of atomic clusters has also been demonstrated. These diverse applications are a reflection of the fascinating structures of these microporous materials. Each time a new zeolite framework structure is reported, it is examined by the Structure Commission of the International Zeolite Association (IZA-SC), and if it is found to be unique and to conform to the IZA-SC's

definition of a zeolite, it is assigned a 3-letter framework type code. This code is part of the official IUPAC nomenclature for microporous materials. The Atlas of Zeolite Framework Types is essentially a compilation of data for each of these confirmed framework types. These data include a stereo drawing showing the framework connectivity, features that characterize the idealized framework structure, a list of materials with this framework type, information on the type material that was used to establish the framework type, and stereo drawings of the pore openings of the type material. * Clear stereo drawings of each of the framework types * Description of the features of the framework type, allowing readers to quickly see if the framework type is suitable to their needs * References to isotypic materials, readers can quickly identify related materials and consult the appropriate reference *Adsorption and Desorption of CO2 on Solid Sorbents* Springer Science & Business Media This book contains papers presented in the 3rd International Conference on Separation

Technology 2020 (ICoST 2020) held from 15 to 16th August 2020 at Johor, Malaysia. This proceeding contains papers presented by academics and industrial practitioners showcasing the latest advancements and findings in field of separation technology. The papers are categorized under the following tracks and topics of research: Environment Engineering Biotechnology Absorption and Adsorption Technology Wastewater Treatment ICoST 2020 covers multidisciplinary perspectives on separation research and aims to promote scientific information interchange between academics, researchers, graduates and industry professionals worldwide. This conference provides opportunities for the delegates to exchange new ideas and application experiences face to face, to establish business or research relations and to find global partners for future collaboration. *Negative Emissions Technologies and Reliable Sequestration* Royal Society of Chemistry The experimental results of CO2 adsorption and desorption in a packed column indicated that the concentration wave front at the center of

the packed column differs from those which are close to the wall of column filled with adsorbent material even though the ratio of column diameter to the particle size is greater than 20. The comparison of the experimental results with one dimensional model of packed column shows that in order to simulate the average breakthrough in a packed column a two dimensional (radial and axial) model of packed column is needed. In this paper the mathematical model of a non-slip flow through a packed column with 2 inches in diameter and 18 inches in length filled with 5A zeolite pellets is presented. The comparison of experimental results of CO2 absorption and desorption for the mixed and central breakthrough of the packed column with numerical results is also presented. Adsorption of CO2 on Indian Coals Springer IPCC Report on sources, capture, transport, and storage of CO2, for researchers, policy-makers and engineers. Adsorption of Supercritical Carbon Dioxide on Microporous Adsorbents Springer Science & Business Media CO2 Adsorption with a Nanoporous Amine-modified Sorbent

Development of an Acid Gas Adsorbent for CO2 Removal with Increased Performance in the Presence of Moisture CO2 Adsorption with a Nanoporous Amine-modified SorbentThe sorbents for separation of CO2 from ultra dilute gas streams are required to be able to achieve high CO2 sorption capacities, although CO2 concentrations of such gases are extremely low. They are also expected to have fast adsorption kinetics at low temperature ranges (e.g., 5-30°C). In addition, their CO2 desorption kinetics should be fast, as is expected for any other sorbents. An alternative amine-based sorbent (referred as RFAS) developed in this work was assessed under various conditions. Studies showed that the CO2 sorption capacities of the sorbent increased considerably with N loading, slowly with increasing temperature (apparently contrary to the prediction with the isothermal equation of exothermic sorption), and gradually with the decease of gas flow rate in the tested range. In addition, CO2 sorption capacity increased and then decreased with increasing H2O:CO2 mole ratio and the stoichiometric ratio 1:1 is the turning point. The CO2 sorption

