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Advances in nanostructured materials for energy storage applications: A materials science and engineering perspective

Olusegun Adigun Afolabi
Durban University of Technology, South Africa

Advancement in technological innovations is rising globally, which calls for a need to understand the effects of materials involved in the manufacturing of these products, such as lithium batteries and hydrogen storage. The advent of electric vehicles and portable electronic devices has stimulated the need for energy storage materials (ESM). These ESMs can be batteries and supercapacitors with higher power density and energy density capacity. Furthermore, ESM is essential for the exploitation of renewable energy sources and for efficient, clean, cost-effective, and adaptable energy use. As a result, energy storage materials encompass a broad spectrum of substances and have been the focus of intense research, development, as well as industrialization. Energy storage relies heavily on MSE since improvements in material performance and characteristics have a direct impact on the lifespan, capacity, and efficiency of energy storage devices. This study presents an overview of the applications of advanced nanostructured materials in energy storage devices with focus on batteries (lithium-ion, sodium-ion, and lead-acid), supercapacitors, fuel cells, hydrogen storage, and thermal energy storage. Additionally, it highlighted the use of cost-effective energy storage devices.

Biography

Olusegun Adigun Afolabi is currently an NRF-Postdoctoral Researcher at Durban University of Technology, South Africa. He bagged his PhD in Mechanical Engineering, with expertise in composite and nanocomposite materials. His current research areas focus on composite materials, nanocomposites, material characterizations, hybrid nanocomposite, additive manufacturing, ergonomics, and material science engineering. He has authored several research papers, including journal articles, conference proceedings, and book chapters. He has presented his research work at both local and international conferences.

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