Development of Low-cost Titania-based Photocatalysts for Enhanced Solar Disinfection (SODIS) of Water in Rural India

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Introduction

***Photocatalysis* – The process of using light in the presence of a semiconductor material to initiate a reaction.**

Potential to be an excellent water treatment method, as it is less chemically intensive than conventional methods (e.g. chlorination) and safe to conduct.

Few decentralised water treatment systems can remove both pathogens and chemical pollutants effectively. **Therefore, photocatalysis has the potential to improve health, as well as be important in environmental remediation.**

However, there is **still a disconnect between research and practical application of photocatalysis in rural settings.** This research aims to **bridge this gap**, by developing photocatalytic materials that are safe, inexpensive, re-usable and stable, and apply them to the context of an **enhanced solar disinfection (SODIS) method**.

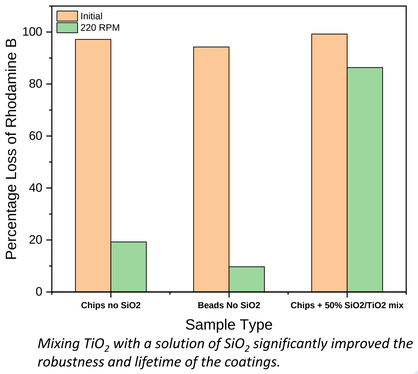
Need to start with developing materials that work well under the **whole solar spectrum**, not just UV like the commercial standard TiO_2.

Methods and Results

Material Development and Testing

1

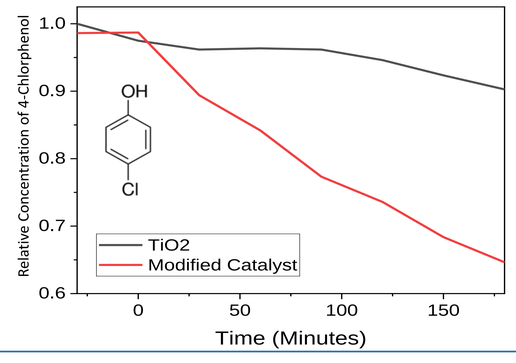
It is important to reduce the need for complex or expensive components. One important part of this **is immobilisation of the catalyst powder onto a solid support.** We have used **upcycled glass chips**, rather than previously used smooth glass beads, to reduce the extent of chemical preparation needed, and lowers costs



Mixing TiO_2 with a solution of SiO_2 significantly improved the robustness and lifetime of the coatings.

Clean glass on the left, coated on the right.

Materials developed to improve efficiency under sunlight show promise. The fall in concentration of an organic pollutant during treatment with a chemically modified catalyst under visible light is shown here.



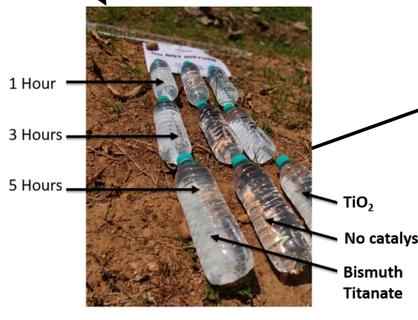
System Optimisation

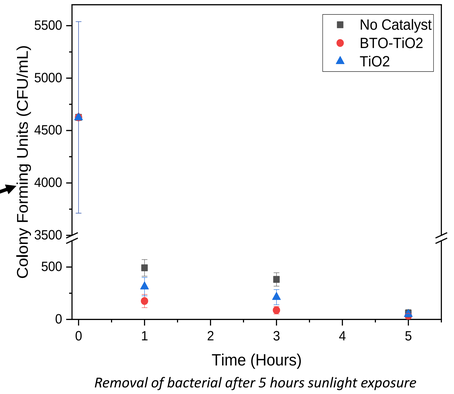
2

Field Testing

3

Tests on a novel material (bismuth titanate, BTO-TiO_2) were conducted at the Indian Institute of Technology Kharagpur. These tests showed **BTO-TiO_2 performed better than commercial TiO_2** photocatalyst to remove bacteria under sunlight.





Removal of bacterial after 5 hours sunlight exposure

Practical Implementation

4

The ultimate goal is to apply this to **widen access to safe drinking water** and help meet **SDG 6**

Acknowledgements
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Future Work

Continue materials development & immobilisation testing in the lab
More in-depth microbial studies
Follow-up field placement with new materials

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