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Editorial

Editorial for *Clean Energy Science and Technology* (Volume 2, Issue 4)

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In today's era of rapid technological advancements and growing emphasis on sustainability, innovative solutions across various fields are reshaping industries and addressing pressing global challenges. From the recycling of spent lithium-ion batteries to advancements in solar energy utilization, latent thermal energy storage, and chip material processing, these technologies not only tackle critical issues such as resource conservation, efficient energy use, and emission reduction but also pave the way for sustainable development by fostering technological innovation and enhancing energy system efficiency.

The effective utilization of clean energy has become increasingly important as it can not only address environmental issues but also confront the energy crisis. Prof. Kendall [1], Fellow of the Royal Society, discussed how to create green villages as a new model for achieving local energy self-sufficiency by combining wind, solar, and hydrogen energy. This model can not only reduce residents' energy bills but also promote the development of the local economy, thus achieving the goal of sustainable development.

In recent years, with the continuous advancement of laser technology, the application of LEC has been continuously expanding. This issue provides a detailed analysis of the thermomechanical reliability of laser-to-electric converters and emphasizes the importance of analyzing the reliability of laser-to-electric converters [2]. This study provides an important reference for the design of laser-to-electric converters and makes a certain contribution to alleviating the energy crisis and reducing environmental pollution.

The rapid adoption of electric vehicles has significantly amplified the demand for power batteries, highlighting the urgent need for recycling and treatment of spent lithium-ion batteries to enhance environmental protection and resource conservation. Dong et al. summarized the core characteristics, current trends, and future directions of spent power battery recycling technologies [3]. His analysis explores strategies for recovering valuable metals through hydrometallurgy and pyrometallurgy techniques and emphasizes the increasing popularity of recovering materials like anodes, electrolytes, separators, and electrodes from spent power batteries. These advancements offer a promising pathway toward resource efficiency and circular economy practices.

Solar energy, with its broad spectrum of radiation, presents significant potential for comprehensive utilization. This issue introduces a cutting-edge technology for full-spectrum harnessing of solar energy, comprising four key components: concentration, transmission, splitting, and detection. A trough parabolic concentrator, combined with one-way glass and optical fiber transmission, ensures efficient capture and direction of sunlight [4]. Collimation using Total Internal Reflection (TIR) lenses further

stabilizes transmission and improves uniform intensity distribution. By fully leveraging sunlight across different wavelengths, this technology significantly enhances solar energy efficiency and accelerates its role in green, low-carbon renewable energy transitions.

Latent thermal energy storage (LTES) plays a pivotal role in bridging energy supply gaps, particularly in solar, geothermal, and electricity storage systems. However, its widespread application is constrained by the low thermal conductivity of phase-change materials (PCMs). Rotation-based heat transfer enhancement methods offer promising solutions, as highlighted in a review by Li et al [5]. These methods improve charging and discharging rates and ensure temperature uniformity, particularly when combined with other passive methods. Although optimization is needed for cost-effective application, the integration of such techniques holds immense potential for advancing LTES systems.

In modern science and technology, chips have garnered significant attention for their superior energy integration, reliability, low power consumption, and high energy transfer speed. Serving critical roles in solar technology, smart grids, and battery management systems, chips ensure the safety and efficiency of renewable energy systems. Advances in materials science and semiconductor technology have driven innovations in chip polishing techniques. Traditional methods for removing microscale defects face limitations, necessitating alternatives like low-temperature plasma technology. This innovative approach enables environmentally friendly processing, efficiently removing defects and roughness with minimal mechanical surface damage. As an alternative to traditional methods, low-temperature plasma technology combines high impurity removal rates with reduced environmental impact, providing a green solution for optimizing chip performance [6].

In industrial production, especially in the field of food processing, solar drying technology is considered an important means to achieve decarbonization. This new type of solar drying system not only has the characteristics of high efficiency, portability, and modularity, but also significantly reduces production costs, with a payback period of only 1–2 years [7]. The promotion of this technology will help improve the food production system, enhance resource utilization efficiency, and further drive the entire industry towards low-carbon transformation.

In addition, an innovative controlled tornado technology has also attracted widespread attention. This technology can generate electricity by generating strong airflows, which has the potential to solve the current global electricity demand problem. Controlled tornadoes can not only reduce dependence on fossil fuels, but may also become an important tool for combating climate change [8]. By optimizing airflow and heat sources, this new type of power generation is expected to play an important role in the future.

In summary, these transformative technologies not only address immediate energy and environmental challenges but also chart a course for sustainable development. In the pursuit of sustainable development, it is crucial to re-evaluate the energy value chain, and by combining energy consumption, value creation, and carbon emissions, it can provide a new perspective for optimizing operations in various industries [9]. By driving innovation and enhancing efficiency, they lay the foundation

for a green, low-carbon future. Looking ahead, continued interdisciplinary collaboration and technological advancements will be critical in solving global challenges and fostering coordinated progress in economic, social, and environmental dimensions.

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References

1. Kendall K. Green villages by Wind + Solar + Hydrogen. Clean Energy Science and Technology. 2024; 2(4): 261. doi: 10.18686/cest261
2. Wu C. Analysis on thermo-mechanical reliability of laser-electricity converter. Clean Energy Science and Technology. 2024; 2(4): 288. doi: 10.18686/cest288
3. Dong Y, Zhu H, He W, Li G. Intellectual property analysis of recycling technologies for spent power lithium-ion batteries. Clean Energy Science and Technology. 2024; 2(4): 253. doi: 10.18686/cest253
4. Yin G, Jia X, Miao Z, Ni R. A brief analysis of spectral technology for effective utilization of full spectrum of solar energy. Clean Energy Science and Technology. 2024; 2(4): 240. doi: 10.18686/cest240
5. Li Z, Fang C, Wu Q, et al. Rotation-based heat transfer enhancement for shell-and-tube latent thermal energy storage systems: From mechanisms to applications. Clean Energy Science and Technology. 2024; 2(4): 237. doi: 10.18686/cest237
6. Yan H, Xue S, Guo P, et al. Research progress of low-temperature plasma polishing technology in chip material processing. Clean Energy Science and Technology. 2024; 2(4): 263. doi: 10.18686/cest263
7. Elizabeth CR, Araceli RMC. Solar energy utilization and conservation in an industrial solar drying process. Clean Energy Science and Technology. 2024; 2(4): 218. doi: 10.18686/cest218
8. Michaud LM. Controlled tornadoes could fix climate and energy problems. Clean Energy Science and Technology. 2024; 2(4): 232. doi: 10.18686/cest232
9. Luo Z, Lin X, Wu Y, Zhong W. Role of energy value chain in carbon neutrality: A review. Clean Energy Science and Technology. 2024; 2(4): 192. doi: 10.18686/cest.v2i4.192