Illuminating brighter horizons: Photocatalysis for water remediation and energy production [Poster]

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Illuminating Brighter Horizons: Photocatalysis for water remediation and energy production

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INTRODUCTION

Motivation:
Environmental pollution and energy supply are currently major concerns to society, in light of this, contaminated water is increasingly being used to produce clean water. Photocatalysis using semiconductors (Fig 1) can be used to remove contaminants from contaminated water with the added benefit of hydrogen production. Currently many photocatalysts only respond to UV light hence having a catalysts that responds to visible light would be a great benefit. Therefore, having a small cheap device that can remediate water as-well as produce hydrogen would be a major advantage. Ultraviolet light can be effective in photodegrading pharmaceuticals and contaminants of concern but the range of commercial products is low. In this project a novel microcapillary film (MCF) array photoreactor will be used to carry out photo reactions (Fig 6).

Aims:
• To develop and investigate efficient visible light photocatalysts
• Immobilise and/or run photocatalysts through a novel microcapillary film (MCF) array photoreactor
• Optimise microcapillary film (MCF) array photoreactor to produce hydrogen

PHOTOCATALYSIS FABRICATION

Fig 2. A novel microcapillary film (MCF) array photoreactor will be used to investigate photo transformations

Microcapillary film (MCF) coatings

A preliminary MCF TiO2 coating was developed by mixing TiO2 with a polymer, swelling, hydrothermal treatment and a crosslinking process.

Fig 4. Overview of fluoropolymer Microcapillary film (MCF) used within the photoreactor: a) Flexible MCF produced from Teflon. b) schematic showing 10 bore holes with mean diameter 103 ± 7 µm. c) Image showing the MCF optical transparency

Fig 5. SEM images of the MCF and MCF TiO2 coating a different magnifications: a) MCF channels b) MCF channels containing immobilised TiO2 c) TiO2 particles before calcination d) TiO2 particles after calcination

Fig 6. Microarray photocatalytic reactor: a) syringe pump b) photo reactor c) gas liquid separation d) Gas chromatograph(e)High performance liquid chromatography (HPLC)

MCF ARRAY PHOTOREACTOR

Fig 3. Scanning electron microscope images (SEM) images of nanofibres at different stages of production: a) TiO2 nanofibres b) Ag/AgCl nanofibres before calcination c) TiO2 @Ag/AgCl nanofibres after calcination

Fig 1. Photocatalysis schematic: Representing the photocatalytic process mediated by semiconductors and the basic degradation mechanism

Fig 6. Microarray photocatalytic reactor: a) syringe pump b) photo reactor c) gas liquid separation d) Gas chromatograph(e)High performance liquid chromatography (HPLC)

OUTCOMES

• A novel microcapillary film (MCF) array photoreactor will be used to investigate photo transformations
• Novel visible light catalyst will continuously be developed and tested

REFERENCES