Editorial

Editorial for *Clean Energy Science and Technology* (Volume 1 Issue 2)

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In the era of industrial revolution, from powering factories to keeping our digital world humming, energy resources are the hidden engine behind modern economic activity, fueling production, transportation, and every click of a keyboard[1]. However, these commercial endeavors generate contaminants and toxins, which are extremely harmful for the environment and public health. To overcome these concerns, the utilization of clean energy is the main focus to enhance the economic growth and environmental preservation. During this time, many researchers and academicians are pivoted to study and research on clean energy technologies. Their successful research work helped us in publishing one commentary and six review articles, centered around the efficient use of resources, sustainable development, and environmental protection, in issue 2, volume 1 of this journal. It offers readers an overview of the most recent research trends in clean energy technology.

Since last decade, generation and storage of clean energy has been emerged as an imperative field of research because of its considerable contribution to sustainable industrial development, environmental protection and conservation. One of the potential renewable and sustainable energy sources is lignocellulosic biomass (LCB), which is found abundantly[2]. Its anaerobic digestion, biomethanation, and chemical pretreatment are examined by Omondi and Kegode[2]. They concluded that LCB can be converted through a biochemical process called anaerobic digestion (AD) into biogas, which can meet energy needs and have positive effects on the economy, the environment, and human health. They also mentioned that proper pretreatment can improve the AD process and turn LCB into bioenergy[2]. This study may enhance the bioenergy production process by focusing on the pretreatment methods of LCB.

The efficient utilization of energy resources and greenhouse gas can prevent the deterioration of environment and can enhance the fuel economy. Carbon dioxide is one of the greenhouse gas, can be extremely perilous for environment and living beings. However, by smart utilization, carbon dioxide can be helpful for industrial applications. As a naturally occurring refrigerant with excellent physical and chemical characteristics, Mei et al.[3] noted that CO_2 has several benefits for heat pump technology when used as a working fluid in transcritica cycles. In their work, they presented the future prospects for CO_2 heat pump technology and methodically compile the most recent findings on transcritical CO_2 heat pumps, utilized across a range of industrial domains[3].

Moreover, CO_2 can be used as the source of microalgae culture, which is widely used in various industries, including the food, pharmaceutical, and animal feed sectors. In another published article of this issue, Yu et al.[4] pointed out that CO_2 fixation and financial gains can be obtained by utilizing flue gas as a carbon source in microalgae biorefineries. Other than this, recognizing the significant potential of direct air capture of CO_2, researchers have focused their attention in this area. In one of the published article, Zheng et al.[5] discussed the current research status of mainstream solid adsorbent material DAC technology, analyzed the benefits and difficulties faced by each type of technology, and highlighted the development prospects of various DAC technology routes.

This issue also features an interesting overview of most cardinal clean technologies. According to Li et al.[6], the development of technologies in areas of effective organic waste treatment, clean traditional fossil

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energy use, and effective thermal recovery of heavy oil can be fraternize by supercritical hydrothermal combustion technology. By summarizing the basic characteristics of supercritical hydrothermal combustion technology, they focused on experimental and parametric analysis of supercritical hydrothermal combustion of typical fuels to highlight the importance of above mentioned technique in various industrial applications[6].

Recently, nanomaterials are widely applied as new energy materials in various applications, such as solar cells, photocatalysis, lithium-ion batteries, hydrogen storage, etc[7]. According to Zhao et al.[8], carbon nanomaterials are frequently employed as substrate to fabricate stretchable conductive composites due to their good stability, strong conductivity, and moderate price. These materials can be effectively utilized in aerospace, energy storage, biomedicine, and other fields due to their exceptional qualities. Keeping this important information in mind, authors have added carbon nanomaterials as reinforcing phases to polymer materials using 3D printing technology[8] which demonstrates the importance of nano materials in 3D printing.

Furthermore, Zhao[9] prepared a commentary on the thioindigo photoswitches, available for the modulation of hydrogels' stiffness by visible light and concluded that future development in the field of photoswitching, should include material optimization for various parameters. This will extend its application in various sustainable areas, which will highlight the innovation in the development of these materials.

It is extremely imperative to understand the efficient use of energy in a clean way, which can be achieved by continuous research on clean energy technologies, to benefit environment and well-being of all mankind. We look forward to gather high-quality papers related to clean energy science and technology.

Finally, we highly appreciate the authors' permission to allow us to share their valuable research findings.

Conflict of interest

The author declares no conflict of interest.

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