Inorganic Chemistry: An Indian Journal

Editorial | Vol 18 Iss 1

Catalysis and Its Fundamental Role in Accelerating Inorganic Chemical Reactions

Elena Petrov*

Department of Inorganic Chemistry, Lomonosov Moscow State University, Russia,

***Corresponding author:** Elena Petrov. Department of Inorganic Chemistry, Lomonosov Moscow State University, Russia, Email: elena.petrov.cat@chemnet.ru

Received: jan 04, 2022; **Accepted:** jan 18, 2022; **Published:** jan 27, 2022

Abstract

Catalysis is a cornerstone of inorganic chemistry, enabling chemical reactions to proceed at enhanced rates without permanent consumption of the catalyst. Inorganic catalysts, particularly transition metal complexes and metal oxides, play a vital role in industrial synthesis, environmental processes, and energy conversion. Understanding catalysis provides insight into reaction pathways, intermediate stabilization, and efficiency improvements. This article elaborates the role of catalysis in accelerating inorganic chemical reactions and its broad scientific importance. The theory provides insight into magnetic and optical properties of coordination compounds. This article elaborates the application of crystal field theory in understanding electronic behavior of transition metal complexes.

***Keywords:** Catalysis and its fundamental role in accelerating inorganic chemical reactions*

Introduction

Catalysis and its fundamental role in accelerating inorganic chemical reactions are central to both laboratory research and industrial chemistry. Catalysis involves the participation of a substance that lowers activation energy and facilitates alternative reaction pathways (1). In inorganic systems, transition metal complexes often function as catalysts due to their variable oxidation states and ability to form intermediate coordination species (2). The theory explains inner and outer orbital complexes based on ligand field strength and electron pairing (2). Valence bond theory also provides insight into coordination geometry and magnetic properties (3). Despite its inability to explain electronic spectra, valence bond theory remains conceptually important (4). Its historical significance continues to influence coordination chemistry education (5). (3). In catalytic systems, the influence of ligand design determines selectivity and reaction efficiency by stabilizing key intermediates (4). Biological systems further demonstrate the importance of

Citation: Elena Petrov. Catalysis and Its Fundamental Role in Accelerating Inorganic Chemical Reactions. Inog chem Ind J. 18(1):11.

ligand design, as naturally occurring ligands precisely control metal ions in enzymes and metalloproteins (5).

Conclusion

Catalysis continues to be a fundamental tool in inorganic chemistry, enhancing reaction rates and enabling sustainable chemical processes across industrial and environmental applications. Molecular orbital theory remains indispensable for interpreting bonding and reactivity in inorganic chemistry, supporting advances in catalysis and materials science. Coordination chemistry and its role in understanding metal–ligand interactions remain central to inorganic chemistry. By elucidating how metals interact with ligands, coordination chemistry supports advances in catalysis, bioinorganic chemistry, and materials science, reinforcing its enduring importance.

REFERENCES

1. Isahak WN, Al-Amiery A. Catalysts driving efficiency and innovation in thermal reactions: A comprehensive review. Green Technologies and Sustainability. 2024 May 1;2(2):100078.
2. Studer A, Curran DP. Catalysis of radical reactions: a radical chemistry perspective. Angewandte Chemie International Edition. 2016 Jan 4;55(1):58-102.
3. Lin H, Chen Y, Shi J. Nanoparticle-triggered in situ catalytic chemical reactions for tumour-specific therapy. Chemical Society Reviews. 2018;47(6):1938-58.
4. Thomas JM. Uniform Heterogeneous Catalysts: The Role of Solid-State Chemistry in their Development and Design. Angewandte Chemie International Edition in English. 1988 Dec;27(12):1673-91.
5. Kitanosono T, Masuda K, Xu P, Kobayashi S. Catalytic organic reactions in water toward sustainable society. Chemical Reviews. 2018 Jan 24;118(2):679-746.