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An Integrally-designed, Flexible Polysulfide Host for High-performance Lithium-sulfur Batteries with Stabilized Lithium-metal Anode

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Abstract

Fast capacity degradation and low sulfur loading hamper lithium-sulfur batteries from practical application. We present here a flexible and robust paper electrode consisting of carbon nanotubes (CNT) and activated carbon nanofibers (ACNF) loaded with MnO₂ nanosheets to serve as an efficient sulfur host for Li/dissolved polysulfide batteries. This integrally-designed flexible host facilitates high sulfur loading, improves sulfur utilization, and suppresses effectively the parasitic shuttle. Accordingly, the Li/dissolved polysulfide cells with high sulfur loading exhibit a high-rate capacity of 780 mAh g⁻¹ at 2C rate and a high capacity retention of 64% over 300 cycles, demonstrating great promise for practical applications of Li-S batteries. In addition, a stable lithium-metal anode resulting from the suppressed shuttle effect is also proved to contribute significantly to the promising cycling performance.

Keywords: lithium-sulfur batteries, flexible electrodes, polysulfide trapping, manganese dioxide

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1. Introduction

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