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Step-scheme photocatalysts: Promising hybrid nanomaterials for optimum conversion of CO2
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Abstract
The appealing prospect of photocatalysts as an environmentally friendly method for converting atmospheric CO2 into value-added products is undeniable, and scientists are working hard to further enhance their performance. This review outlines the most recent developments in the synthesis, characterization, computational insights, and emerging application of Step-scheme (S-scheme) photocatalysts in CO2 transformation into value added products. The review begins with a survey of different generations of heterojunctions and the challenges associated with each heterojunction generation. S-scheme heterojunctions are therefore suggested as a solution to the drawbacks of type-II and Z-scheme family heterojunctions, and the underlying reaction mechanism of S-scheme is critically outlined. The different synthesis approaches for the design of S-scheme heterojunctions are discussed. Following this, direct characterization techniques and emerging computational methods to identify the charge transfer mechanism in S-scheme heterojunctions are presented. Furthermore, emerging applications of S-scheme photocatalysts in CO2 transformation into value-added products are critically surveyed from recent literature. Finally, the current challenges and prospects of the S-scheme heterojunction photocatalyst are discussed. © 2023 Elsevier Ltd

Author Keywords
CO2 conversion; Computational method; Heterojunction; S-scheme photocatalysts

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