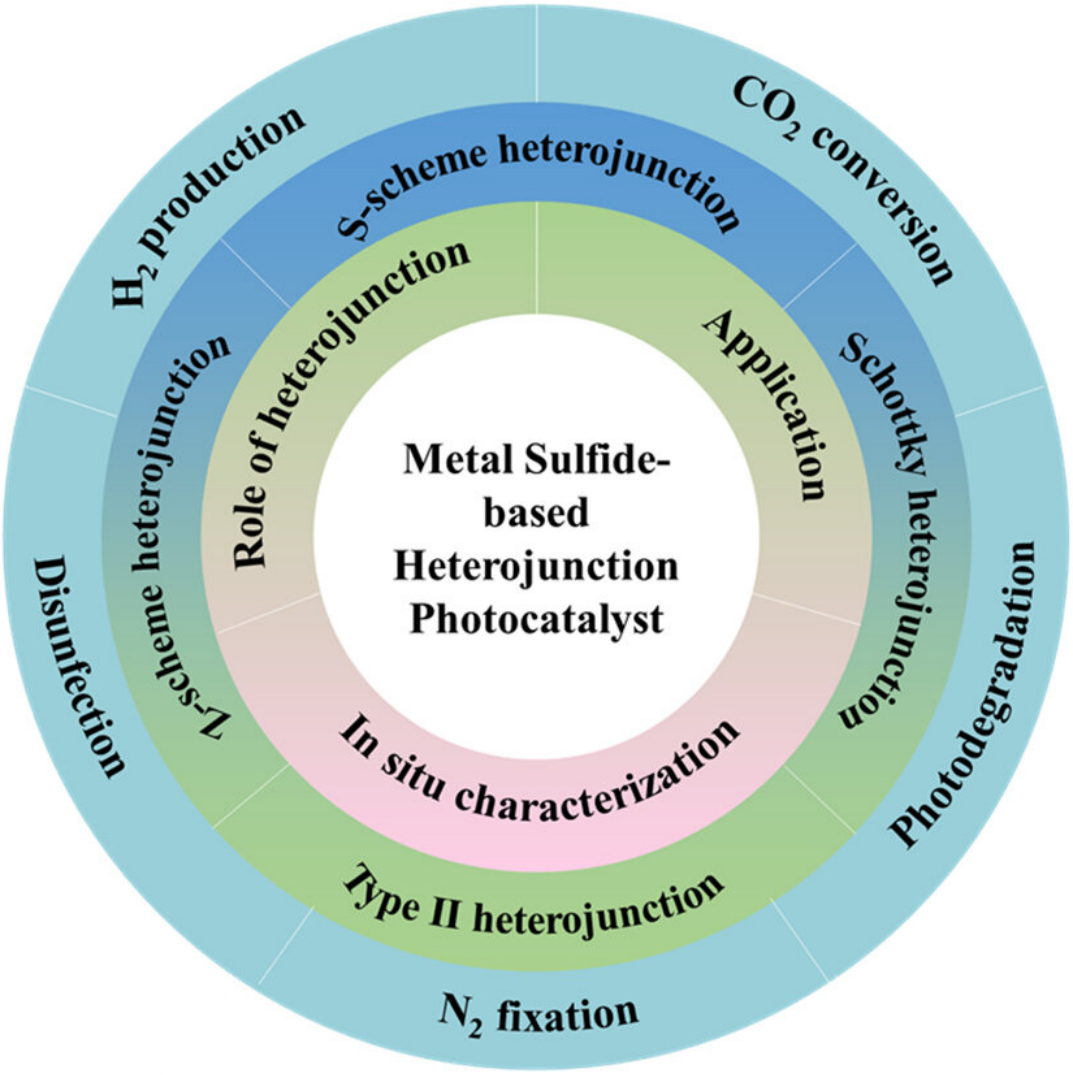
A review of the latest metal sulfide-based heterojunction photocatalysts

July 6 2023



A comprehensive review on metal sulfide-based heterojunction photocatalysts presents the latest advancements in the design, applications, and in-situ

characterization techniques of heterojunction. Credit: *Chinese Journal of Catalysis*

Since the Industrial Revolution, the global economy has experienced rapid development, which is closely tied to the exploitation of natural energy resources. However, it has led to a gradual depletion of energy resources and an increasingly serious environmental pollution problem. Photocatalytic technology has emerged as a green and pollution-free solution that aligns with sustainable development principles. It not only enables the production of new types of energy but also facilitates environmental remediation.

Metal sulfides, known for their strong reducibility, are considered one of the most promising semiconductor photocatalysts in energy and environmental-remediation applications. However, the photocatalytic performance of most metal sulfides is hindered by their poor stability and significant charge carrier recombination. To overcome these limitations, the fabrication of metal sulfide-based heterojunction has been explored as an effective strategy.

Recently, a research team led by Prof. Kai Dai from Huaibei Normal University, China, published a research review article in the field of photocatalysis in the *Chinese Journal of Catalysis*. The authors provide a comprehensive summary of the advantages and drawbacks of metal sulfides in the field of photocatalysis, while discussing the role of heterojunction in enhancing their performance.

Various synthesis methods for metal sulfide-based heterojunction photocatalysts, including hydrothermal synthesis, ion exchange, electrospinning, and in-situ photochemical deposition, are discussed. Moreover, the review categorizes the types of metal sulfide

heterojunction based on electron transfer pathways, such as Schottky junctions, type II, Z-scheme, and S-scheme heterojunction.

The authors also present an extensive overview of the applications of metal sulfide heterostructure photocatalysts, with a particular emphasis on achieving simultaneous desired redox reactions through the efficient utilization of electron-hole pairs. Furthermore, the importance of in-situ characterization techniques in elucidating the mechanisms of heterojunction photocatalysts is thoroughly discussed.

More information: Haibo Zhang et al, Metal-sulfide-based heterojunction photocatalysts: Principles, impact, applications, and in-situ characterization, *Chinese Journal of Catalysis* (2023). DOI: 10.1016/S1872-2067(23)64444-4

Provided by Chinese Academy of Sciences