Carbon Dioxide Storage In Geological Media Underground Storage Methods

Carbon Dioxide Capture for Storage in Deep Geologic FormationsGeologically Storing CarbonCarbon Capture, Utilization and SequestrationCarbon Capture and StorageGeological Disposal of Carbon Dioxide and Radioactive Waste: A Comparative AssessmentCarbon Dioxide Capture and StorageCarbon Capture and StorageGeological Storage of CO2 in Deep Saline FormationsCarbon Dioxide Chemistry, Capture and Oil RecoveryGeological Storage of Carbon Dioxide (CO2)Negative Emissions Technologies and Reliable SequestrationGeophysics and GeosequestrationGeological Carbon StorageCarbon Capture and StorageData-Driven Analytics for the Geological Storage of CO2Carbon Capture and StorageUnderground Storage of CO2 and EnergyGeologic Carbon SequestrationCarbon Capture, Storage and UtilizationCCS GuidelinesCO2 Sequestration and ValorizationGeological Storage of Carbon Dioxide (CO2)Geochemistry of Geologic CO2 SequestrationHow to Store CO2 Underground: Insights from early-mover CCS ProjectsCarbon Capture and its StorageCarbon Dioxide Sequestration in Geological MediaA Technical Basis for Carbon Dioxide StorageCarbon Sequestration for Climate Change Mitigation and AdaptationRecent Advances in Carbon Capture and StorageCarbon Sequestration and Its Role in the Global Carbon CycleClimate

InterventionGeologic Framework for the National Assessment of Carbon Dioxide Storage ResourcesGeological CO2 Storage CharacterizationAdvances in the Geological Storage of Carbon DioxideArid Environments and SustainabilityGeological Storage of CO2 – Long Term Security AspectsScience of Carbon Storage in Deep Saline FormationsGeological Storage of CO2Greenhouse GasesCarbon Capture and Storage

Carbon Dioxide Capture for Storage in Deep Geologic Formations

This book investigates geological CO2 storage and its role in greenhouse gas emissions reduction, enhanced oil recovery, and environmentally responsible use of fossil fuels. Written for energy/environmental regulators at every level of government (federal, state, etc.), scientists/academics, representatives from the power and fossil energy sectors, NGOs, and other interested parties, this book uses the characterization of the Rock Springs Uplift site in Wyoming as an integrated case study to illustrate the application of geological CO2 storage science, principles, and theory in a real-world scenario.

Geologically Storing Carbon

This book is divided in two sections. Several chapters in the first section provide a state-of-the-art review of various carbon sinks for CO2 sequestration such as soil and oceans. Other chapters discuss the carbon

sequestration achieved by storage in kerogen nanopores, CO2 miscible flooding and generation of energy efficient solvents for postcombustion CO2 capture. The chapters in the second section focus on monitoring and tracking of CO2 migration in various types of storage sites, as well as important physical parameters relevant to sequestration. Both researchers and students should find the material useful in their work.

Carbon Capture, Utilization and Sequestration

The signals are everywhere that our planet is experiencing significant climate change. It is clear that we need to reduce the emissions of carbon dioxide and other greenhouse gases from our atmosphere if we want to avoid greatly increased risk of damage from climate change. Aggressively pursuing a program of emissions abatement or mitigation will show results over a timescale of many decades. How do we actively remove carbon dioxide from the atmosphere to make a bigger difference more quickly? As one of a two-book report, this volume of Climate Intervention discusses CDR, the carbon dioxide removal of greenhouse gas emissions from the atmosphere and sequestration of it in perpetuity. Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration introduces possible CDR approaches and then discusses them in depth. Land management practices, such as low-till agriculture, reforestation and afforestation, ocean iron fertilization, and land-and-ocean-based accelerated

