

Title: Progress and Perspectives on Promising Covalent-Organic Frameworks (COFs) Materials for Energy Storage Capacity

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Abstract: In recent years, a new class of highly crystalline advanced permeable materials covalent-organic frameworks (COFs) have garnered a great deal of attention thanks to their remarkable properties, such as their large surface area, highly ordered pores and channels, and controllable crystalline structures. The lower physical stability and electrical conductivity, however, prevent them from being widely used in applications like photocatalytic activities and innovative energy storage and conversion devices. For this reason, many studies have focused on finding ways to improve upon these interesting materials while also minimizing their drawbacks. This review article begins with a brief introduction to the history and major milestones of COFs development before moving on to a comprehensive exploration of the various synthesis methods and recent successes and signposts of their potential applications in carbon dioxide (CO₂) sequestration, supercapacitors (SCs), lithium-ion batteries (LIBs), and hydrogen production (H₂-energy). In conclusion, the difficulties and potential of future developing with highly efficient COFs ideas for photocatalytic as well as electrochemical energy storage applications are highlighted.

Key words: Covalent-organic frameworks (COFs), Crystalline materials, Photocatalysis, Energy storage, CO₂ sequestration, Supercapacitors, Lithium-ion batteries, Hydrogen production

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