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Chapter 13

Functionalized Nanomaterials for Catalytic Application: Trends and Developments

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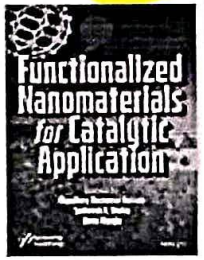

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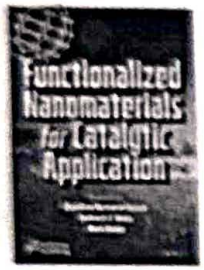
Summary

Catalysis by functionalized nanomaterials is the contemporary discipline of nanoscience which is expanding exceptionally to meet the upcoming global demands of mankind. Nanocatalysts, being lying at the frontier of homogeneous and heterogeneous catalysts, offer multiple benefits of atom economy, remarkable stability, enhanced activity, better selectivity, recoverability, reusability, and energy efficiency, thereby allowing optimum feedstock utilization and minimal chemical waste. However, with time, it was diagnosed that some of these very active nanocatalysts suffer with the limitation of stability causing them to agglomerate during catalysis, which was later resolved to a great extent by modifying their surface composition via functionalization. The functionalization of these nanocatalysts with various biocompatible and active species serving as weak ligands not only enhances their stability and selectivity but also facilitates their easy separation along with preventing their undue coagulation during catalysis. Besides these, the functionalization of nanomaterials also has considerable effect reflected in their structure, morphology, optical, electrical, magnetic, and other properties owing to the novel theory of quantum effects, enabling a control of their catalytic activity.



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About this book

This is the first handbook that provides an integrated approach for functionalized nanomaterials (FNMs) based catalytic materials.

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Functionalized Nanomaterials for Catalytic Application: Trends and Developments

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Abstract

Catalysis by functionalized nanomaterials is the contemporary discipline of nanoscience which is expanding exceptionally to meet the upcoming global demands of mankind. Nanocatalysts, being lying at the frontier of homogeneous and heterogeneous catalysts, offer multiple benefits of atom economy, remarkable stability, enhanced activity, better selectivity, recoverability, reusability, and energy efficiency, thereby allowing optimum feedstock utilization and minimal chemical waste. However, with time, it was diagnosed that some of these very active nanocatalysts suffer with the limitation of stability causing them to agglomerate during catalysis, which was later resolved to a great extent by modifying their surface composition via functionalization. The functionalization of these nanocatalysts with various biocompatible and active species serving as weak ligands not only enhances their stability and selectivity but also facilitates their easy separation along with preventing their undue coagulation during catalysis. Besides these, the functionalization of nanomaterials also has considerable effect reflected in their structure, morphology, optical, electrical, magnetic, and other properties owing to the novel theory of quantum effects, enabling a control of their catalytic activity.

This Chapter will cover nanocatalysis, factors affecting catalytic performance, different functionalization strategies and application of these functionalized nanocatalysts in various fields.

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