capacities achieved by the sorbent with 8.07 mmol N/g for air with 400 ppm CO2 and the CO2 -N2 gas mixtures containing 1 vol-% CO2, were 1.78 mmol CO2 /g and 1.92 mmol CO2 /g, respectively, higher than those reported in the most recent literature. A kinetic model corresponding to three proposed pathways was derived and expected to quantitatively predict the CO2 sorption characteristics given that the involved parameters can be established in the future. The half-CO2 - adsorption and desorption times of the sorbent along with temperatures were used to evaluate the dynamics of the sorbent. The adsorbed CO2 can be completely desorbed at only 80°C within as short as 30 minutes. The CO2 sorption capacities of the sorbent within 10 sorption-desorption cycles are repeatable. All the results confirmed that the sorbent is a highly adsorptive, reversibly dynamic, and regenerable sorbent for capture of ultradilute CO2 from gas mixtures. Key words: carbon dioxide emissions, carbon dioxide capture and sequestration, amine-based solid adsorbents, air capture, adsorption capacity.Experimental and Numerical Investigation of Two Dimensional

Co2 Adsorption/Desorption in Packed Sorption Beds Under Non-Ideal Flows Taking you to the forefront of the emerging field of Nanofluidics, this cutting-edge book details the physics and applications of fluid flow in nanometer scale channels. You gain a solid understanding of the fundamental aspects of transport processes and force interactions in microscale. Moreover, this unique resource presents the latest research on nanoscale transport phenomena. You find a comprehensive overview of fabrication technologies for nanotechnologies, including detailed technology recipes and parameters. The book concludes with a look at future trends and the possible directions this new field could take. Atlas of Zeolite Framework Types Royal Society of Chemistry This book focuses on modelling issues and their implications for the correct design of reactive absorption–desorption systems. In addition, it addresses the case of carbon dioxide (CO2) post-combustion capture in detail. The book proposes a new perspective on these systems, and provides technological solutions with

comparisons to previous treatments of the subject. The model that is proposed is subsequently validated using experimental data. In addition, the book features graphs to guide readers with immediate visualizations of the benefits of the methodology proposed. It shows a systematic procedure for the steady-state model-based design of a CO2 post-combustion capture plant that employs reactive absorption-stripping, using monoethanolamine as the solvent. It also discusses the minimization of energy consumption, both through the modification of the plant flowsheet and the set-up of the operating parameters. The book offers a unique source of information for researchers and practitioners alike, as it also includes an economic analysis of the complete plant. Further, it will be of interest to all academics and students whose work involves reactive absorption-stripping design and the modelling of reactive absorption-stripping systems. Computer Applications for Modeling, Simulation, and Automobile Springer CO2 is an important greenhouse gas leading to global climate change. Capturing CO2 from power

plants, i.e., coal-fired and natural gas-fired power plants, has been considered as an effective method to control the atmospheric CO2 concentration . The traditional solid amine adsorbents have been widely studied in CO2 capture process because of their low toxicity, low corrosion to the equipment, and low heat capacity. However, the elevated temperature required for desorbing CO2 from solid amine adsorbents could significantly increase the capture cost and have the potential of degradation. In this research, a novel solid amine adsorbent, amine-immobilized elastomers (i.e., PEI-elastomer), were proposed to efficiently adsorb and desorb CO2 by applying the stretching process. At room temperature, the PEI-elastomers could react with CO2 and form weakly adsorbed CO2, i.e., ammonium carbamates, which can be desorbed under stretching. Desorption of CO2 from the stretched PEI elastomer can be attributed to the reduced amine density and generated heat during stretching. The new concept of the PEI-elastomer adsorbents may open up a new low-cost CO2 capture

process for coal-fired and natural-gas-fired power plants. *Absorption, Adsorption, and Membrane Separation Methods* BoD – Books on Demand The aim of this book has been to explore the variety of phenomena associated with the major forms of the material, while laying the foundation for a clear and detailed working and understanding of the materials. We tried to present new types of advanced materials, which are currently a hot topic, and provide readers with a selective review of important improvements in the field. I believe that every chapter in this book presents the progress in the subject and describes the latest advances in microporous and mesoporous materials. CO2 Adsorption with a Nanoporous Amine-modified Sorbent Elsevier "An innovative preparation method is developed to highly improve the carbon dioxide capture capacity of the silica sorbents. In the previously used sorbent treatment method, free hydroxyl groups of silica available for further reaction are obtained by silica dehydration at high temperature. This new approach, however, grafts

