Electrochemical redistribution of sulfur using soluble lithium polysulfide for enhanced performance in Li-S battery

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Recently, numerous researches on lithium-sulfur batteries (LSB) were reported since the sulfur has a high specific theoretical capacity (1,675 mA h g^{-1}) and natural abundance. However, there are many obstacles for practical application of the LSB. In particular, dissolution and migration of the soluble lithium polysulfide make a capacity decay and decreased coulombic efficiency, which is commonly called "shuttle effect". Melt infiltration of sulfur into the porous carbon host is one of the approaches to prevent the shuttle effect. However, the melt infiltration process has disadvantages such as lack of uniformity and unreacted sulfur (dead sulfur) in the pores. Therefore, uniform distribution of sulfur into the pores is very important for enhancing performance of the LSB. Herein, we suggest a facile electrochemical activation process for uniform redistribution of sulfur using hierarchical mesoporous carbon, which is compared with sulfur melt diffusion process. This is because the activation process can induce the production of lithium polysulfide. This research will contribute to the development of batteries by facilitating the commercialization of LSBs.