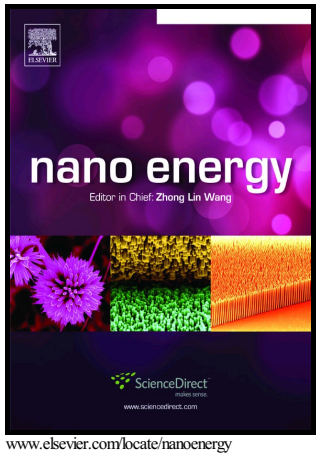

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Promoting Lithium Polysulfide/sulfide Redox Kinetics by the Catalyzing of Zinc Sulfide for High Performance Lithium-Sulfur Battery

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Abstract: Entrapping polysulfide from dissolution into electrolyte by strong chemisorption of polar materials has been widely reported in lithium-sulfur (Li-S) battery. Here, for the first time, zinc sulfide (ZnS) was demonstrated as an activation catalyst in Li-S battery to suppress the soluble polysulfide shuttle effect by powering kinetics redox reactions of lithium polysulfide/sulfide. Kinetic analyses comprehensively identify that ZnS not only facilities polysulfide redox kinetics in liquid phase ($Li_2S_8 \rightarrow Li_2S_6 \rightarrow Li_2S_4$), but also promotes the effective decompositions of lithium sulfide (Li_2S). Furthermore, first-principle calculations confirm that the low lithium ion diffusion barrier on the surface of ZnS promotes the redox reaction between lithium ion and sulfur species; and the low migration energy barrier of polysulfide on its surface guarantees the fast diffussion of polysulfides from the ZnS