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Carbon nanostructures for energy storage applications

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Sustainable and renewable energy sources from hydropower, solar, and wind power are expected to release the heavy burdens on the current energy infrastructure and the environmental concerns. As these renewable energy sources such as solar and wind power are intermittent in nature, reliable electrochemical energy storage systems, mainly including rechargeable batteries and electrochemical capacitors, are purposely explored to promote efficient utilization of these energy sources and are a growing challenge. The development of high energy storage devices has been one of the most important research areas in recent years and relies mostly on the successful engineering of electrode materials. Carbon nanostructures such as carbon nanotubes (CNTs) and graphene have been full of surprises since their emergence and are intensively investigated for use as electrode materials in energy storage devices. Utilizing CNTs, graphene, and their composites for various energy storage applications such as Li-ion and L-S batteries, and supercapacitors are under scrutiny because of their improved electrochemical activity, cost effectiveness, environmental benign nature, and promising electrochemical performance. At present, we are working on our research strategies and efforts to employ carbon nanostructures for different energy storage applications including flexible and even stretchable electricity storage devices.

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