

# Versatile Electrochemical Ways to Fabricate Lithium Sulfide

## Cathodes in Glyme-based Bath

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Lithium sulfide (Li<sub>2</sub>S) is an attractive cathode alternate material for Li-ion battery due to its high specific capacity (1165 mAh g<sup>-1</sup>).<sup>1</sup> Li<sub>2</sub>S suffers from severe dissolution of the intermediate product polysulfides in electrolyte and low electronic conductivity. Confining sulfur species in conductive porous host materials<sup>2,3</sup> is a way widely reported to alleviate the dissolution of polysulfide as well as improving the conductivity. The high melting point of Li<sub>2</sub>S (1372 °C) makes the popular melting-infiltration method difficult for the Li<sub>2</sub>S based composite. As a result, the practical approach to build the Li<sub>2</sub>S/conductive host composite with high performance remains challenging.

In this study, the cost-effective and easy operate electrochemical ways, namely constant current and constant voltage have been studied to fabricate Li<sub>2</sub>S cathodes. The glyme-based electrolyte shows capability of suppressing polysulfide dissolution during electrochemical process. From the initial charge discharge curve showed in Figure 1a, the Li<sub>2</sub>S cathode made by constant voltage method showed much higher charge capacity than that of the Li<sub>2</sub>S cathode made by constant current method, indicating the well fabricated Li<sub>2</sub>S cathode. Figure 1b compares the cycling performance at 0.2 C-rate of the two Li<sub>2</sub>S cathodes made by the electrochemical ways, from which the improved capacity performance of the Li<sub>2</sub>S cathode made by constant voltage can be observed. We believe this constant voltage electrochemical way to make Li<sub>2</sub>S can be applied in various S cathodes, paving a step forward realizing the sulfur Li-ion battery.

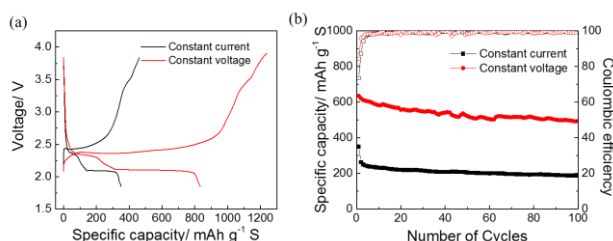


Figure 1. (a) Initial charge discharge curves (b) Cycling performance comparison of the Li<sub>2</sub>S cathodes fabricate by constant current and constant voltage electrochemical methods.

### References:

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