OPEN ACCESS Freely available online

Journal of Thermodynamics & Catalysis

Perspective

Acceleration of a Chemical Reaction by using Photocatalytic Degradation

Zeyu Siwen*

Department of Chemistry, University of Jiaotong, Sichuan, China

DESCRIPTION

As the world deals with escalating environmental challenges, innovative technologies are important for reducing pollution and promoting sustainability. One such technology is photocatalytic degradation a promising method for breaking down pollutants using light-activated catalysts. This approach offers a green, efficient, and versatile solution to various environmental problems, including air and water contamination. Photocatalytic degradation refers to the process where a photo catalyst, typically a semiconductor material, accelerates the breakdown of organic pollutants when exposed to light which refers to the acceleration of a chemical reaction by a substance not consumed in the reaction. In this context, the photo catalyst facilitates the decomposition of harmful compounds into less toxic substances. The most common photo catalysts include titanium dioxide, zinc oxide, and Tungsten Oxide (WO_3). These materials are often used due to their stability, non-toxicity, and efficiency in generating reactive species under light irradiation.

When a photo catalyst is exposed to Ultraviolet (UV) or visible light, it absorbs photons, which excite electrons from the valence band to the conduction band, creating electron-hole pairs. The excited electrons and holes migrate to the surface of the photo catalyst, where they interact with Water (H_2O) and Oxygen (O_2) molecules, generating highly reactive species such as Hydroxyl Radicals (OH) and superoxide anions. These reactive species attack and break down organic pollutants present in the environment, leading to their degradation into simpler, less harmful compounds such as Carbon Dioxide (CO_2) and Water (H_2O). The end products of the degradation process are often mineralized, meaning they are converted into inorganic substances, thus eliminating the contaminants completely. Photocatalytic degradation has a wide range of applications, making it a versatile tool for environmental remediation. In urban areas with high levels of air pollution, photocatalytic materials can be incorporated into coatings for building surfaces or used in air filters. For example, TiO_2-coated surfaces can degrade Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOCs) when exposed to sunlight, improving air quality and reducing smog.

Photo catalysis is highly effective in treating contaminated water. It can be used to remove harmful substances such as pesticides, pharmaceuticals, and dyes from wastewater. This method is particularly valuable for treating industrial effluents and contaminated drinking water, where traditional treatment methods might fall short. Photocatalytic coatings are increasingly being used on surfaces to create self-cleaning materials. These surfaces can break down organic dirt and stains when exposed to light, maintaining cleanliness with minimal effort. Photo catalysis can be employed to decompose hazardous chemicals such as chlorinated solvents and endocrine-disrupting compounds, which are difficult to treat using conventional methods. Many photo catalysts, like TiO_2, are primarily activated by UV light, which constitutes only a small fraction of sunlight. Investigators is ongoing to develop photo catalysts that are active under visible light to enhance efficiency. Scaling up photocatalytic systems for large-scale applications, such as municipal water treatment, requires overcoming technical and economic hurdles. Efficient design and integration into existing infrastructure are critical for broader adoption.

CONCLUSION

Photocatalytic degradation represents a significant advancement in environmental technology, offering a sustainable solution to pollution control. Its ability to decompose a wide range of organic pollutants using light energy makes it an attractive option for air and water treatment applications. As study continues to address current limitations, photo catalysis holds promise for contributing to cleaner, healthier environments. The evolution of this technology could plays an important role in shaping a more sustainable future.

Correspondence to: Zeyu Siwen, Department of Chemistry, University of Jiaotong, Sichuan, China, E-mail: siwen555@gmail.com

Received: 21-Jun-2024, Manuscript No. JTC-24-33419; **Editor assigned:** 24-Jun-2024, PreQC No. JTC-24-33419 (PQ); **Reviewed:** 08-Jul-2024, QC No. JTC-24-33419; **Revised:** 15-Jul-2024, Manuscript No. JTC-24-33419 (R); **Published:** 22-Jul-2024, DOI: 10.32548/2157-7544.24.15.399

Citation: Siwen Z (2024) Acceleration of a Chemical Reaction by using Photocatalytic Degradation. J Thermodyn Catal. 15:399.