

## **Recent in situ/operando characterization of lithium-sulfur batteries**

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### **ABSTRACT:**

To address the ever-increasing energy demand due to the increase in the population and at the same time depleting fossil fuel reserves, new energy storage systems, such as batteries, are being developed. Among various battery systems, Li-S batteries have comparatively high theoretical energy density and lower cost, making Li-S batteries very promising for next-generation secondary batteries. However, the current energy density and capacity decay with cycling of Li-S batteries do not fulfill the industrialization needs. To overcome the drawbacks of Li-S batteries and improve its performance, better mechanism understanding is necessary. A great deal of ex situ characterization research has been conducted making a lot of progress in the understanding of the working mechanism. Considering the complexity of the intermediate lithium polysulfides and the inherent multi-electron reaction pathways, advanced in situ/operando techniques are highly required. In this chapter, recent progress of a few typical in situ/operando characterization techniques used in Li-S battery studies is reviewed. These techniques provide more in-depth understanding of Li-S batteries in different aspects and could be enlightening for other energy storage systems too.