weathering, could amplify the rates of processes that are already occurring as part of the natural carbon cycle. Other CDR approaches, such as bioenergy with carbon capture and sequestration, direct air capture and sequestration, and traditional carbon capture and sequestration, seek to capture CO2 from the atmosphere and dispose of it by pumping it underground at high pressure. This book looks at the pros and cons of these options and estimates possible rates of removal and total amounts that might be removed via these methods. With whatever portfolio of technologies the transition is achieved, eliminating the carbon dioxide emissions from the global energy and transportation systems will pose an enormous technical, economic, and social challenge that will likely take decades of concerted effort to achieve. Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration will help to better understand the potential cost and performance of CDR strategies to inform debate and decision making as we work to stabilize and reduce atmospheric concentrations of carbon dioxide.

Carbon Capture and Storage

Geological Disposal of Carbon Dioxide and Radioactive Waste: A Comparative Assessment

The Carbon Dioxide Capture and Storage (CCS) Guidelines effort was initiated to develop a set of preliminary guidelines and recommendations for the

deployment of CCS technologies in the United States, to ensure that CCS projects are conducted safely and effectively. The guidelines are written for those who may be involved in decisions on a proposed project: the developers, regulators, financiers, insurers, project operators, and policy makers. These guidelines are intended to guide full-scale demonstration of and build public confidence in CCS technologies by informing how projects should be conducted.

Carbon Dioxide Capture and Storage

This book focuses on issues related to a suite of technologies known asCarbon Capture and Storage (CCS), which can be used to capture and store underground large amounts of industrial CO2 emissions. It addresses how CCS should work, as well as where, why, and how these technologies should be deployed, emphasizing the gaps to be filled in terms o

Carbon Capture and Storage

This exclusive compilation written by eminent experts from more than ten countries, outlines the processes and methods for geologic sequestration in different sinks. It discusses and highlights the details of individual storage types, including recent advances in the science and technology of carbon storage. The topic is of immense interest to geoscientists, reservoir engineers, environmentalists and researchers from the scientific and industrial communities working on the methodologies for carbon dioxide storage.

Increasing concentrations of anthropogenic carbon dioxide in the atmosphere are often held responsible for the rising temperature of the globe. Geologic sequestration prevents atmospheric release of the waste greenhouse gases by storing them underground for geologically significant periods of time. The book addresses the need for an understanding of carbon reservoir characteristics and behavior. Other book volumes on carbon capture, utilization and storage (CCUS) attempt to cover the entire process of CCUS, but the topic of geologic sequestration is not discussed in detail. This book focuses on the recent trends and up-to-date information on different storage rock types, ranging from deep saline aquifers to coal to basaltic formations.

Geological Storage of CO2 in Deep Saline Formations

Geological storage and sequestration of carbon dioxide, in saline aquifers, depleted oil and gas fields or unminable coal seams, represents one of the most important processes for reducing humankind’s emissions of greenhouse gases. Geological storage of carbon dioxide (CO2) reviews the techniques and wider implications of carbon dioxide capture and storage (CCS). Part one provides an overview of the fundamentals of the geological storage of CO2. Chapters discuss anthropogenic climate change and the role of CCS, the modelling of storage capacity, injectivity, migration and trapping of CO2, the monitoring of geological storage of CO2, and the role

of pressure in CCS. Chapters in part two move on to explore the environmental, social and regulatory aspects of CCS including CO2 leakage from geological storage facilities, risk assessment of CO2 storage complexes and public engagement in projects, and the legal framework for CCS. Finally, part three focuses on a variety of different projects and includes case studies of offshore CO2 storage at Sleipner natural gas field beneath the North Sea, the CO2CRC Otway Project in Australia, on-shore CO2 storage at the Ketzin pilot site in Germany, and the K12-B CO2 injection project in the Netherlands. Geological storage of carbon dioxide (CO2) is a comprehensive resource for geoscientists and geotechnical engineers and academics and researches interested in the field. Reviews the techniques and wider implications of carbon dioxide capture and storage (CCS) An overview of the fundamentals of the geological storage of CO2 discussing the modelling of storage capacity, injectivity, migration and trapping of CO2 among other subjects Explores the environmental, social and regulatory aspects of CCS including CO2 leakage from geological storage facilities, risk assessment of CO2 storage complexes and the legal framework for CCS

