Dual-protective Effect of the Flexible SWCNTs/TiO_2 interlayer for Highly Stable Lithium Sulfur Batteries

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The rechargeable Lithium Sulfur battery is a promising battery system for electric vehicles and energy storage owing to its low cost, environment friendly and high energy density.[1,2] However, several challenges associated with sulfur cathode is still persist and prevent their practical application, such as low electronic and ionic conductivities, dissolution of polusulfide intermediates into electrolyte and significant volumetric changes during charging/discharging process.[3]

Herein, we use a novel strategy to address the problems in the sulfur cathode by designing and synthesizing a high flexible SWCNTs/TiO_2 hybrid membrane with a thickness of 10 μm as the interlayer. In this membrane, the SMCNTs network not only provides fast electron conduction path and high mechanical stability, but also plays a physical barrier layer for polusulfides. The TiO_2 nanoparticles afford strong chemical binding sites for trapping polysulfide intermediates. The sulfur cathode with the flexible SWCNTs/TiO_2 hybrid interlayer exhibits an excellent cycling stability with a low decay as low as ～0.01% per cycle over 500 cycles at the current of 0.5 C.

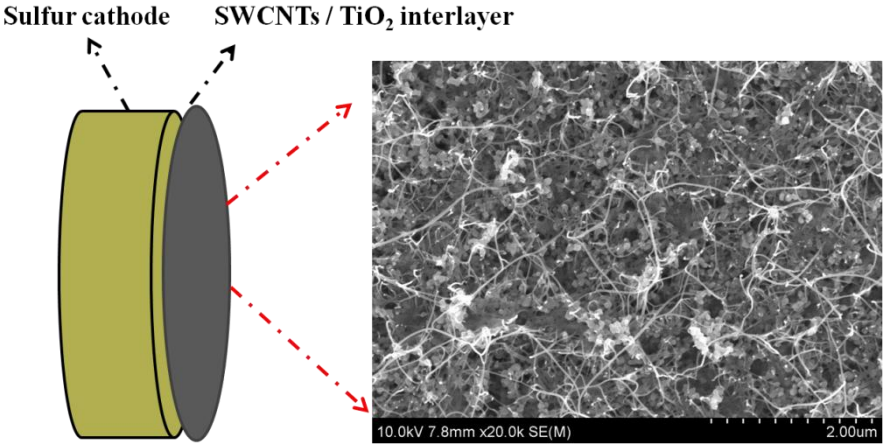

Figure 1. Illustration of the cathode structure

References:

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