

TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

ALUMINIUM FERRITE (AlFeO₃): RECYCLABLE AND LEACH RESISTANT MAGNETIC PHOTOCATALYST FOR WASTEWATER TREATMENT

IITM Technology Available for Licensing

Problem Statement

- There are uses of photocatalytic materials for wastewater treatment. These materials are semiconductors & others.
- A few photocatalysts like TiO₂ based materials are used commercially, however retrieving & photocatalysts of said recycling challenged in terms of scale, when said photocatalyst are used in the process of slurrybased water treatment.
- Further other photocatalyst materials discussed present problems with assaying of its toxicity
- Hence, there is a requirement of an improvised process to address the above issues efficiently.

Technology Category/ Market

Technology: Photocatalyst Aluminium ferrite (AlFeO₃).

Industry: Wastewater treatment plant, textile, pharmaceutical industries, Air purification, PV cell, solar energy-based companies;

Applications: Waste- water treatment, air purification & etc...

Market: The global photocatalyst AlFeO₃ is expected to reach to \$4.685B with a CAGR of 5 to 9% during forecast period (2021-2030);

Technology

- Patent literature talks about a process of magnetic photocatalyst synthesis of Aluminium ferrite(AlFeO₃), shown in smart
- Said **AIFeO₃** having optical bandgap of 2.0eV, enables the sunlight driven photoactivity.
- Further, the subject matter describes the process for treatment of water using said photocatalyst AlFeO₃, shown in smart charts.
- The process of treatment of water using photocatalyst achieves better AlFeO₃ performance shown in figures.

Taking the nitrate salts of aluminum & iron in a ratio of 1:1 & preparing a 0.1M solution using deionized water

> Adding NH₄OH to the solution obtained in above step till pH reaches 10, wherein NH₄OH acts as a precipitating agent;

Drying the precipitates obtained in said step in a hot air oven at 90°C for 24 hours & calcining said dried precipitates obtained in current step at 1400°C for 2 hours to obtain the calcined powder of AIFeO₃

Herein depicts process of waster water treatment using Aluminium ferrite, which is explained via smart chart:

> Carrying out the photocatalytic reaction of AIFeO₃ in a slurry reactor at static condition;

> > After degradation of Rhodamine B, using a permanent magnet to remove the catalyst from the treated water;

Drying the retrieved catalyst in a hot air over without any washing and reusing for consecutive cycles & obtaining the treated water with negligible trace of aluminium and iron.

Intellectual Property

IITM IDF Ref. 2267;

IN Patent No: 421520 (Granted)

TRL (Technology Readiness Level)

TRL- 4, Proof of Concept Ready & validated

Research Lab

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Key Features / Value Proposition

* Technical Perspective:

Present invention facilitates better performance in visible light with 99% degradation of RhB in 180 mins.

* Industrial Perspective:

- 1. Claimed system provides the reusable facility of **AlFeO₃ particles** in effective manner.
- 2. **AIFeO**₃ shows 95% efficiency at 5th cycle.
- 3. Aluminium ferrite (AIFeO₃) is recyclable, recoverable, sustainable, and ecofriendly.

Images

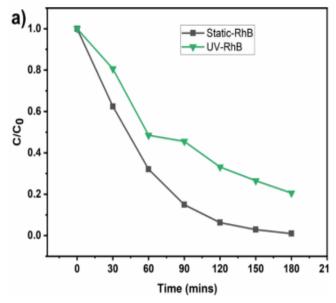


Fig. 1a: Illustrates degradation in concentration (C/Co) of RhB at static & UV reaction conditions;

Images

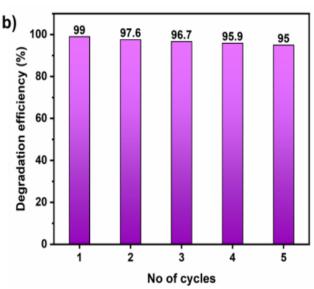


Fig. 1b: Illustrates reusability & performance of the catalyst for 5 cycles.

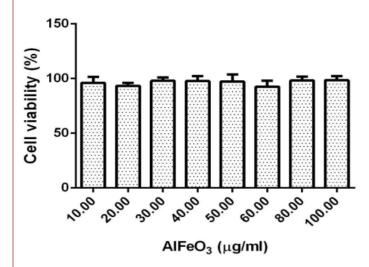


Fig. 2: Illustrates the viability of L929 Fibroblast cells incubated with AIFeO₃ particles for 24hrs exhibits non-toxic behavior (>90% viability at all concentrations)

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