

WO₃/ZrO₂ as an efficient Polysulfide Mediator for High-Performance Lithium-Sulfur Batteries

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Owing to the high theoretical specific capacity (1166 mAh g⁻¹), lithium sulfide has been considered as a promising cathode material for Li-S batteries. However, the polysulfide dissolution and low electronic conductivity of Li₂S limit its further application in next-generation Li-S batteries. Herein, we proposed an effective strategy is proposed to overcome the limitations associated with the use of a Li₂S cathode in Li-S batteries. Tungsten oxide/zirconia (WO₃/ZrO₂) with a ratio of 3:7 is prepared and incorporated into a 2D compacted Li₂S-graphene matrix through pelletization. In the pelletized cathode, simultaneously the incorporated WO₃/ZrO₂ particles act as a polysulfide mediator to block the outflow of soluble polysulfide into the electrolyte solution. Therefore, the pelletized cathode shows high interfacial stability and thus substantially extends the lifetime of the Li-S battery over 200 cycles at a high Li₂S loading of 10 mg cm⁻². The practical Li-S full cell fabricated by combining the pelletized cathode and graphite anode achieved a reliable cycling stability over 1500 cycles.