Core-Shell Structure of Sulfur-Polypyrrole for Lithium-Sulfur Batteries
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INTRODUCTION
Rechargeable lithium–sulfur (Li–S) batteries hold great potential for next generation performance energy storage systems because of their low cost, high theoretical specific capacity (theoretical value of 1675 mAh/g of S(8)), and environmental safety. They offer up to a five-fold increase in energy density compared with present Li-ion batteries.

CHALLENGES of Li-S BATTERY
However, the Li-S battery still has issues with life cycle use. Unlike conventional insertion cathode materials, sulfur undergoes a series of compositional and structural changes during cycling, which involve soluble polysulfides and insoluble sulfides. These cycle life and efficiency problems prevent their use in commercial cells. We designed a method to stabilize electrode structure, fully utilize the active material, and provide sufficient cycle life with good system efficiency.

EXPERIMENTAL

CHARACTERIZATION

RESULTS

CONCLUSION

• The uniform and flexible PPy layer helps to encapsulate and confine the sulfur/polysulfides physically inside the core-shell structure, thus alleviating the volume expansion of sulfur and polysulfide effects during the cycling.
• With PPy as a coating layer, the aggregation and growth of sulfur particles was also obviously avoided, which results in faster ion transfer.
• Moreover, PPy as a conductive polymer can partly enhance the electrical conductivity of sulfur particles.

BIBLIOGRAPHY

1 Xie et al., “Facile large-scale synthesis of core-shell structured sulfur@polymerole composite and its application in lithium-sulfur batteries with high energy density”, Applied Energy 175 (2016), 522-528.

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