Carbon Dioxide Chemistry, Capture and Oil Recovery

Despite the large research effort in both public and commercial companies, no textbook has yet been written on this subject. This book aims to provide an overview to the topic of Carbon Capture and Storage

(CSS), while at the same time focusing on the dominant processes and the mathematical and numerical methods that need to be employed in order to analyze the relevant systems. The book clearly states the carbon problem and the role of CCS and carbon storage. Thereafter, it provides an introduction to single phase and multi-phase flow in porous media, including some of the most common mathematical analysis and an overview of numerical methods for the equations. A considerable part of the book discusses the appropriate scales of modeling, and how to formulate consistent governing equations at these scales. The book also illustrates real world data sets and how the ideas in the book can be exploited through combinations of analytical and numerical approaches.

Geological Storage of Carbon Dioxide (CO2)

This book provides an understanding of the role of human activities in accelerating change in global carbon cycling summarizes current knowledge of the contemporary carbon budget. Starting from the geological history, this volume follows a multidisciplinary approach to analyze the role of human activities in perturbing carbon cycling by quantifying changes in different reservoirs and fluxes of carbon with emphasis on the anthropogenic activities, especially after the industrial revolution. It covers the role of different mitigation options – natural ecological, engineered, and geoengineered processes as well as the emerging field of climate

engineering in avoiding dangerous abrupt climate change. Although the targeted audience is the educators, students, researchers and scientific community, the simplified analysis and synthesis of current and up to date scientific literature makes the volume easier to understand and a tool policy makers can use to make an informed policy decisions.

Negative Emissions Technologies and Reliable Sequestration

Carbon capture and storage (CCS) is among the advanced energy technologies suggested to make the conventional fossil fuel sources environmentally sustainable. It is of particular importance to coal-based economies. This book deals at length with the various aspects of carbon dioxide capture, its utilization and takes a closer look at the earth processes in carbon dioxide storage. It discusses potential of Carbon Capture, Storage, and Utilization as innovative energy technology towards a sustainable energy future. Various techniques of carbon dioxide recovery from power plants by physical, chemical, and biological means as well as challenges and prospects in biomimetic carbon sequestration are described. Carbon fixation potential in coal mines and in saline aquifers is also discussed. Please note: This volume is Co-published with The Energy and Resources Institute Press, New Delhi. Taylor & Francis does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka

Geophysics and Geosequestration

Data-driven analytics is enjoying unprecedented popularity among oil and gas professionals. Many reservoir engineering problems associated with geological storage of CO2 require the development of numerical reservoir simulation models. This book is the first to examine the contribution of artificial intelligence and machine learning in data-driven analytics of fluid flow in porous environments, including saline aquifers and depleted gas and oil reservoirs. Drawing from actual case studies, this book demonstrates how smart proxy models can be developed for complex numerical reservoir simulation models. Smart proxy incorporates pattern recognition capabilities of artificial intelligence and machine learning to build smart models that learn the intricacies of physical, mechanical and chemical interactions using precise numerical simulations. This ground breaking technology makes it possible and practical to use high fidelity, complex numerical reservoir simulation models in the design, analysis and optimization of carbon storage in geological formations projects.

Geological Carbon Storage

IPCC Report on sources, capture, transport, and storage of CO2, for researchers, policy-makers and engineers.

Carbon Capture and Storage

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.

