

A new redox-mediating polymer binder for enhancing the performance of Li-S batteries

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Li-S batteries are promising energy storage devices due to their high energy density and the low cost of sulfur, but they are still far from being applied commercially due to detrimental capacity fade resulting from the dissolution of lithium polysulfide (LPS) in liquid electrolyte. Here, we introduced a new polymer binder having a redox-mediating function that assists the reduction of soluble LPS to Li_2S at the cathode to suppress the shuttle effect, as well as enhance sulfur utilization. An amine group containing benzo(ghi)perylene imide (BPI) was synthesized and grafted onto poly(acrylic acid) to produce a redox-mediating polymer binder. A Li-S cell fabricated using the new redox-mediating polymer binder demonstrated a capacity decay retention of 0.036 % per cycle up to 500 cycles at 0.5 C with a coulombic efficiency of 98%.