

Are next-generation batteries the future?

In the pursuit of next-generation battery technologies that go beyond the limitations of lithium-ion, it is important to look into the future and predict the trajectory of these advancements. By doing so, we can grasp the transformational potential these technologies hold for the global energy scenario.

Does material innovation influence the development of next-generation batteries?

In summary, the paper provided an overview of the evolving landscape of new-generation battery technologies, with a particular focus on advancements in material research. The adopted analysis emphasizes the increasing significance of material innovation as a key factor influencing the development of next-generation batteries.

What is the future of battery production in 2050?

By 2050, the annual base metal production could increase five- to six-fold (e.g., copper, nickel, aluminum). As for lithium, the demand could reach 100 times its current level. As shown in Figure 1, according to , in order to respond to the battery market demand, the annual production should attain 6700 GWh in 2031.

Where are alternative battery technologies being developed?

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6.1. Status Rapid growth in the demand of the energy-storage technologies, from portable electronic devices to electrical vehicles and smart grids, makes the development of the alternative battery technologies beyond the LIBs.

Why is battery demand increasing in 2025?

Driven by the societal and governmental goals of transitioning to a low-carbon economy, the continuously growing global battery demand will approach 1,000 GWh in 2025. The main contributor to the rising demand for LIBs is the electric vehicle (EV) market.

What are the future research directions for battery technology?

As the field of battery technology continues to progress, it is evident that future research directions should emphasize and explore novel materials, their synthesis methods, and their impact on enhancing battery performance and sustainability.

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Battery improvements continue to emerge, enabling increased driving range, total distance driven over the life of vehicles, and ability to charge at high rates. Herein, an analysis framework to provide insights into inclusive design metrics, such as specific energy of batteries, energy consumption of vehicles, and charging power infrastructure ...

Na-based batteries have the potential to represent the next generation sustainable and low-cost energy storage solution. Great achievements in terms of materials development have been reported. However, further work is still needed to fully understand a proper structure-function correlation in several Na-ion battery materials. In this ...

This paper aims to provide some promising solutions for multi-physics ...

This review systematically classifies lithium batteries to explore their issues and breakthroughs for energy density increase, as well as systematic stability in diverse categories from fundamental materials (cathode, anode, electrolyte, and separator) to complex design systems (all solid-state, anode-free) for the next generation and suggest a ...

Lithium-metal batteries, spotlighted as a next-generation battery, replace the conventional graphite-based anode material of lithium-ion batteries with a lithium metal to significantly improve energy density and driving range. However, conventional lithium-metal batteries have their issues, such as the formation of dendrite on the anode surface and ...

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