

A Method for Fabricating Monoclinic Sulphur and Carbon Nanofiber Cathodes for High - Performance Lithium - Sulphur Batteries

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ABSTRACT

The present invention provides a method for fabricating cathodes for lithium-sulfur (Li-S) batteries, utilizing monoclinic sulfur and carbon nanofibers. The method involves electrospinning a polyacrylonitrile (PAN) solution, followed by stabilization, carbonization, and activation of the resulting nanofiber mat with potassium hydroxide (KOH). Subsequent deposition of sulfur onto the activated carbon nanofibers results in cathodes with enhanced loading efficiency and improved electrochemical performance. The fabricated cathodes exhibit high-capacity retention, excellent cycling stability, and an areal capacity of 0.8 mAh/cm². The present invention provides a significant potential for enhancing the energy density and longevity of Li-S batteries thereby facilitating the application of the Li-S batteries in electric vehicles, portable electronics, and renewable energy storage systems.

KEY APPLICATION AREAS

- 1.Lithium-Sulfur (Li-S) Batteries.
- 2.Electric Vehicle (EV) Batteries.
- 3.Grid-Scale Energy Storage Systems.
- 4.Portable Electronics.
- 5.Advanced Battery Materials.
- 6.Energy Storage Manufacturing.

POTENTIAL USE

- 1.High-performance Li-S battery cathodes with enhanced sulfur loading and long cycle life.
- 2.Electric vehicle batteries requiring high energy density and lower-cost cathode materials.
- 3.Grid-scale renewable energy storage for solar and wind power integration.
- 4.Portable electronic devices with longer battery life and improved capacity.
- 5.Low-cost battery manufacturing using earth-abundant sulfur as the active material.
- 6.Commercial next-generation rechargeable batteries with high cycling stability (up to 1400 cycles) and high-rate performance.
- 7.Advanced alkali-sulfur battery systems as an alternative to conventional lithium-ion batteries.