

Advanced Nanomaterials in Catalysis: Bridging the Gap Between Pollution Control and Renewable Energy

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Abstract : This review focuses on the application of advanced nanomaterials in catalysis for pollution control and renewable energy solutions. This review provides a comprehensive examination of the latest developments in nanocatalysts, highlighting their role in addressing environmental challenges and facilitating sustainable energy solutions. The unique properties of nanomaterials, including high surface area, tunable electronic properties, and enhanced reactivity, make them ideal candidates for catalytic applications. This review explores various types of nanomaterials, such as metal nanoparticles, carbon-based nanostructures, and metal-organic frameworks, and their effectiveness in processes like photocatalysis, electrocatalysis, and hydrogen production. Additionally, the review discusses the environmental benefits of using nanocatalysts in pollution control, focusing on the degradation of pollutants in water and air. The potential of these materials to bridge the gap between environmental remediation and clean energy production is emphasized, showcasing their dual role in mitigating pollution and advancing renewable energy technologies. In conclusion, the review analyzes the current challenges and future directions in the field, highlighting the need for continued research to improve the design and application of nanocatalysts for a sustainable future.

Keywords : nanomaterials, catalysis, pollution control, renewable energy, sustainable technology

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