

WASTE DERIVED CATALYSTS

Sustainable Materials for Energy and Environment



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Chapter 24 - Circular economy, life cycle assessment, and sustainability of waste derived catalysts

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Abstract

With the advent of artificial intelligence and machine learning technologies, the integration of emerging AI-assisted design methodologies offers a transformative pathway to optimize catalyst performance and accelerate innovation. With these advancements waste-derived catalysts have potential to drive the transition towards a zero-waste economy and foster sustainable industrial, agricultural and waste disposal practices. Waste-derived catalysts have emerged as an important tool in addressing the environmental, economic, and social challenges associated with conventional chemical processes. These catalysts can be sourced from agricultural dumps, municipal waste, and industrial runoffs and derived as catalysts using advanced thermochemical and hydrothermal techniques. Waste-derived catalysts offer a great example of a system which follows the principles of the circular economy which helps to convert discarded materials into high-value, functional catalysts.

Waste-derived catalysts have demonstrated enhanced surface properties and reactivity. The catalysts can chemically be classified as carbon-based, transition metal-based,