DarkLight™ Catalyst

Process for producing bio-engineered black TIO2 photocatalyst

"The Catalyst That Works Beyond Light"

Technology

The DarkLight™ Catalyst is an advanced, bio-synthesised titanium dioxide (TiO_2) photocatalyst that functions efficiently without the need for visible or ultraviolet light. Developed through a green synthesis process using natural extracts from *Hibiscus sabdariffa*, the material features an oxygen-deficient "black" TiO_2 structure capable of photocatalytic activity under near-infrared and even dark conditions.

This breakthrough enables pollutant degradation and environmental purification in enclosed or low-light environments, eliminating the dependence on artificial light sources. By fine-tuning the material's electronic bandgap, the process enhances its performance across the visible and infrared spectra, significantly expanding the operational range of photocatalysis.

The DarkLight™ Catalyst represents a sustainable and energy-independent innovation for next-generation water treatment, air purification, and self-cleaning applications, combining green chemistry, high efficiency, and environmental adaptability.

Market need

Current photocatalytic materials face several limitations, including their reliance on UV light for activation, low quantum efficiency due to rapid charge carrier recombination, and the use of energy-intensive, chemically hazardous synthesis methods. Additionally, their effectiveness is often restricted in dark or indoor environments, limiting their use in applications such as wastewater treatment in low-light conditions, indoor air purification systems, off-grid or energy-scarce areas, and affordable water decontamination in developing regions. In response to increasing global demands for sustainable environmental remediation, green chemistry, and energy-efficient technologies, the development of dark-active, bio-engineered TiO_2 offers a crucial solution that provides a light-independent, eco-friendly, and scalable approach to pollutant degradation across diverse settings.

Features

- Light-Independent Photocatalytic Activity
- Bio-Synthesised Oxygen-Deficient TiO_2, derived from natural Hibiscus sabdariffa extracts for eco-friendly, sustainable synthesis.
- Enhanced Bandgap Engineering
- Green, Scalable Manufacturing Process
- Versatile Application Potential

Benefits

- Operates without visible or UV light, enabling purification in dark or enclosed environments.
- Eco-friendly and sustainable synthesis using renewable plant-based extracts.
- High efficiency and energy independence reduce operational costs and carbon footprint.
- Broad-spectrum photocatalysis extends performance beyond traditional TiO_2 materials.
- Scalable, low-cost manufacturing for diverse environmental and industrial markets.

Industry

Manufacturing

Potential Applications

- Water Treatment: Photocatalytic degradation of organic pollutants and dyes in low-light settings.
- Air Purification: Continuous pollutant removal in indoor or low-illumination environments.
- Self-Cleaning Surfaces: Energy-independent coatings for glass, textiles, and construction materials.
- Industrial Waste Remediation: Treatment of chemical effluents and contaminated sites.
- Healthcare and Sanitation: Antimicrobial coatings for sterile and enclosed facilities.

Creators

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Stage of development

Early stage

Intellectual Property

Patent protection

Desired relationship

Co-development, Investors