Innovative Energy & Research
ISSN: 2576-1463
Mini Review Open Access

Development of Carbon Capture Technologies is now Considered to be Effective way to Alleviate Global Warming

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Abstract

While sequentially inoculating non-Saccharomyces yeasts with Saccharomyces cerevisiae can lower the alcohol contents of wine, the abilities of these yeasts to utilize/produce ethanol or generate other byproducts remained unclear. Development of carbon capture technologies is now considered to be an effective way to alleviate global warming, as they not only separate CO2 from the gas mixture, but also prepare it for further utilization. Selection of adsorbents is still in the research stage. Metal-organic frameworks (MOFs) are attracting attention as powerful candidates for the most ideal carbon capture adsorbents due to excellent properties. A comprehensive review of the mainstream carbon capture technologies using MOFs was presented.

Keywords: Regional comprehensive economic partnership; Carbon pricing; Carbon offset; Computable general equilibrium model

Introduction

Brief introduction of MOFs is given, describing their general properties, the adsorption mechanisms of rigid and flexible MOFs, and current methods for synthesis of MOFs. Gas separation tasks and working conditions of different carbon capture technologies are compared. Adsorbent regeneration cycles in each carbon capture process were described including TSA, PSA, VSA, and ESA. Some critical indicators for evaluating carbon capture performance are proposed for screening of MOFs. After COP21, various economies start putting efforts to fulfill the pledge and achieve carbon neutrality. By doing so, scholars highlight several essential factors that can curb carbon emissions.

Discussion

In this lieu, the current study analyzes the role of technological innovation, carbon finance, environmental awareness, urbanization, and green energy like renewable energy consumption (REC) and renewable energy output (REO) on carbon neutrality in E7 countries covering the time span of 2006–2020. By employing CUP-FM and CUP-BC, it is revealed that technological innovation, carbon finance, environmental awareness, urbanization, REC, and REO have a positive connection with carbon neutrality in E7 countries. The study provides guidelines to the policymakers in developing policies regarding to obtain carbon neutrality using technological innovation, carbon finance, environmental awareness, and green energy. Carbon farming refers to deliberate adoption of restorative land use and site-specific best management practices which create a positive soil /ecosystem carbon budget and lead to sequestration of atmospheric CO2 in soil and biomass such that increase in soil /terrestrial carbon stock can generate another income stream for land managers. Land-based carbon sequestration can be in biomass (above- and belowground), and increase in soil carbon pool. The latter comprises of soil inorganic carbon (SIC) and soil organic carbon (SOC) pools. Sequestration of carbon as SIC pool is through formation of secondary carbonates and leaching of bicarbonates with irrigation water [1-4].

Sequestration as SOC pool occurs through biogeochemical transformation of biomass-C (roots and shoots) into labile, particulate organic carbon and microbial biomass carbon fractions which upon reactions with clay colloids form organo-mineral complexes and get protected within stable microaggregates. The passive fraction has a long mean residence time and thus is the target of a carbon farming initiative. Some examples of practices which are adopted for carbon farming include conservation agriculture with residue mulching and cover cropping, agroforestry, complex farming systems based on integration of crops with trees and livestock, systems involving integrated nutrient and pest management, those based on precision agriculture and sub-drip fertigation, and growing special crops with favorable root system and biomass production. Temporal changes in soil carbon pools must be measured to 1-m depth along with those of bulk density for different layers. The overall objective of carbon farming Is to grow carbon in land-based sinks and use it as a commodity to generate income while making agriculture a solution to climate change and restoring the environment. This paper introduced a non-monetary double-entry carbon accounting method for entities in emission trading systems. To mitigate climate change, government imposed carbon emission reduction obligations to industries with high greenhouse gas emissions. These entities performed carbon accounting and participated in emission trading systems annually to acquire enough carbon emission allowance and carbon credit to compensate for their greenhouse gas emissions. However, current carbon accounting methods did not account for their long-term emission potential, undermining assessment for their sustainability and financial risk. The proposed method addressed this issue by considering carbon emission allowance and carbon credit as carbon asset and emission potential from life cycle and embodied carbon assessment as long-term liability. Double-entry accounting methods were used to introduce carbon accounting balance sheet, income statement and flow statements and to enable carbon management performance analysis by analogous methods on financial statements. A case study was performed with historical data of an emission trading system. The result revealed that

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Received: 03-July-2023, Manuscript No. iep-23-112812; **Editor assigned:** 05-July-2023, PreQC No. iep-23-112812(PQ); **Reviewed:** 19-July-2023, QC No. iep-23-112812; **Revised:** 24-July-2023, Manuscript No: iep-23-112812(R); **Published:** 31-July-2023, DOI: 10.4172/2576-1463.1000349

