A study on the difference of mass transfer effect of lithium polysulfide by pore size in lithium-sulfur battery

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Lithium-sulfur battery (LSB) is the promising alternative for lithium-ion battery (LIB) since sulfur has a high theoretical specific capacity (1,675 mA h g^{-1}) and low price. However, sulfur requires a carbon additive owing to the low conductivity, and it forms intermediate called lithium polysulfide (Li_2S_x, $1 \leq x \leq 8$). Among various length of Li_2S_x, long chain lithium polysulfide ($4 \leq x \leq 8$) can dissolve in an ether-based electrolyte. For this reason, the capacity is deteriorated because of continuous loss of sulfur and the passivation layer caused by diffusion of dissolved lithium polysulfide to the cathode. Therefore, the mass transfer effect of soluble lithium polysulfide should be considered to understand the behavior of lithium polysulfide in the sulfur cathode. In this study, we used 3-dimensionally ordered macroporous (3DOM) carbon having different pore size and two types of cathode starting materials to investigate the mass transport effect by the pore size and starting materials. This research suggests the considerations of electrode design for achieving the performance of LSB and the detailed contents will be discussed in the presentation.