Smart Energy Storage Devices with Visual Charge Monitoring

Material Science

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The growing demand for energy devices that store and deliver power and offer additional functionalities, like instant performance monitoring, is evident. We introduce an innovative energy storage technology that integrates electrochromic (EC) materials to visually indicate real-time charge status through color changes. The technology utilizes a metal-organic electrochromic layer that serves as a charge indicator and an active battery electrode, making it ideal for applications where instant charge visibility is beneficial.

APPLICATIONS

- Smart batteries and supercapacitors with built-in charge indicators
- Wearable electronics with integrated energy storage
- Optoelectronic devices such as color filter displays, monitors, and TVs
- Optical telecommunication systems (e.g., optical switches, laser devices)
- Medical devices with energy storage and visual status indicators
- Smart windows and light-filtering construction materials
- Automotive applications, including tintable reflective surfaces

DEVELOPMENT STAGE

The research team has demonstrated EC film fabrication on rigid and flexible supports, integration into solid-state devices, development of a hybrid supercapacitor with a novel electrode, and testing in PCBs for optoelectronic applications.

DIFFERENTIATION

Flexible and scalable

Long-term stability – over 1000 charge-discharge cycles

High efficiency – 99% coulomb efficiency and charge retention of ~60 min

Eco-friendly production

Fast charging- as low as 2 seconds