Data-Driven Analytics for the Geological Storage of CO2

Carbon capture and storage (CCS) refers to a set of technologies and methods for the mitigation, remediation, and storage of industrial CO2 emissions, the most imminent and virile of the greenhouse gases (GHG). The book addresses the methods and technologies currently being applied, developed, and most in need of further research. The book: • Discusses methods of carbon capture in industrial settings • Presents biological and geological approaches to carbon sequestration • Introduces ionic liquids as a method of carbon capture • Introduces new approaches to capturing CO2 from ambient air

Carbon Capture and Storage

Underground Storage of CO2 and Energy

This book introduces the scientific basis and engineering practice for CO2 storage, covering topics such as storage capacity, trapping mechanisms, CO2 phase behaviour and flow dynamics, engineering and geomechanics of geological storage, injection well design, and geophysical and geochemical monitoring. It also provides numerous examples from the early mover CCS projects, notably Sleipner and Snøhvit offshore Norway, as well as other pioneering CO2 storage projects.

Geologic Carbon Sequestration

Carbon capture and storage (CCS) has been considered as a practical way in sequestering the huge anthropogenic CO2 amount with a reasonable cost until a more pragmatic solution appears. The CCS can work as a bridge before fulfilling the no-CO2 era of the future by applying to large-scale CO2 emitting facilities. But CCS appears to lose some passion by the lack of progress in technical developments and in commercial success stories other than EOR. This is the time to go back to basics, starting from finding a solution in small steps. The CCS technology desperately needs far newer ideas and breakthroughs that can overcome earlier attempts through improving, modifying, and switching the known principles. This book tries to give some insight into

developing an urgently needed technical breakthrough through the recent advances in CCS research, in addition to the available small steps like soil carbon sequestration. This book provides the fundamental and practical information for researchers and graduate students who want to review the current technical status and to bring in new ideas to the conventional CCS technologies.

Carbon Capture, Storage and Utilization

Sustainability should be a key component of every process, safeguarding resources and reserves for future generations. This book shows how a responsible use of resources is possible, offering valid technological alternatives to fight climate change. We offer current technologies and valid methods for a wide range of activities: teaching, investigation, work, business and even daily life. We encourage all our readers to join us and become part of the solution to climate change, rather than the problem. After reading this book, we are certain that you will find justified reasons to start your own personal and social awareness campaign in favour of these effective technologies against climate change.

CCS Guidelines

Carbon capture and geological storage (CCS) is presently the only way that we can make deep cuts in emissions from fossil fuel-based, large-scale sources of CO2 such as power stations and industrial plants. But if this technology is to be acceptable to the

community, it is essential that it is credibly demonstrated by world-class scientists and engineers in an open and transparent manner at a commercially significant scale. The aim of the Otway Project was to do just this. Geologically Storing Carbon provides a detailed account of the CO2CRC Otway Project, one of the most comprehensive demonstrations of the deep geological storage or geosequestration of carbon dioxide undertaken anywhere. This book of 18 comprehensive chapters written by leading experts in the field is concerned with outstanding science, but it is not just a collection of scientific papers – it is about 'learning by doing'. For example, it explains how the project was organised, managed, funded and constructed, as well as the approach taken to community issues, regulations and approvals. It also describes how to understand the site: Are the rocks mechanically suitable? Will the CO2 leak? Is there enough storage capacity? Is monitoring effective? This is the book for geologists, engineers, regulators, project developers, industry, communities or anyone who wants to better understand how a carbon storage project really 'works'. It is also for people concerned with obtaining an in-depth appreciation of one of the key technology options for decreasing greenhouse emissions to the atmosphere.

