QUANTITATIVE INVESTIGATION ON LITHIUM POLYSULFIDE ADSORPTION OF MXENE COMPOSITIONS FOR HIGH PERFORMANCE Li-S BATTERIES

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Lithium-Sulfur batteries have attracted a lot of attention because of their high theoretical energy density, low cost, and relative abundance of their host materials. However, the practical utility is hindered by poor cycle stability and cell efficiency due to loss of active material by the dissolution of intermediate lithium polysulfides (host material) in the electrolyte and the incomplete utilization of sulfur due to its insulating nature. In this study, MXenes, a new family of two-dimensional transition metal carbides and nitrides with rich surface functionalities and high conductivity are used to tackle the challenges associated with rapid capacity decay by physically confining the soluble polysulfides to conductive MXene. Here, we quantitatively compared the lithium polysulfide (LiPS) adsorption capacities of Ti-based MXenes - $Ti_3C_2T_x$ and Ti_2CT_x. Interestingly, large-flake Ti_2CT_x has the highest polysulfide adsorption capacity of ~226 mg over large-flake $Ti_3C_2T_x$ (68 mg) per gram of MXene. In the future, by expanding the quantitative investigation to other MXene compositions, it is possible to select a suitable MXene composition for use as a cathode material in Li-S batteries.