Citation: Greene R (2023) Development of Carbon Capture Technologies is now Considered to be Effective way to Alleviate Global Warming. Innov Ener Res, 12: 349.

an entity's future carbon emission potential imposed significant long-term liability and risk. Its relevant emission expense was also found incurred much earlier before the actual emission. But more research was needed to expand the method to entities with their carbon neutrality targets, to enable comparison of entities in different emission trading systems and to ensure data credibility in generated reports. The rise of quantum computing has prompted interest in the field of cryogenic electronics. Carbon-based materials possess great promise in cryogenic electronics due to their excellent material properties and emergent quantum effects. This paper introduces the advantages of carbon-based materials for cryogenic applications and reviews recent progress in carbon nanotubes and graphene for logic devices, sensors and novel quantum devices at cryogenic temperatures. Finally, the main challenges and extensive prospects for the further development of carbon-based cryoelectronics are summarized. Coastal blue carbon ecosystems offer promising benefits for both climate change mitigation and adaptation [5-7].

While there have been widespread efforts to transplant mangroves from the tropics to the subtropics and to introduce exotic saltmarsh plants like Spartina alterniflora in China, few studies have thoroughly quantified the chronological records of carbon sequestration with different organic carbon (OC) sources. To understand how variations in OC sources can affect the carbon sequestration potential of coastal wetland environment over time, we conducted a study on typical islands with two scenarios: S. alterniflora invasion and mangrove transplantation. Our study determined chronological records of carbon sequestration and storage from five sediment profiles and traced changes in the OC sources using carbon stable isotope (δ13C) and C:N ratios in response to these scenarios. The S. alterniflora invasion resulted in an 84 ± 19 % increase in the OC burial rate compared to unvegetated mudflats, while mangrove transplantation resulted in a 167 ± 74 % increase in the OC burial rate compared to unvegetated mudflats. S. alterniflora and mangroves showed greater carbon sequestration potential in areas with high supplies of suspended particulate matter, while mangroves needed to grow to a certain scale to display obvious carbon sequestration benefits. In the mangrove saltmarsh ecotone, mature mangrove habitats exhibited resistance to the S. alterniflora invasion, while mangrove transplantation in the environment invaded by S. alterniflora had a significant effect on OC contribution. Besides, plant-derived OC can be exported to the surrounding environment due to the rapid turnover of sediments. The blue carbon chronosequence-based estimation of OC sources and burial rates provides a useful reference for establishing carbon accounting policies. Commercial carbon fibre manufacture is a proprietary process which has resulted in limited information being publicly available in regard to the processing of different materials and their impact on material, environmental and economic characteristics. This study investigates the relationship between different precursor materials and these parameters through an in-depth analysis of process structures, material properties, incurred emissions, energy demand and cost composition. This study compares three important precursor types for carbon fibre manufacture including ecological and economical aspects. Two of the precursors are polyacrylonitrile based, a special carbon fibre and textile grade, while the third is a sustainably derived lignin-cellulose blend. The lower cost textile precursor has significantly higher processing cost than the specialized material while also incurring a higher amount of emissions. Indeed, up to 270% more compared to the special grade precursor. The analysis of the lignin-cellulose blend precursor illustrates its shortcomings, especially with respect to processability and properties, despite its lower environmental impact and up to 25% cost advantage. This study suggests pathways for the industrial processing of alternative precursors outlining their economic and ecological benefits and highlighting areas of necessary improvement such as material properties and energy demand. To improve the renewable energy consumption capacity of integrated energy system (IES) and reduce the carbon emission level of the system, a low-carbon economic dispatch model of IES with coupled power-to-gas (P2G) and hydrogen-doped gas units (HGT) under the stepped carbon trading mechanism is proposed [8-10].

Conclusion

On the premise of wind power output uncertainty, the operating characteristics of the coupled electricity-to-gas equipment in the system are used to improve the wind abandonment problem of IES and increase its renewable energy consumption capacity; HGT is introduced to replace the traditional combustion engine for energy supply, and on the basis of refined P2G, a part of the volume fraction of hydrogen obtained from the production is extracted and mixed with methane to form a gas mixture for HGT combustion, so as to improve the low-carbon economy of the system. The ladder type carbon trading mechanism is introduced into IES to guide the system to control carbon emission behavior and reduce the carbon emission level of IES. Based on this, an optimal dispatching strategy is constructed with the economic goal of minimizing the sum of system operation cost, wind abandonment cost, carbon trading cost and energy purchase cost. After linearization of the established model and comparison analysis by setting different scenarios, the wind power utilization rate of the proposed model is increased by 24.5%, and the wind abandonment cost and CO2 emission are reduced by 86.3% and 10.5%, respectively, compared with the traditional IES system, which achieves the improvement of renewable energy consumption level and low carbon economy.

Acknowledgment

None

Conflict of Interest

None

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