Importance of open pore structures with mechanical integrity in designing the cathode electrode for lithium–sulfur batteries


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Highlights

- The Li/S cells can be improved by optimizing the electrode pore structure.
- The capacity of 1000 mAh g⁻¹ at 0.1 C was obtained.
- The stable capacity retention was of >700 mAh g⁻¹ after 200 cycles.
- At 0.5 C, it can be achieved with relatively high sulfur content of 68%.

Abstract

The robustness of conductive networks and the accessibility of electrolyte into the network are important factors in designing the cathode electrode for lithium/sulfur (Li/S) batteries containing liquid electrolytes that involve liquid phase electrochemical reactions. We show that the performance of Li/S cells can be significantly improved by simply optimizing the electrode processing conditions to have open pore structures and mechanical integrity of the electrode architecture. It is demonstrated that the capacity of 1000 mAh g⁻¹ at 0.1 C and the stable capacity retention of >700 mAh g⁻¹ after 200 cycles at 0.5 C can be achieved with relatively high sulfur content of 68%. 417 Wh kg⁻¹ in specific energy and 623 Wh l⁻¹ in energy density are achievable with this new technology.

Graphical abstract

Keywords

Lithium/sulfur battery; Electrode process; Pore structure; Mechanical integrity

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