CO2 Sequestration and Valorization

As is now generally accepted mankind’s burning of fossil fuels has resulted in the mass transfer of greenhouse gases to the atmosphere, a modification of the delicately-balanced global carbon cycle, and a

measurable change in world-wide temperatures and climate. Although not the most powerful greenhouse gas, carbon dioxide (CO) drives climate 2 change due to the enormous volumes of this gas pumped into the atmosphere every day. Produced in almost equal parts by the transportation, industrial and energy-generating sectors, atmospheric CO concentrations have 2 increased by about 50% over the last 300 years, and according to some sources are predicted to increase by up to 200% over pre-industrial levels during the next 100 years. If we are to reverse this trend, in order to prevent significant environmental change in the future, action must be taken immediately. While reduced use of fossil fuels (through conservation, increased efficiency and expanded use of renewable energy sources) must be our ultimate goal, short to medium term solutions are needed which can make an impact today. Various types of CO storage techniques have been proposed to fill this 2 need, with the injection of this gas into deep geological reservoirs being one of the most promising. For example this approach has the potential to become a closed loop system, whereby underground energy resources are brought to surface, their energy extracted (via burning or hydrogen extraction), and the resulting by-products returned to the subsurface.

Geological Storage of Carbon Dioxide (CO2)

Fossil fuels will remain the backbone of the global energy economy for the foreseeable future. The

contribution of nuclear energy to the global energy supply is also expected to increase. With the pressing need to mitigate climate change and reduce greenhouse gas emissions, the fossil energy industry is exploring the possibility of carbon dioxide disposal in geological media. Geological disposal has been studied for decades by the nuclear industry with a view to ensuring the safe containment of its wastes. Geological disposal of carbon dioxide and that of radioactive waste gives rise to many common concerns in domains ranging from geology to public acceptance. In this respect, comparative assessments reveal many similarities, ranging from the transformation of the geological environment and safety and monitoring concerns to regulatory, liability and public acceptance issues. However, there are profound differences on a broad range of issues as well, such as the quantities and hazardous features of the materials to be disposed of, the characteristics of the targeted geological media, the site engineering technologies involved and the timescales required for safe containment at the disposal location. There are ample opportunities to learn from comparisons and to derive insights that will assist policymakers responsible for national energy strategies and international climate policies.

Geochemistry of Geologic CO2 Sequestration

This book offers readers a comprehensive overview, and an in-depth understanding, of suitable methods for quantifying and characterizing saline aquifers for

the geological storage of CO2. It begins with a general overview of the methodology and the processes that take place when CO2 is injected and stored in deep saline-water-containing formations. It subsequently presents mathematical and numerical models used for predicting the consequences of CO2 injection. This book provides descriptions of relevant experimental methods, from laboratory experiments to field scale site characterization and techniques for monitoring spreading of the injected CO2 within the formation. Experiences from a number of important field injection projects are reviewed, as are those from CO2 natural analog sites. Lastly, the book presents relevant risk management methods. Geological storage of CO2 is widely considered to be a key technology capable of substantially reducing the amount of CO2 released into the atmosphere, thereby reducing the negative impacts of such releases on the global climate. Around the world, projects are already in full swing, while others are now being initiated and executed to demonstrate the technology. Deep saline formations are the geological formations considered to hold the highest storage potential, due to their abundance worldwide. To date, however, these formations have been relatively poorly characterized, due to their low economic value. Accordingly, the processes involved in injecting and storing CO2 in such formations still need to be better quantified and methods for characterizing, modeling and monitoring this type of CO2 storage in such formations must be rapidly developed and refined.

How to Store CO2 Underground: Insights

from early-mover CCS Projects

The reconciliation of economic development, social justice and reduction of greenhouse gas emissions is one of the biggest political challenges of the moment. Strategies for mitigating CO2 emissions on a large scale using sequestration, storage and carbon technologies are priorities on the agendas of research centres and governments. Research on carbon sequestration is the path to solving major sustainability problems of this century a complex issue that requires a scientific approach and multidisciplinary and interdisciplinary technology, plus a collaborative policy among nations. Thus, this challenge makes this book an important source of information for researchers, policymakers and anyone with an inquiring mind on this subject.

Carbon Capture and its Storage

Accompanying CD-ROM contains the results from the CO2 capture projects.