tetraethylenepentamine (TEPA) onto silica surface directly via incipient wetness impregnation (IWI) of TEPA/ethanol solutions at room temperature. The CO2 adsorption/desorption performance of the catalysts is studied by Diffused Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) and Mass Spectrometer (MS) spectroscopy both qualitatively and quantitatively. The concentration of TEPA/ethanol solutions influences the deposit process of pentamine molecules onto silica particles by controlling the concentration differential of TEPA between the bulk solution and the surface layer. Samples treated with more concentrated solutions had higher maximum carbon dioxide adsorption values, calculated from the calibrated CO2 desorption peak area of MS spectra. The loading amount of solution also affects the mass transfer rate and equilibrium of TEPA. After the concentration is equilibrated between the bulk and the surface, the system lost the concentration gradient between bulk solution and silica surfaces, excessive pentamine solution removes the

grafted pentamine molecules, and makes the carbon dioxide capture capacity curve drop from the peak point. The 0.03g silica treated by 2%, 10% and 20% TEPA/EtOH solution got the CO2 adsorption capacity of 1545.03, 4590.28 and 7674.99 [mu]mol/g-sorbent, respectively. Two pretreatment methods of silica sorbents, ethanol pretreatment and carbon dioxide pretreatment, are used to further enhance the adsorption performance. In the former pretreatment, ethanol solvent is injected before each injection of TEPA solution, and in the latter, TEPA solution is injected in the atmosphere of a carbon dioxide gas. The principles behind these pretreatments underlie mass and momentum transfer processes. After the injection of TEPA/ethanol solution, the TEPA layer on silica surface becomes more and more concentrated with the solvent evaporation. Pores and channels are likely to be blocked by the high viscous TEPA on silica surfaces. Sufficient solvent molecules in the ethanol pretreatment help more than keep the concentration gradient between the bulk and surface and maintain a

driving force to deposit the TEPA onto silica surfaces, an appropriate viscosity assists TEPA molecules diffuse deeper. 0.03g silica at the loading of 200 [mu]l, 20% TEPA/EtOH solution, the maximum CO2 adsorption capacity is 8362.36 [mu]mol/g-sorbent with Ethanol pretreatment approach. The grafted pentamine molecules on silica surface can form inter-molecular H-bonds, which consume the functional amine groups and reduce the surface area available for CO2 capture. Carbon dioxide was used to protect these free NH groups in the carbon dioxide pretreatment. DRIFTS and MS spectroscopy analysis shows either way gives the sorbent a higher carbon dioxide adsorption capacity than those without any pretreatment. 0.03g silica at the loading of 250 [mu]l, 20% TEPA/EtOH solution, the maximum CO2 adsorption capacity is 9455.58 [mu]mol/g-sorbent with CO2 pretreatment approach."--Abstract.

Experimental and Numerical Investigation of Two Dimensional Co2 Adsorption/Desorption in Packed Sorption Beds Under Non-Ideal Flows

Springer Fossil fuels

still need to meet the growing demand of global economic development, yet they are often considered as one of the main sources of the CO2 release in the atmosphere. CO2, which is the primary greenhouse gas (GHG), is periodically exchanged among the land surface, ocean, and atmosphere where various creatures absorb and produce it daily. However, the balanced processes of producing and consuming the CO2 by nature are unfortunately faced by the anthropogenic release of CO2. Decreasing the emissions of these greenhouse gases is becoming more urgent. Therefore, carbon sequestration and storage (CSS) of CO2, its utilization in oil recovery, as well as its conversion into fuels and chemicals emerge as active options and potential strategies to mitigate CO2 emissions and climate change, energy crises, and challenges in the storage of energy. Methane and Carbon Dioxide Adsorption/desorption Isotherms for Powder River Basin Coal BoD – Books on Demand CO2 capture and sequestration from coal-fired power plant flue gas is an attractive technique to control CO2 emissions. Polyamine-based sorbent is considered

