Metal Sulfide-Based Functional Material for Chemical Confinement of Polysulfide in Li-S Battery

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Li-ion battery technology has promoted the growth of global market such as portable electronic devices, electric vehicles and grid-scale energy storage systems. Current increases in energy density and decreases in cost, however, mainly resulted from advances in battery manufacture skills and now it is reaching its theoretical limit. In this regard, finding next-generation energy storage material that satisfies high energy density and low cost is essential. Sulfur is one of the most promising candidate active materials due to its high theoretical specific capacity, abundant availability in earth's crust, environmental friendliness and low cost [1-2]. However, Li-S battery utilizing sulfur as a cathode suffers from rapid capacity fading due to the dissolution and migration of lithium polysulfides formed during discharge process. Many efforts have been made to mitigate these problems, but just physical blocking of polysulfide was not enough for preventing capacity fading in long-term cycling, implying the necessity of introducing further confinement by utilizing chemical interaction [3]. Herein, we focused on chemical confinement of polysulfide by utilizing functional material synthesized from Fe_2O_3, which showed high effectiveness in confining polysulfide in Li-S battery system. In addition, this material has ability to store lithium ion and did not sacrifice electronic conductivity for its affinity, showing good cycling performance especially at high C-rate.

References:

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