

What is driven self-assembly?

Driven self-assembly. A dissipative self-assembly process leading to energy storage in a high-energy aggregate, as a consequence of kinetic asymmetry in energy consumption. Consumed energy. The energy associated to the conversion of fuel to waste (which, at fixed $[F]$ and $[W]$, corresponds to an associated ΔG for the reaction).

What is electrochemical energy storage?

Electrochemical energy storage is a promising technology for the integration of renewable energy. Lead-acid battery is perhaps among the most successful commercialized systems ever since thanks to its excellent cost-effectiveness and safety records.

How to maximize energy storage?

Moreover, to maximize energy storage, the kinetics of the equilibrium steps must be slower than the catalytic conversion of fuel, because otherwise the self-assembling steps will rapidly re-equilibrate during fuel-to-waste conversion, in which case all consumed energy is just dissipated without leading to energy storage.

What is energy storage in a supercapacitor?

The essence of energy storage is, in fact, charge storage in the form of ions in the electrode material. In supercapacitors (also called electrochemical capacitors), the energy is stored as adsorbed ionic species at the interface between the porous carbon electrode and the electrolyte (Fig. 1b).

Can carbon nanostructures be used in energy storage devices?

Designing ingenious and stable carbon nanostructures is critical but still challenging for use in energy storage devices with superior electrochemistry kinetics, durable capacitive activity, and high rate survivability.

How does assembly technology work?

The assembly technology usually takes advantage of the characteristics of the initial structural unit, or modified functional groups on the surface of the initial structural unit, forming the hierarchical structure with a certain order based on certain rules.

To construct silicon-based anodes for lithium-ion batteries with high energy density and excellent electrochemical performance, novel energy storage devices with different morphologies and functions can be prepared by ...

A class of novel N-doped porous carbon nanospheres (PCNSs) with ultrahigh surface areas (e.g., Langmuir surface area = $3219 \text{ m}^2 \text{ g}^{-1}$) and large templated mesopore diameters (up to 18.6 nm) was synthesized based upon a simple ...

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Efficient energy storage is crucial for handling the variability of renewable energy sources and satisfying the power needs of evolving electronic devices and electric vehicles [3], ...

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Lithium-metal batteries (LMBs) using limited-Li anodes are imperative for realizing high-energy storage. Proper solid-electrolyte interphase (SEI) design to control Li-deposition ...

Self-assembly of block copolymers (BCPs) provides a versatile strategy for controllable preparation of a broad range of functional materials with different ordered structures. In recent decades, this soft-templating strategy ...

How Flywheel Energy Storage Systems Work. Flywheel energy storage systems (FESS) employ kinetic energy stored in a rotating mass with very low frictional losses. Electric energy input accelerates the mass to speed via an integrated ...

The wavy structures are able to withstand large tensile strains as well as compressions without destruction of the materials by tailoring the wavelengths and wave amplitudes. [] Wavelengths are defined as the distance between ...

Self-assembly methods combined with standard top-down approaches are demonstrated to be suitable for fabricating three-dimensional ultracompact hybrid organic/inorganic electronic devices based on rolled-up nanomembranes.