Carbon Dioxide Sequestration in Geological Media

"Over the past 20 years, the concept of storing or permanently storing carbon dioxide in geological media has gained increasing attention as part of the important technology option of carbon capture and storage within a portfolio of options aimed at reducing anthropogenic emissions of greenhouse gases to the earth's atmosphere. Research programs focusing on

the establishment of field demonstration projects are being implemented worldwide to investigate the safety, feasibility, and permanence of carbon dioxide geological sequestration. AAPG Studies 59 presents a compilation of state of the science contributions from the international research community on the topic of carbon dioxide sequestration in geological media, also called geosequestration. This book is structured into eight parts, and, among other topics, provides an overview of the current status and challenges of the science, regional assessment studies of carbon dioxide geological sequestration potential, and a discussion of the economics and regulatory aspects of carbon dioxide sequestration."--P. [4] of cover.

A Technical Basis for Carbon Dioxide Storage

Carbon Capture and Storage, Second Edition, provides a thorough, non-specialist introduction to technologies aimed at reducing greenhouse gas emissions from burning fossil fuels during power generation and other energy-intensive industrial processes, such as steelmaking. Extensively revised and updated, this second edition provides detailed coverage of key carbon dioxide capture methods along with an examination of the most promising techniques for carbon storage. The book opens with an introductory section that provides background regarding the need to reduce greenhouse gas emissions, an overview of carbon capture and storage (CCS) technologies, and a primer in the fundamentals of power generation. The next chapters focus on key

carbon capture technologies, including absorption, adsorption, and membrane-based systems, addressing their applications in both the power and non-power sectors. New for the second edition, a dedicated section on geological storage of carbon dioxide follows, with chapters addressing the relevant features, events, and processes (FEP) associated with this scenario. Non-geological storage methods such as ocean storage and storage in terrestrial ecosystems are the subject of the final group of chapters. A chapter on carbon dioxide transportation is also included. This extensively revised and expanded second edition will be a valuable resource for power plant engineers, chemical engineers, geological engineers, environmental engineers, and industrial engineers seeking a concise, yet authoritative one-volume overview of this field. Researchers, consultants, and policy makers entering this discipline also will benefit from this reference. Provides all-inclusive and authoritative coverage of the major technologies under consideration for carbon capture and storage Presents information in an approachable format, for those with a scientific or engineering background, as well as non-specialists Includes a new Part III dedicated to geological storage of carbon dioxide, covering this topic in much more depth (9 chapters compared to 1 in the first edition) Features revisions and updates to all chapters Includes new sections or expanded content on: chemical looping/calcium looping; life-cycle GHG assessment of CCS technologies; non-power industries (e.g. including pulp/paper alongside ones already covered); carbon negative technologies (e.g. BECCS); gas-fired power plants; biomass and waste co-firing; and

hydrate-based capture

Carbon Sequestration for Climate Change Mitigation and Adaptation

Science of Carbon Storage in Deep Saline Formations: Process Coupling across Time and Spatial Scales summarizes state-of-the-art research, emphasizing how the coupling of physical and chemical processes as subsurface systems re-equilibrate during and after the injection of CO2. In addition, it addresses, in an easy-to-follow way, the lack of knowledge in understanding the coupled processes related to fluid flow, geomechanics and geochemistry over time and spatial scales. The book uniquely highlights process coupling and process interplay across time and spatial scales that are relevant to geological carbon storage. Includes the underlying scientific research, as well as the risks associated with geological carbon storage Covers the topic of geological carbon storage from various disciplines, addressing the multi-scale and multi-physics aspects of geological carbon storage Organized by discipline for ease of navigation

Recent Advances in Carbon Capture and Storage

Climate change is arguably the most important environmental issue that the world currently faces. Carbon Capture and Storage (CCS) offers the possibility of significant reductions in the volume of CO2 released into the atmosphere in the near to medium term. As a fairly new technology that has not

been widely adopted, there remain some uncertainties related to both viability and desirability. This book discusses the key issues with regard to technical and legal feasibility, economic viability and public and stakeholder perceptions. It also provides recommendations for policy and future research.

