Heterogeneous Catalysis at Nanoscale for Energy Applications

Description:
A comprehensive textbook and reference tool that provides state-of-the-art research and understanding of heterogeneous catalysis for efficient energy conversion.

One of the most crucial technologies at the forefront of materials chemistry, physical chemistry and chemical engineering topics is heterogeneous catalysis. The quality of our everyday lives owes much to the technology's involvement in the efficient conversion of renewable energy with least environmental impact. Heterogeneous catalysis typically occurs on reactive sites of catalysts consisting of specific surface structures at the atomic scale. Both in-situ and ex-situ experimental techniques and theoretical approaches have been applied to study this mechanism used in energy conversion processes.

Providing a foundation for the design and further development of new technical catalysts and technologies for energy economy, Heterogeneous Catalysis at Nanoscale for Energy Applications presents the fundamental concepts, latest achievements and promising solutions for global energy problems. The book features:

- Coverage of heterogeneous catalysis at the atomic- and nano-scales—from synthesis, ex-situ and in-situ characterization, catalytic activity and selectivity, to mechanistic understanding based on experimental exploration and theoretical simulation
- Theoretical studies and experimental exploration on a range of energy conversion processes, providing an overview of modern catalysis and current trends in nanocatalysis research
- Discussion on the challenges that remain to overcome limitations imposed by oxygen reduction reaction at catalyst surface during the electrochemical operation, including electrochemical technologies

Addressing heterogeneous catalysis, this comprehensive and authoritative text/reference is useful for graduate students, engineers and scientists in physical chemistry, materials chemistry, chemical engineering, nanoscience and nanotechnology, materials science, and environmental sciences.

Franklin (Feng) Tao, PhD, is a tenured Miller associate professor of chemical engineering and chemistry at the University of Kansas. He leads a research group focusing on synthesis, evaluation of catalytic performance, and in-situ characterization of heterogeneous catalysts at nanoscale for chemical and energy transformations. He has published almost 100 papers and three books with Wiley and RSC.

William F. Schneider, PhD, is a Professor of Chemical and Biomolecular Engineering at the University of Notre Dame. His research interests are in the application of theory and simulation to probe and predict the molecular details of surface chemical reactivity and catalysis. He has co-authored more than 130 papers and book chapters.

Prashant V. Kamat, PhD, is Rev. John A. Zahm Professor of Science in the Department of Chemistry and Biochemistry, and Radiation Laboratory at the University of Notre Dame. For nearly three decades, he has worked to build bridges between physical chemistry and material science by developing semiconductor and metal nanostructure based hybrid assemblies for cleaner and efficient light energy conversion. He has co-authored more than 450 papers, reviews and book chapters.

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