as a promising sorbent for CO2 capture due to its low equipment corrosion and regeneration energy penalty. One critical aspect of development of polyamine-based CO2 capture process is to understand the nature of the adsorbed species with amine and their evolution in adsorption / desorption process. Fourier transform infrared (FTIR) spectroscopy is a powerful and versatile tool that can provide the insights from molecular level to address these scientific issues. This dissertation is focusing on using in-situ FTIR spectroscopy to discuss several important topics in CO2 capture and utilization processes, including (i) the structure and binding energy of adsorbed CO2/H2O on solid amine sorbent, (ii) the role of H2O in CO2 adsorption/de sorption on liquid amine films, (iii) mechanism of water-enhancement on CO2 capture by amine, and (iv) photoelectrocatalytic reduction of CO2 on polyamine/TiO2 thin film.H2O vapor in flue gas has dramatic effects on polyamine-based sorbent. H2O could affect CO2 capture capacity, regeneration energy, and degradation kinetics of the sorbents. This in situ IR study

investigated these various effects on polyamine-based sorbents. The results revealed that CO2 adsorbed on primary amine as ammonium carbamate while H2O adsorbed on secondary amine and promoted the formation of carbamic acid. Adsorbed H2O increases the binding strength of CO2 with amine and protects sorbent from SO2 poisoning. The results of this study clarify the role of H2O in polyamine-based sorbent for CO2 capture and provide a molecular basis for the design and operation of polyamine-based CO2 capture processes. The use of FTIR spectroscopy in the investigation of role of water on CO2 capture by amine has enabled us to verify the reaction processes. The results unraveled that adsorption of CO2 on the 20 µm tetraethylenepentamine (TEPA) film at 50 °C followed a zwitterion-intermediate pathway: zwitterion ¿ ammonium carbamate. H2O in the mixed TEPA/H2O (5:1) film decreased the rate of CO2 adsorption, but increased the amine efficiency. The presence of H2O promotes the formation of carbamic acid and produces a broad IR band centered at 2535 cm-1, which can be assigned to

(O-H) of hydronium carbamate, -NCOO-···H-OH2+. The broadness of this 2535 cm-1 band ranging from 2100 cm-1 to 2800 cm-1 persists at 120 °C. These broad components of the band can be ascribed to ¿(N-H) in hydrogen-bonded ammonium carbamate, a R-NH3+/R1R2-NH2+···-NCOO- moiety. The binding strength of adsorbed species on the TEPA film increases in the order: adsorbed H2O

Experiment and Simulation

John Wiley & Sons

This comprehensive volume brings together an extensive collection of systematic computer-aided tools and methods developed in recent years for CO2 capture applications, and presents a structured and organized account of works from internationally acknowledged scientists and engineers, through: Modeling of materials and processes based on chemical and physical principles Design of materials and processes based on systematic optimization methods Utilization of advanced control and integration methods in process and plant-wide operations The tools and methods described are illustrated through case studies on materials such as solvents,

adsorbents, and membranes, and on processes such as absorption / desorption, pressure and vacuum swing adsorption, membranes, oxycombustion, solid looping, etc. Process Systems and Materials for CO2 Capture: Modelling, Design, Control and Integration should become the essential introductory resource for researchers and industrial practitioners in the field of CO2 capture technology who wish to explore developments in computer-aided tools and methods. In addition, it aims to introduce CO2 capture technologies to process systems engineers working in the development of general computational tools and methods by highlighting opportunities for new developments to address the needs and challenges in CO2 capture technologies. Cleaner Combustion and Sustainable World Artech House CO2 sorption studies were conducted for Raniganj coals of India from the point of view of CO2 adsorption & desorption and the effect of temperature, coal particle size and media pH. Adsorption and desorption studies were conducted for 4 samples with the highest adsorption capacity reported as 11.09mL/g of

coal and lowest as 5.15mL/g at 30°C. Desorption studies revealed the existence of both positive and negative hysteresis curves. The minimum desorption capacity was attained for S -2, 1.29ml/g at the pressure of 22.361Psi. Hystresis was minimum for sample 1. While sample 3 and sample 5 showed maximum positive hysteresis. The hysteresis increases with increasing pressure initially and extended till 600Psi. Experimental data were verified using several adsorption isotherms such as Langmuir, BET, Dubinin-Astakhov (D-A) and Dubinin-Radushkevich (D-R). The Langmuir isotherm model was failed to predict the data accurately. The D-A model gave an enough satisfactory representation suggesting that the pore filling model proposed by the Polany. Sorption studies conducted at 30, 31.1, 40 and 50°C revealed that adsorption decreased with increase in temperature. These values were also compared with those obtained through the characteristic plots defined by the Dubinin-Ashtakov equation. CO2 adsorption behavior at new temperature fit in with the experimental data reported

for CO2 adsorption below its critical temperature. The effect of particle size was studied by considering samples of 150æm, 650æm and 850æm and it was found that adsorption capacity decreased with increase in particle size. As far as the effect of pH was concerned, the adsorption capacity was highest for acidic media followed by alkaline media and neutral media.