Carbon Sequestration and Its Role in the Global Carbon Cycle

Volume 77 of Reviews in Mineralogy and Geochemistry focuses on important aspects of the geochemistry of geological CO2 sequestration. It is in large part an outgrowth of research conducted by members of the U.S. Department of Energy funded Energy Frontier Research Center (EFRC) known as the Center for Nanoscale Control of Geologic CO2 (NCGC). Eight out of the 15 chapters have been led by team members from the NCGC representing six of the eight partner institutions making up this center - Lawrence Berkeley National Laboratory (lead institution, D. DePaolo - PI), Oak Ridge National Laboratory, The Ohio State University, the University of California Davis, Pacific Northwest National Laboratory, and Washington University, St. Louis.

Climate Intervention

Geologic Framework for the National Assessment of Carbon Dioxide Storage Resources

Of the known greenhouse gases, political attention to date has primarily focused on carbon dioxide (CO2), whereby it is assumed that underground storages of crude oil and natural gas through Carbon Capture and Storage (CCS) technology could contribute significantly to global climate protection. Underground Storage of CO2 and Energy covers many aspects of CO2 sequestration and its usage, as well as of underground storage of fossil and renewable energy sources, and is divided into 8 parts: • Environmental and Energy Policy & Law for Underground Storage • Geological Storage and Monitoring • Enhanced Gas and Oil Recovery Using CO2 (CO2 -EGR/EOR) • Rock Mechanical Behavior in Consideration of Dilatancy and Damage • Underground Storage of Natural Gas and Oil • Underground Storage of Wind Energy • State-of-the-Art & New Developments in Gas Supply in Germany and China • EOR & New Drilling Technology Underground Storage of CO2 and Energy will be invaluable to academics, professionals and engineers, and to industries and governmental bodies active in the field of underground storage of fossil and renewable energy sources.

Geological CO2 Storage Characterization

Geological storage and sequestration of carbon dioxide, in saline aquifers, depleted oil and gas fields or unminable coal seams, represents one of the most important processes for reducing humankind's emissions of greenhouse gases. Geological storage of carbon dioxide (CO2) reviews the techniques and

wider implications of carbon dioxide capture and storage (CCS).Part one provides an overview of the fundamentals of the geological storage of CO2. Chapters discuss anthropogenic climate change and the role of CCS, the modelling of storage capacity, injectivity, migration and trapping of CO.

Advances in the Geological Storage of Carbon Dioxide

An overview of the geophysical techniques and analysis methods for monitoring subsurface carbon dioxide storage for researchers and industry practitioners.

Arid Environments and Sustainability

Published by the American Geophysical Union as part of the Geophysical Monograph Series, Volume 183. For carbon sequestration the issues of monitoring, risk assessment, and verification of carbon content and storage efficacy are perhaps the most uncertain. Yet these issues are also the most critical challenges facing the broader context of carbon sequestration as a means for addressing climate change. In response to these challenges, Carbon Sequestration and Its Role in the Global Carbon Cycle presents current perspectives and research that combine five major areas: The global carbon cycle and verification and assessment of global carbon sources and sinks Potential capacity and temporal/spatial scales of terrestrial, oceanic, and geologic carbon storage Assessing risks and benefits associated with

terrestrial, oceanic, and geologic carbon storage Predicting, monitoring, and verifying effectiveness of different forms of carbon storage Suggested new CO2 sequestration research and management paradigms for the future. The volume is based on a Chapman Conference and will appeal to the rapidly growing group of scientists and engineers examining methods for deliberate carbon sequestration through storage in plants, soils, the oceans, and geological repositories.

