

Key Advantages of Platinum-Based Catalysts Over Iridium

Platinum-based catalysts have gained significant attention in various industries thanks to their exceptional performance and versatility. As catalysts play a crucial role in numerous chemical reactions and industrial processes, it is essential to explore the advantages of platinum-based catalysts over their counterparts, particularly iridium catalysts. This article delves into the unique properties of platinum catalysts, highlighting their wider array of reactions, stability, catalytic activity, selectivity, thermal stability, synergistic effects, and environmental friendliness.

Catalysts and Their Importance in Various Industries

Catalysts act as facilitators in chemical reactions, accelerating the reaction rate without being consumed. They are vital components in industries such as petroleum refining, chemical production, and automotive exhaust treatment. Catalysts enable efficient conversion processes, optimize reaction conditions, and enhance the desired product yields.

Brief Overview of Platinum and Iridium Catalysts

Both platinum and iridium are transition metals that possess excellent catalytic properties. Platinum-based catalysts, in particular, are used in many different applications due to their ability to catalyze a broad range of reactions, including oxygen reduction reactions (ORR) and oxidation reactions. Iridium catalysts are also utilized in various industries but exhibit limitations in terms of cost and availability.

Advantages of Platinum-Based Catalysts Over Iridium

Platinum-based catalysts offer a range of advantages compared to iridium, including wide availability and cost-effectiveness. In this section, we look at more advantages in detail.

Better Selectivity

Platinum catalysts offer superior selectivity in specific reactions, enabling the production of desired products with minimal side reactions and byproducts. The precise control over the reaction pathway contributes to the overall efficiency of the catalytic process, making platinum catalysts valuable in industries where product purity is paramount.

Environmental Friendliness

Apart from their exceptional catalytic properties, platinum-based catalysts offer environmental benefits, ease of industrialization, and recyclability. Their good atom economy and recyclable nature contribute to sustainable practices, aligning with the growing focus on green technologies and reducing the environmental impact of industrial processes.

Good Stability and Strong Anti-Toxic Properties

Platinum catalysts exhibit exceptional stability and possess strong anti-toxic properties. They prevent the formation of black substances during storage or use, reducing the detrimental effects of nitrogen and sulfur-containing compounds. This stability ensures consistent catalytic

performance and prolongs the catalyst's lifespan, allowing for long-term usage in various industrial processes.

Wider Array of Reactions

Platinum catalysts demonstrate a wider array of reactions compared to iridium catalysts. These catalysts exhibit stability at higher temperatures, opening up opportunities for discovering new catalysts capable of operating under demanding conditions. Their large surface areas and small particle sizes contribute to enhanced catalytic activities, making them suitable for diverse applications such as methanol fuel cells (DMFC) and proton exchange membrane fuel cells (PEMFC).

Synergistic Effects with Other Metals

Platinum has the unique ability to form bimetallic catalysts with other metals, such as ruthenium.² These bimetallic catalysts exhibit enhanced catalytic activity, combining the strengths of both metals. For example, ruthenium dissociates hydrogen molecules, while platinum prevents the catalyst from excessive deactivation. This synergy enables the development of highly efficient catalysts for various applications.

How Nikalyte Uses Catalysts

Catalysts are key in driving technological advancements and enabling efficient chemical transformations. As researchers continue to explore novel catalyst materials and refine existing ones, the potential for breakthroughs in diverse industries remains promising. Understanding the advantages and characteristics of different catalysts, such as platinum-based catalysts, empowers scientists and engineers to push the boundaries of innovation and create a more sustainable future.

At Nikalyte, we are a leading manufacturer of deposition systems used to coat substrates used in catalysis. Typical catalysis applications include electrochemistry, fuel cells, photocatalysis, and water/air purification, all of which require high-performing catalysts to ensure a reliable and efficient process.

To learn more about using platinum-based catalysts, contact a member of Nikalyte today.

Reference

1. <https://www.researchgate.net/publication/334637424> Platinum utilization in proton exchange membrane fuel cell and direct methanol fuel cell - Review
2. <https://pubs.acs.org/doi/10.1021/acscatal.7b00393>