In Situ Infrared Studies of Carbon Dioxide Capture and Photoelectrocatalytic Reduction Springer Addresses materials, technology, and products that could help solve the global environmental crisis once commercialized This multidisciplinary book encompasses state-of-the-art research on the topics of Carbon Capture and Storage (CCS), and complements existing CCS technique publications with the newest research and reviews. It discusses key challenges involved in the CCS materials design, processing, and modeling and provides in-depth coverage of solvent-based carbon capture, sorbent-based carbon capture, membrane-based carbon capture, novel carbon capture methods, computational modeling, carbon

capture materials including metal organic frameworks (MOF), electrochemical capture and conversion, membranes and solvents, and geological sequestration. Materials and Processes for CO2 Capture, Conversion and Sequestration offers chapters on: Carbon Capture in Metal-Organic Frameworks; Metal Organic Frameworks Materials for Post-Combustion CO2 Capture; New Progress of Microporous Metal-Organic Frameworks in CO2 Capture and Separation; In Situ Diffraction Studies of Selected Metal-Organic Framework (MOF) Materials for Guest Capture Applications; Electrochemical CO2 Capture and Conversion; Electrochemical Valorization of Carbon Dioxide in Molten Salts; Microstructural and Structural Characterization of Materials for CO2 Storage using Multi-Scale X-Ray Scattering Methods; Contribution of Density Functional Theory to Microporous Materials for Carbon Capture; and Computational Modeling Study of MnO2 Octahedral Molecular Sieves for Carbon Dioxide Capture Applications. Addresses one of the most pressing concerns of society—that of environmental damage caused by the greenhouse gases emitted

as we use fossil fuels Covers cutting-edge capture technology with a focus on materials and technology rather than regulation and cost Highlights the common and novel CCS materials that are of greatest interest to industrial researchers Provides insight into CCS materials design, processing characterization, and computer modeling Materials and Processes for CO2 Capture, Conversion and Sequestration is ideal for materials scientists and engineers, energy scientists and engineers, inorganic chemists, environmental scientists, pollution control scientists, and carbon chemists.

CO2 Adsorption on Amine-coated Elastomers Springer Science & Business

Adopting a unique integrated engineering approach, this text covers all aspects of fuel processing: catalysts, reactors, chemical plant components and integrated system design. While providing an introduction to the subject, it also contains recent research developments, making this an invaluable handbook for chemical, power and process engineers, electrochemists, catalytic chemists, materials scientists and engineers in power technology.

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Layered Double Hydroxides as CO2 Adsorbents for Sorption-enhanced H2 Production
Springer Nature
This multi-authored book provides a comprehensive overview of the latest developments in porous CO2 capture materials, including ionic liquid–derived carbonaceous adsorbents, porous carbons, metal-organic frameworks, porous aromatic frameworks, micro porous organic polymers. It also reviews the sorption techniques such as cyclic uptake and desorption reactions and membrane separations. In each category, the design and fabrication, the comprehensive characterization, the evaluation of CO2 sorption/separation and the sorption/degradation mechanism are highlighted. In addition, the advantages and remaining challenges as well as future perspectives for each porous material are covered. This book is aimed at scientists and graduate students in such fields as separation, carbon, polymer, chemistry, material science and technology, who will use and appreciate this information source in their research. Other specialists may consult specific chapters to find the latest,

authoritative reviews. Dr. An-Hui Lu is a Professor at the State Key Laboratory of Fine Chemicals, School of Chemical Engineering, Faculty of Chemical, Environmental and Biological Science and Technology, Dalian University of Technology, China. Dr. Sheng Dai is a Corporate Fellow and Group Leader in the Chemical Sciences Division at Oak Ridge National Laboratory (ORNL) and a Professor of Chemistry at the University of Tennessee, USA.