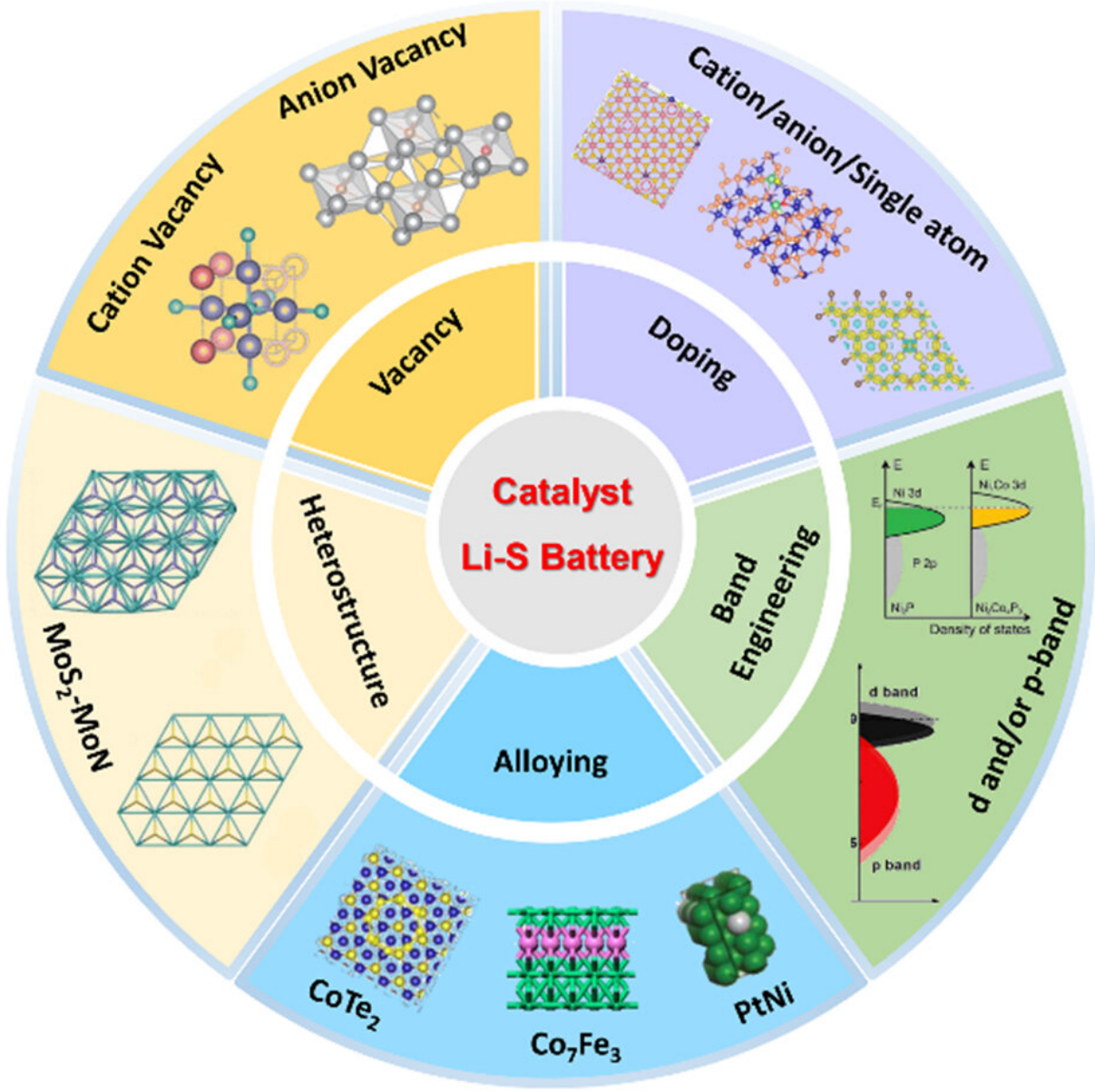


High-efficiency electrocatalysts could be realized through electronic modulation for advanced lithium-sulfur batteries

November 29 2022



A review paper comprehensively summarizes the strategies to tailor the electronic structure of electrocatalysts to construct high-energy-density and long-lifetime Li-S batteries. Credit: *Chinese Journal of Catalysis*

The notorious polysulfide shuttle severely impedes the practical application of Li-S batteries. Utilizing various electrocatalysts to improve the polysulfide redox kinetics has emerged as a promising strategy to address the shuttle effect.

The [electronic structure](#) of the electrocatalysts plays a decisive role in determining the [catalytic activity](#) to facilitate the polysulfide conversion. Therefore, reasonably modulating the electronic structure of electrocatalysts is of paramount significance for improving the electrochemical performance of Li-S batteries. However, previous reviews focus on the classification of catalytic materials in term of their physical and [chemical properties](#), which ignores the relationship between electronic structure and catalytic activity.

Recently, a research team led by Profs. Liang Zhang and Yanguang Li from Soochow University in China systematically summarized the strategies for optimizing the electronic structure of electrocatalysts for Li-S batteries and established the relationship between electronic structure and catalytic activity. Future perspectives and challenges are also proposed for designing high-efficient electrocatalysts to construct high-energy-density and long-lifetime Li-S batteries. The review was published in *Chinese Journal of Catalysis*.

A comprehensive overview of the fascinating strategies to tailor the electronic structure of electrocatalysts for Li-S batteries is presented,

including vacancy engineering, heteroatom doping, single atom doping, band regulation, alloying, and heterostructure engineering.

Vacancy engineering aims at creating more [active sites](#) and tune the surface charge-transfer property. Meanwhile, vacancies can significantly promote the electrocatalytic activity by optimizing the surface-adsorption ability for reaction intermediates, which derives from the abundance of localized electrons around vacancies. Additionally, the vacancies can tailor the surface hydrophilic property for a better electrolyte contact.

In summary, designing sulfur host materials with high catalytic activity has provided a new direction towards high-performance Li-S batteries. The high-efficiency electrocatalysts with high activity and [special functions](#) can be obtained through the coordination of various electronic structure regulation strategies, which can further improve the electrochemical performance of Li-S batteries and also enlighten other energy-related processes based on multi-electron reactions.

More information: Pan Zeng et al, Recent progress in electronic modulation of electrocatalysts for high-efficient polysulfide conversion of Li-S batteries, *Chinese Journal of Catalysis* (2022). [DOI: 10.1016/S1872-2067\(21\)63984-0](#)

Provided by Chinese Academy of Sciences

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