

Catalytic Applications of Metal-Organic Frameworks for Organic Pollutant Removal in Wastewater Treatment: A Review

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Abstract : This review focuses on the application of Metal-Organic Frameworks (MOF)-based catalysts in the degradation of organic pollutants in wastewater. The degradation of organic pollutants in wastewater remains a critical environmental challenge, necessitating innovative solutions for effective treatment. MOFs have garnered significant attention as promising catalysts for this purpose, owing to their exceptional surface area, tunable porosity, and diverse chemical functionalities. It explores various catalytic mechanisms, including photocatalysis, Fenton-like reactions, and other advanced oxidation processes facilitated by MOFs. The review also explores the design strategies that enhance the catalytic performance of MOFs, such as structural modifications, composite formation, and post-synthetic modifications. Furthermore, real-world case studies are presented, highlighting the practical applications and environmental impact of MOF-based catalysts in wastewater treatment. Challenges associated with the scalability and stability of these materials are discussed, along with future directions for research and development. This review highlights the significant potential of MOF-based catalysts in addressing the pressing issue of water pollution and advocates for continued innovation to optimize their application in wastewater treatment.

Keywords : metal-organic frameworks (MOFs), catalysis, wastewater treatment, organic pollutant degradation, photocatalysis

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