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Enhancing Anode Performance in Li-S Batteries via Coating with Waste Battery-Derived Materials

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Abstract : Lithium (Li) metal possesses outstanding characteristics, with the highest specific capacity (3860 mAh g-1) and the lowest electrochemical potential (-3.04 V vs. SHE) among available metal anodes. The collaborative impact of Li and sulfur, featuring a specific capacity of 1670 mAh g-1, positions Li–S batteries (LSBs) as highly promising contenders for the next generation of high-energy-density batteries. However, the comprehensive commercialization of LSBs relies on addressing various challenges inherent to these batteries. One of the most formidable hurdles is the widespread issue of Li dendrite nucleation and growth on the anode surface, stemming from the inherent instability of the solid electrolyte interphase (SEI) layer. In this study, we employed a Zn-based coating derived from waste materials, significantly enhancing the performance of the symmetrical cell across various current densities. The applied coating not only improved the cyclability of the cell by more than fourfold but also reduced the charge transfer resistance from over 300 to less than 10 before cycling. Examination through SEM micrographs of both samples revealed the successful suppression of Li dendrites by the applied coating.

Keywords : Li-S batteries, Li dendrite, sustainability, Li anode
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