Innovative Floating Materials For Water Remediation Under Sunlight

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Introduction

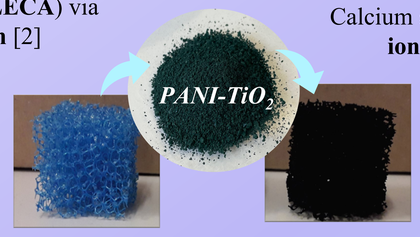
Recently, the field of research has been led towards the production of **innovative** and **inexpensive materials** able to degrade emerging compounds, such as persistent organic pollutants (POPs). In this regard, heterogeneous **photocatalysis** offers a green solution for water remediation [1].

Furthermore, a photocatalytic **floating** device can be adopted to overcome issues related to the use of catalyst-based slurry systems and to **maximize light utilization**. In the present work, photoactive materials were prepared immobilizing **visible light responsive catalysts** on **floating supports** (synthetic and natural polymers, inorganic materials) and tested towards the degradation of a model molecule (Rhodamine B RHB).

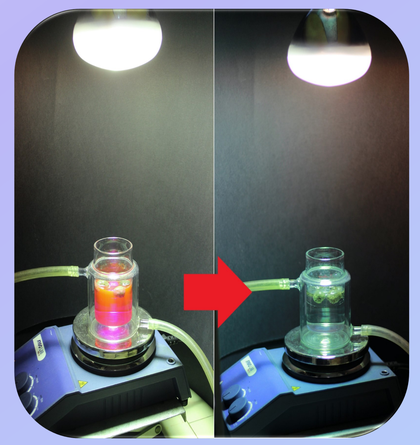
Materials & Methods

Titanium dioxide on Expanded Clay Aggregates (**LECA**) via **impregnation** [2]

Grafitic carbon nitride on Calcium alginate Spheres (**Alg**) via **ionotropic gelation** [3]



Polyaniline-Titanium dioxide on Polyurethane Foam (**PU**) via **impregnation** [4]



Floating photocatalysts activity was assessed through the **photodegradation** of 10 ppm aqueous solution of **rhodamine B** (RHB) under **solar light**. Experiments last for 210 min, 30 min of dark followed by 180 min of irradiation.

Results

LECA

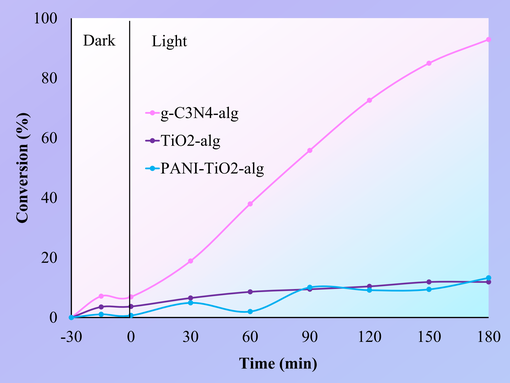
Advantages:

- Cheap material
- Eco-compatible
- Stress-resistance

Disadvantages

- Instability of the coating
- Inertness of the material

Alginates



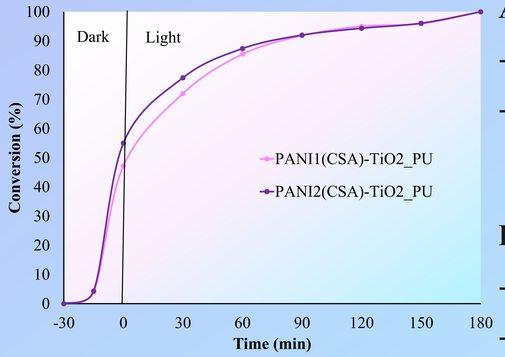
Advantages:

- Cheap material
- Easy synthetic route
- Eco-compatible

Disadvantages

- Deactivation of catalysts (TiO_2) caused by carbonates
- Long-term instability of calcium alginate

Polyurethane



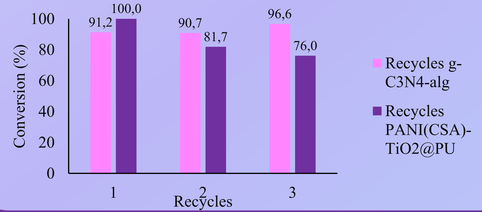
Advantages:

- Cheap material
- 2 synthetic routes: traditional PANI (PANI1) vs green PANI (PANI2)

Disadvantages

- PU is not eco-friendly
- PU is not suitable for the attachment of inorganic catalysts

Recycles



The best materials have been subjected to recycle tests. It was observed that they maintain high photoactivity.

Conclusions: All the mentioned materials were promising for the development of floating photocatalysts in order to photo-degrade organic pollutants in water. However, further studies shall be carried out to find a compromise between coating stability/activity and eco-compatibility.

Bibliography:

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