Polyamide interlayer onto the sulfur-electrode for high performance of Li-S battery

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Lithium-sulfur (Li-S) batteries are considered to be a promising energy storage devices owing to its high specific capacity and more importantly low cost of S cathode. Poor cycle stability arising from polysulfide shuttling is the main obstacle for its practical application. One approach is to prevent the formed polysulfide from shuttling using cation permeable polymeric membrane as interlayers, which serve as either chemically interacting with polysulfide or diffusion barrier, allowing Li ions to access the active S. Herein, we report a scalable and facile method of coating a porous and thin polyamide (PA) interlayer onto the S cathode formed by interfacial polymerization technique. The PA interlayer prevents the dissolution of polysulfide in electrolyte through the physical barrier effect as well as provide chemical interaction through amide functionalities. Thus, the resulting PA coated S-cathode reveals about 70% of capacity retention over 1,000 cycles at 1C with 0.035% capacity decay per cycle.