Improvement in Electrochemical Performances of Sulfur/Mesoporous Carbon Composites for Li-S Battery Cathodes

오창일, 최재호, 안성현, 이정규†
동아대학교
(jklee88@dau.ac.kr†)

Energy storage devices with high energy density and low cost are highly demanding since the existing state-of-the-art Li-ion battery (LIB) systems have intrinsic limitations in energy and price. Thus, lithium-sulfur (Li-S) batteries have attracted a great attention because sulfur is abundant and it has high theoretical capacity (1672 mAh g-1) and energy density (2600 Wh kg-1). However, it is still challenging to device Li-S batteries offering a long-term cycling stability at a high level of sulfur loading due to poor electronic conductivity of sulfur, dissolution and shuttle effects of polysulfides (Li2Sx, 4 < x < 8) in Li-S batteries. Recently, many important technological breakthroughs have been reported to suppress the polysulfides shuttle effects. In this aspect, a rational design of sulfur cathode is still regarded as one of the most important measures in mitigating the polysulfides shuttle problems. For this study, we synthesized mesoporous carbons (MCs) and N-doped mesoporous carbon (N-MC) as the sulfur host materials. We investigated the effects of 1) sulfur loading and 2) sulfur loading methods (melt-impregnation in a flow or a closed system, and 3) the use of a conductive separator (CS) on the electrochemical performances of Li-S batteries.