

International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

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Visible and Sunlight Photocatalytic Active Self-Cleaning Technology for Indoor and Outdoor applications

Overview

Titanium dioxide (TiO₂), the most promising photocatalytic material is already used in various practical applications, such as sterilization, deodorization, self-cleaning and super hydrophilic functionality by the strong oxidizing agents (holes and free radicals) thereof being generated after exposure to light. Conventional TiO₂ materials most preferably prepared from sol-gel, and other conventional methods can active (generating oxidizing species) only under the exposure to UV lights because of its large band gap of 3.20 eV. Moreover, if a conventional TiO₂ material is illuminated with visible light (>400nm), oxidizing species cannot be formed because of no charge carrier formation. To activate in the visible light, incorporation of a few weight percent of smart carbon in the form of nanoparticles or sensitized carbon either in the bulk or at the surface of titanium dioxide leads to visible-light and sunlight active suitable for indoor and outdoor self-cleaning applications. The technology of smart carbon based TiO₂ nanostructure materials are available in the form of paste, suspension and thin films having highest visible and sunlight photocatalytic self-cleaning properties and they can be easily applied to any type of device/ object.

Key Features

- Highly visible and sunlight photocatalytic properties
- Good dispersion in solvents
- High stability under solar and UV light
- Easily incorporate into any type of device/object (e.g. fabrics or paints or ceramic tiles etc.)

Potential Applications

- Self-clean fabrics/ceramic tiles manufacturing
- Indoor and outdoor self-cleaning paint manufacturing
- Self-clean coatings for antibacterial and antifouling applications

Major Patents/Publications

- Filed an Indian patent. Application No: 201811011478

Current Status:

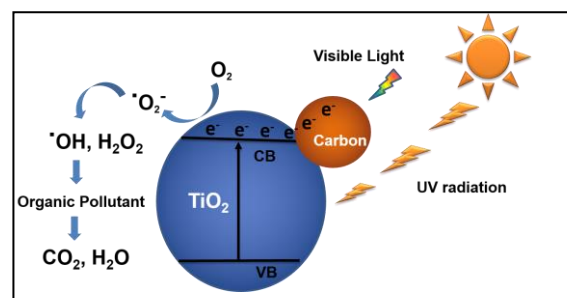
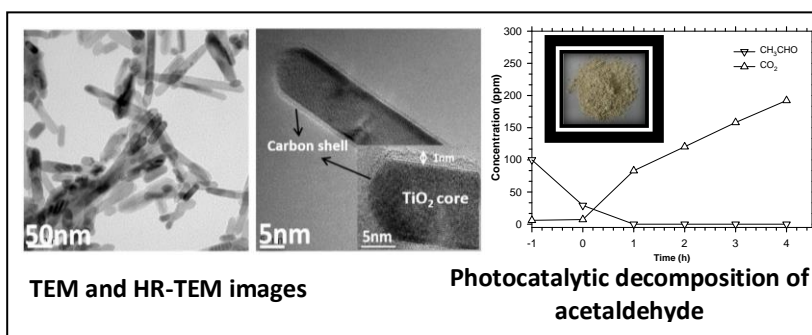
- Prototype fabric has been developed and validated.
- Technology transfer are being progressed

Outcome:

- A technology of smart carbon based TiO₂ nanostructure materials has been successfully developed and demonstrated for indoor and outdoor self-cleaning applications

IPDI*	1	2	3	4	5	6	7	8	9	10
Activities	Basic concepts and understanding of underlying scientific principles	Short listing possible applications	Research to prove technical feasibility for targeted application	Coupon level testing in stimulated conditions	Check repeatability/consistency at coupon level	Prototype testing in real-life conditions	Check repeatability/consistency at prototype level	Reassessing feasibility (IP, competition technology, commercial)	Initiate technology transfer	Support in stabilizing production
Status										

Morphology and Self-cleaning activity of smart carbon based TiO₂



Mechanism of self-cleaning process

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