Non-Confidential Description - PSU No. 3919
“Doped Carbon-Sulfur Nanocomposite Cathode for Li-S Batteries”

Keywords:
Lithium-sulfur battery, heteroatom-doped carbon, nanocomposites, columbic efficiency

Links:
Inventor Website
Published US Patent Application

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Background
Lithium-sulfur batteries have attracted increasing attention as next-generation energy storage devices for plug-in hybrid electric vehicles and electric vehicles. This is largely due to its extremely high theoretical specific capacity and energy density. The use of sulfur is low-cost, abundant, and eco-friendly. These batteries operate by reaction of sulfur with lithium to form lithium polysulfides, lithium disulfide, and finally lithium sulfide. Lithium-sulfur batteries have been limited by poor capacity, polysulfide shuttle effect, and capacity fading. These limitations have created a significant challenge in the development of high-performance cathodes.

Invention Description
The proposed invention utilizes heteroatom-doped carbon to form doped carbon-sulfur nanocomposites for use in high-performance lithium sulfur batteries. In this nanocomposite, the heteroatom-doped carbon serves not only as a conductive network in the electrode, but also strongly adsorbs elemental sulfur and sulfur compound via chemical adsorption. This strong adsorption mitigates diffusion loss of sulfur and ensures high columbic efficiency (>93%) as well as a long cycle life. This heteroatom-doped carbon can be used to advance the development of high-performance cathodes.

Advantages/ Applications
- Mitigates diffusion loss of sulfur
- Ensures high columbic efficiency (>93%)
- Ensures long cycle life

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