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Designing of Efficient Polysulphide Reservoirs to Boost the Performance of Li-S Battery

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Abstract : Among the existed myriad energy-storage technologies, lithium–sulfur batteries (LSBs) show the appealing potential for the ubiquitous growth of next-generation electrical energy storage application, owing to their unparalleled theoretical energy density of 2600 Wh/kg that is over five times larger than that of conventional lithium-ion batteries (LIBs). Despite its significant advances, its large scale implementations are plagued by multitude issues: particularly the intrinsic insulating nature of the sulfur (10-30 S/cm), mechanical degradation of the cathode due to large volume changes of sulfur up to 80 % during cycling and loss of active material (producing polysulfide shuttle effect). We design a unique structure, namely silicon/silica (Si/SiO2) crosslink with hierarchical porous carbon spheres (Si/SiO2@C), and use it as a new and efficient sulfur host to prepare Si/SiO2@C-S hybrid spheres to solve the hurdle of the polysulfides dissolution. As results of intriguing structural advantages developed hybrids spheres, it acts as efficient polysulfides reservoir for enhancing lithium sulfur battery (LSB) in the terms of capacity, rate ability and cycling stability via combined chemical and physical effects.

Keywords : high specific surface area, high power density, high content of sulfur, lithium sulfur battery
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