Sustainable Agriculture Reviews

Volume 38

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Sustainable agriculture is a rapidly growing field aiming at producing food and energy in a sustainable way for humans and their children. Sustainable agriculture is a discipline that addresses current issues such as climate change, increasing food and fuel prices, poor-nation starvation, rich-nation obesity, water pollution, soil erosion, fertility loss, pest control, and biodiversity depletion.

Novel, environmentally-friendly solutions are proposed based on integrated knowledge from sciences as diverse as agronomy, soil science, molecular biology, chemistry, toxicology, ecology, economy, and social sciences. Indeed, sustainable agriculture decipher mechanisms of processes that occur from the molecular level to the farming system to the global level at time scales ranging from seconds to centuries. For that, scientists use the system approach that involves studying components and interactions of a whole system to address scientific, economic and social issues. In that respect, sustainable agriculture is not a classical, narrow science. Instead of solving problems using the classical painkiller approach that treats only negative impacts, sustainable agriculture treats problem sources.

Because most actual society issues are now intertwined, global, and fast-developing, sustainable agriculture will bring solutions to build a safer world. This book series gathers review articles that analyze current agricultural issues and knowledge, then propose alternative solutions. It will therefore help all scientists, decision-makers, professors, farmers and politicians who wish to build a safe agriculture, energy and food system for future generations.

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Sustainable Agriculture Reviews 38

Carbon Sequestration Vol. 2 Materials and Chemical Methods

Springer

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Preface

Carbon dioxide (CO_2) is a greenhouse gas which is responsible for global warming and consequently environmental changes. Carbon dioxide in the environment is increasing due to fossil fuel combustion. Various strategies are developed for carbon dioxide capture and utilization, including chemical, photochemical, electrochemical, and biological methods. Carbon dioxide capture and utilization exhibit many challenges for the production of value-added products, biofuels, etc.

Moreover, improvement in CO_2 capture and utilization for a sustainable world is essential to produce significant advances in CO_2 conversion to prevent CO_2 increase in the environment. Therefore, the value-added applications of CO_2 capture and utilization had drawn the wise attention of research and development specialists of various disciplines, including environmentalist, engineers, biotechnologists, material scientists, and mechanical engineers. The research in the area of CO_2 capture and utilization has been in progress to use carbon dioxide as an alternative feedstock toward the development of fossil-free technologies. Thus, the CO_2 capture and utilization have an incredible future, but still more research and development studies are needed to commercialize at an enormous scale.

Carbon Sequestration Vol 2: Materials and Chemical Methods discusses cutting-edge research on carbon dioxide capture and utilization. It covers fundamental knowledge on fabrication strategies, properties, and mechanisms of carbon dioxide sequestration. It discusses carbon dioxide capture and utilization by using metal-organic frameworks, ionic liquids, metal oxides, alkali soils, zeolites, and hybrid membranes. The book also supplies knowledge on carbon dioxide capture in adsorbents, nanosponges, chemical solvents, and cryogenics. This book is an archival reference guide for undergraduate and postgraduate students, faculty, R&D professionals, production chemists, food chemists, environmental engineers, and industrial experts. **Based on thematic topics, the book edition contains the following ten chapters:**

Chapter 1 reviews the CO_2 capture by chemisorption on pore-expanded materials.

Chapter 2 summarizes the different types of absorbent, reaction media, and reagents used for carbon dioxide capture and conversion. The one-step reaction or two-step reaction of carbon dioxide capture and subsequent utilization are also discussed in details.

Chapter 3 provides an overview of recent trends in the development of metal oxide-based materials for carbon dioxide capture. The basic principles of adsorption and chemical looping and the different aspects of a carbon dioxide capturing materials based on magnesium oxide, layered double oxides, calcium oxide, and transition metal oxides are also discussed.

Chapter 4 reviews the performance of the mixed matrix membranes fabricated with different types of filler particles with special focus on post- and pre-combustion carbon capture.

Chapter 5 briefly reviews the advantages and disadvantages of using different ionic liquids and their various modifications for sorption of CO_2. Their physical characteristics in their pure state and after absorption of carbon dioxide are also discussed.

Chapter 6 reviews the methods for carbon sequestration in alkaline soils.

Chapter 7 deals with the use of metal organic frameworks as promising agents for carbon dioxide capture. Several MOFs have been presented along with a description of their properties. Metal-organic framework-based derivatives obtained by pyrolysis and their performance compared with the parent MOF are also presented.

Chapter 9 reviews the properties and application of ionic liquids for carbon dioxide capture. The economic aspects of the carbon dioxide capture process in the industrial scale are also discussed.

Chapter 10 summarizes the major technologies and strategies for capturing CO_2. The features of cryogenic routes and the prospect of CO_2 capture are also reviewed.

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