

Carbon for Better Lithium-Sulfur Batteries

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Abstract: Lithium-sulfur (Li-S) batteries have attracted tremendous interest because of their high theoretical energy density and cost effectiveness.^{1, 2} The object of Li-S battery research is to produce batteries with more high energy density that at least outperforms state-of-the-art lithium-ion batteries. However, due to an intrinsic gap between fundamental research and practical applications, the outstanding electrochemical results obtained in most Li-S battery studies indeed correspond to low useful energy densities and are not really suitable for practical requirements.³ The Li-S battery is a complex device and its useful energy density is determined by several key parameters, most of which are often ignored, leading to the failure to meet commercial requirements.⁴ The purpose of this talk is to discuss how to pave the way for a reliable Li-S battery. From the perspective of fundamental research, high sulfur contents, high areal sulfur loadings and low electrolyte-to-sulfur ratios are essential requirements for achieving high practical energy density of a Li-S device. Possible solutions and some concerns regarding the optimization of these parameters are comprehensively discussed. Besides, problems related to a lithium metal anode in the Li-S system remain a great challenge and further developments are needed for the stabilization and protection of the anode. Finally, the future directions and prospects in Li-S battery field are considered.

References

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