

# Photocatalytic Amidation for Development of Water-repellent Materials Through Surface Functionalization

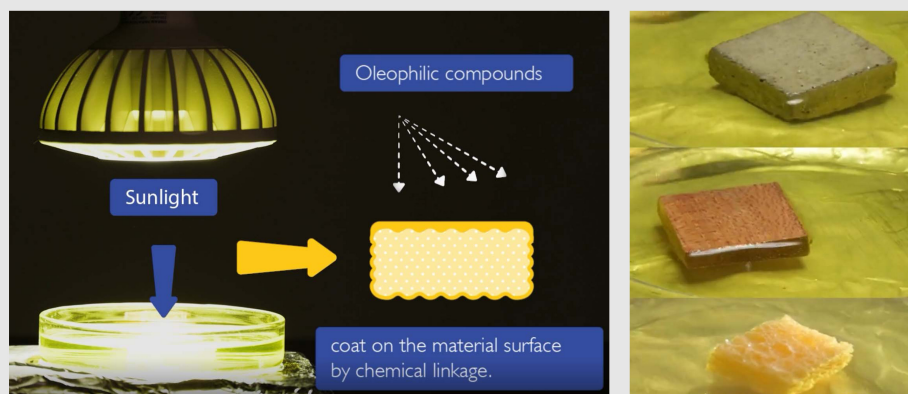
## Manufacturing

Nanotechnology and New Materials

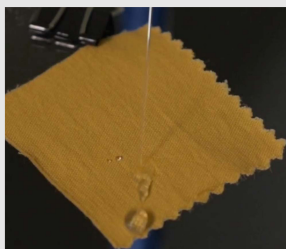
Waste Treatment/Management

## New Coating Technology by Photochemical Method

Photochemical process for surface functionalization



### Water-resistance Materials



### Oleophilic Materials



### Remarks

1. Inventions Geneva Evaluation Days (IGED) 2022 - Silver Medal
2. 3rd Asia Exhibition of Innovations & Inventions Hong Kong (AEII) (2023) - Silver Award

### IP Status

Patent filed



Technology Readiness Level (TRL) ?

6

### Inventor(s)

Prof. KO Chi Chiu Vincent

Dr. XIAO Yelan

Enquiry: [kto@cityu.edu.hk](mailto:kto@cityu.edu.hk)

Department of Chemistry, State Key Laboratory of Marine Pollution  
City University of Hong Kong ([vinccko@cityu.edu.hk](mailto:vinccko@cityu.edu.hk))

## Opportunity

Surface chemical modifications for developing advanced materials with novel functional properties have been one of the most popular research fields over recent decades because these materials have found applications in many different areas. Importantly, surface modification can be applied on existing

Follow on  
Marketing

Build Value

Proof  
Concept

Develop  
concept

materials to introduce functional properties. Silanization processes with fluoroalkyl substituted silanes have been demonstrated to be useful for surface modification and the development of materials with advanced coatings. However, practical industrial applications of fluoroalkyl-substituted silanes in silanization processes are very limited due to its low reaction efficiencies in the silanization, the instability of these silanes for recovery/reuse, and the very high cost of fluoroalkyl-substituted silanes. If a good method could be developed to overcome the limitations, it is foreseeable that the surface functionalization could be applied to a wide range of surfaces, such as glass, paper, wood, natural fibers, textile and cement-based materials, to introduce advanced functional properties. This could have significant impacts in both academia and industry.

## Technology

A new coating technology based on photochemical methods using low cost chemicals and sunlight has been invented. This newly developed chemical coating technology can transform a wide variety of materials including synthetic and natural materials into versatile functional materials with excellent oil attraction and water repellency. These new functional materials can be applied in household grease cleaning, treatments for oil contamination, and remediation of marine oil spills, and as water-repellent materials such as water-repellent construction materials, wood, glass, and textiles.

## Advantages

- Compared to single-step thermal chemical coating method, the current invention 2-step photochemical method uses low-cost and readily accessible fluorochemicals for the surface modification.
- The functional properties, such as oleophilicity, selective oil absorption and water repellency, introduced by the invented coating processes (photochemical surface chemical modification) are significantly improved compared to coating by a single-step thermal method.
- Patterned coating (surface modification) with the invented photochemical method, which can bring additional functional properties, can be achieved using a suitable photomask.

## Applications

- To introduce water-repellency to existing materials
- To develop advanced materials for aqueous/organic biphasic separation.
- To develop advanced materials capable of selective absorbing of hydrophobic organic compounds or oil waste/grease.
- This coating technology is applicable to natural or synthetic fabric, wood, plant-based or polymer-based sponge and cement-based materials.

