Editorial

Materials and Sustainability:

Materials' contribution to sustainable living on earth

Lukas Schmidt-Mende

Department of Physics, University of Konstanz, 78464 Konstanz, Germany, lukas.schmidt-mende@uni-konstanz.de
Received: 2 May 2024; Accepted: 6 May 2024; Published: 11 May 2024

1. Introduction

Materials research plays a crucial role in driving sustainable processes, a pivotal element for the global transition toward sustainable living on earth. Material science and technology have been major driving forces for efficiency improvement and the adoption of renewable energy sources, leading the way toward a sustainable world. We observe exciting new research in the field that not only surpasses current technologies but also sometimes opens up entirely new avenues.

Breakthroughs in this field often result from robust cross-disciplinary approaches that bridge different domains. A significant societal task is the implementation of new manufacturing processes geared toward a more sustainable utilization of resources. Crucial is finding solutions that not only reduce associated emissions but are also financially competitive against current processes reliant on fossil fuels. In many cases, the technology for sustainable living is already available but remains too expensive, limiting widespread acceptance.

This journal is dedicated to exploring materials research, emphasizing its contribution to achieving a more sustainable use of resources. This includes advancements in renewable energy sources, the development of more efficient processes, the establishment of sustainable lifecycles for materials and products, a refined understanding of current processes serving as a foundation for optimization toward sustainable devices, and innovative fabrication methods.

The journal specifically focuses on the pivotal role of materials research in various key areas such as energy harvesting and storage, recycling, and green and novel fabrication processes. This encompasses the enhancement of renewable energy sources, a deep understanding of material functionalities, the development of innovative devices for energy conversion and storage, and the integration of sustainable practices like recycling and energy-saving methods.

Special attention is given to exploring novel material combinations, advocating for the use of more sustainable materials, advancing material synthesis techniques, exploring nanomaterials, and conducting structural investigations to improve device applications. Consideration is given to factors such as stability, efficiency, fabrication technology, and integration into functional devices.

Furthermore, the journal acknowledges the integration of machine learning as a promising tool to augment and expedite progress in this dynamic and vibrant research field.

2. Scope of MatSus

The primary scope of the journal is to publish high-quality papers and reviews that are both timely and impactful, focusing on topics such as energy harvesting and storage, advanced recycling methods, the development of more energy-efficient materials, and innovative process developments. These contributions should offer significant insights, advancements, or solutions in these areas, contributing to the broader goal of sustainable living on Earth.

2.1. Energy harvesting and storage

We are seeking groundbreaking research that explores novel materials or material combinations and innovative processes to optimize renewable energy sources. This encompasses advancements in various areas such as solar cells, wind and hydro-power technologies, solar-to-fuel conversion, CO_2 reduction methods, photocatalysis, fuel cells, and more.

Copyright: © 2024 by the authors. This is an open access article under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).
Publisher's Note: Scilight stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Konstanzer Online-Publikations-System (KOPS)
URL: http://nbn-resolving.de/urn:nbn:de:bsz:352-2-4o9x735dk9la0

For instance, significant progress has been made in the field of emerging solar cells, particularly in terms of enhancing efficiency and lifespan, with notable advancements observed in organic and perovskite solar cells. Material science has been instrumental in driving these improvements, playing a pivotal role in advancing research within these domains.

The Internet of Things (IoT) is anticipated to experience significant growth, offering promising avenues for promoting sustainability. Self-powered devices, such as those based on nanogenerators, can serve as power sources for efficient sensors, facilitating the intelligent management of energy usage. For instance, these devices can automatically regulate the use of lighting, activating it only when necessary, thereby optimizing energy efficiency. This represents just one example of the many possibilities enabled by IoT technologies in advancing sustainability efforts.

Another crucial aspect is the development of efficient energy storage solutions. These may include batteries, capacitors, supercapacitors, hydrogen storage systems, among others. Material science plays a central role in this domain as well, significantly influencing the successful implementation of energy storage devices. Key factors determining the efficacy of energy storage devices include their energy capacity, charging and discharging speeds, loss mechanisms, and more. Material science research contributes significantly to addressing these challenges by exploring novel materials and material combinations, optimizing structural design and fabrication processes, and enhancing the performance and durability of energy storage systems. Through advancements in material science, we can achieve breakthroughs in energy storage technology, paving the way for more efficient and sustainable energy supply.

2.2. Advancing recycling and energy-efficient materials and processes

In every process, it is essential to consider the abundance of materials used, the CO_2 footprint associated with device fabrication, its lifespan, and its recyclability or reusability at the end of its life. Priority should be given to energy-efficient materials and processes. Materials and material combinations that are recyclable should be favored.

Emphasizing energy-efficient materials and processes is crucial. Additionally, prioritizing recyclable materials and incorporating "green" processing and fabrication methods can significantly reduce CO_2 emissions. Processes that facilitate carbon capture also play a vital role in CO_2 reduction efforts.

Moreover, the development of material-based investigation tools and technologies is essential for fostering a greener and more sustainable world. These tools can contribute significantly to understanding and optimizing material properties and processes, ultimately leading to more sustainable practices and outcomes.

2.3. Innovative processes

Innovative material processing holds the key to driving sustainable development forward. Optimizing resource usage and material efficiency are critical considerations. Processes that mitigate undesirable environmental impacts should receive higher attention. This encompasses addressing health and safety aspects within material science, which are sometimes overlooked or neglected.

Furthermore, leveraging automatic fabrication and analysis tools, as well as machine learning and AI, can enhance process efficiency significantly. This opens up avenues for accelerating progress in material science, particularly in energy-related applications, ultimately leading to greater sustainability. This field is rapidly evolving, and our journal aims to actively support this area of research.

3. Conclusion

With Materials and Sustainabilty (MatSus), we aim to provide a dynamic platform for materials research and sustainability, offering rapid feedback and short publication times to expedite the dissemination of valuable findings. Submissions will undergo a rigorous review process to ensure the publication of high-quality and high impact research in form of articles, reviews, tutorials and also software publications.

We envision our journal as a hub for interdisciplinary collaboration, bridging various fields such as material science, physics, chemistry, biology, engineering, and beyond. While our focus is on applied research, we welcome theoretical work and simulation aspects that have practical applications and strong connections to experimental work.

As the world undergoes rapid changes, corresponding challenges have to overcome. We encourage our authors to contribute their insights to address these challenges and work towards achieving sustainable living on Earth. This involves tackling issues stemming from climate change and reducing greenhouse gas emissions, as well as developing widely applicable and accepted alternative material technologies to diminish reliance on fossil

fuels. By collectively striving towards these goals, we can mitigate the green-house gas emissions and their impacts on climate change and ultimately halt its progression.

Conflicts of Interest: The authors declare no conflict of interest.