Geological Storage of CO2 – Long Term Security Aspects

This book explores the industrial use of secure, permanent storage technologies for carbon dioxide (CO2), especially geological CO2 storage. Readers are invited to discover how this greenhouse gas could be spared from permanent release into the atmosphere through storage in deep rock formations. Themes explored here include CO2 reservoir management, caprock formation, bio-chemical processes and fluid migration. Particular attention is given to groundwater protection, the improvement of sensor technology, borehole seals and cement quality. A collaborative work by scientists and industrial partners, this volume presents original research, it investigates several aspects of innovative technologies for medium-term use and it includes a detailed risk analysis. Coal-based power generation, energy consuming industrial processes (such as steel and cement) and the burning of biomass all result in carbon dioxide. Those involved in such industries who are considering geological storage of CO2, as well as earth scientists and

engineers will value this book and the innovative monitoring methods described. Researchers in the field of computer imaging and pattern recognition will also find something of interest in these chapters.

Science of Carbon Storage in Deep Saline Formations

To achieve goals for climate and economic growth, "negative emissions technologies" (NETs) that remove and sequester carbon dioxide from the air will need to play a significant role in mitigating climate change. Unlike carbon capture and storage technologies that remove carbon dioxide emissions directly from large point sources such as coal power plants, NETs remove carbon dioxide directly from the atmosphere or enhance natural carbon sinks. Storing the carbon dioxide from NETs has the same impact on the atmosphere and climate as simultaneously preventing an equal amount of carbon dioxide from being emitted. Recent analyses found that deploying NETs may be less expensive and less disruptive than reducing some emissions, such as a substantial portion of agricultural and land-use emissions and some transportation emissions. In 2015, the National Academies published Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration, which described and initially assessed NETs and sequestration technologies. This report acknowledged the relative paucity of research on NETs and recommended development of a research agenda that covers all aspects of NETs from fundamental science to full-scale deployment. To address this

need, Negative Emissions Technologies and Reliable Sequestration: A Research Agenda assesses the benefits, risks, and "sustainable scale potential" for NETs and sequestration. This report also defines the essential components of a research and development program, including its estimated costs and potential impact.

Geological Storage of CO2

Geological Carbon Storage Subsurface Seals and Caprock Integrity Seals and caprocks are an essential component of subsurface hydrogeological systems, guiding the movement and entrapment of hydrocarbon and other fluids. Geological Carbon Storage: Subsurface Seals and Caprock Integrity offers a survey of the wealth of recent scientific work on caprock integrity with a focus on the geological controls of permanent and safe carbon dioxide storage, and the commercial deployment of geological carbon storage. Volume highlights include: Low-permeability rock characterization from the pore scale to the core scale Flow and transport properties of low-permeability rocks Fundamentals of fracture generation, self-healing, and permeability Coupled geochemical, transport and geomechanical processes in caprock Analysis of caprock behavior from natural analogues Geochemical and geophysical monitoring techniques of caprock failure and integrity Potential environmental impacts of carbon dioxide migration on groundwater resources Carbon dioxide leakage mitigation and remediation techniques Geological Carbon Storage: Subsurface Seals and Caprock

Integrity is an invaluable resource for geoscientists from academic and research institutions with interests in energy and environment-related problems, as well as professionals in the field.

Greenhouse Gases

Arid environments are basically associated with water scarcity. Therefore, soils will have an extremely low moisture level to support plant and animal life as well as human social life. Sustainability is the long durability of systems and processes within various adapted environmental conditions. Recently, systematic scientific studies on arid environments and sustainability have become more attractive, critical, and sound than the previous years. Sharing such experiences related to different environmental circumstances will absolutely help scientists and decision-makers to have better interpretation of their own environment. By learning lessons, appropriate, fast, and effective approaches require to implement for overwhelming such problems. Such actions will certainly lead to more secure and sustainable environments for plant, animal, and human life.

Carbon Capture and Storage

A theoretical and practical analysis of the complex liability issues raised by carbon capture and storage systems for containing greenhouse gases.