

Photodegradation of ibuprofen using phthalocyanine-grafted titanium dioxide nanoparticles

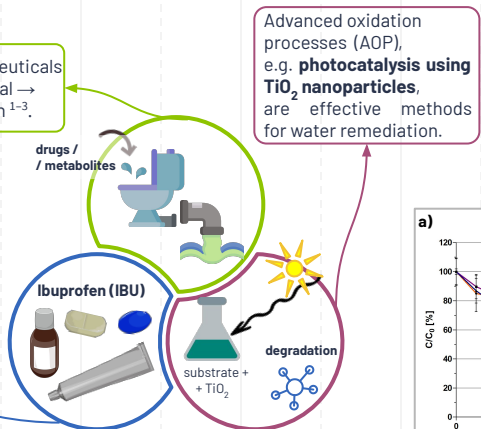
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BACKGROUND

Frequent use of pharmaceuticals and their improper disposal → environmental pollution¹⁻³.

Ibuprofen, a commonly used, nonsteroidal anti-inflammatory drug, is not completely removed during wastewater treatment processes^{4,5}.



RESULTS

As it can be seen in Fig. 1,

- after six hours of the experiment ~90% of the ibuprofen content was removed from the solution using CuPc@TiO₂ and TiO₂,
- comparing CuPc@TiO₂, ZnPc@TiO₂ and pure TiO₂ it can be stated that the photocatalytic activity of CuPc@TiO₂ is similar to the one of pure TiO₂.

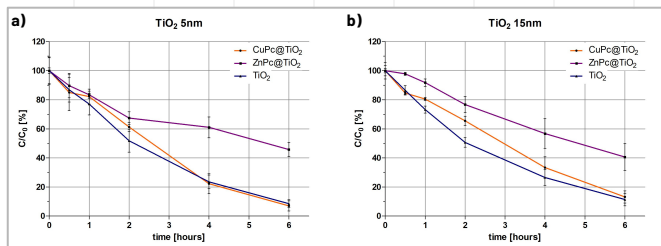


Fig. 1. The changes in ibuprofen concentration after irradiation (365 nm light) of the solution containing a photocatalyst: a) TiO₂ 5 nm, b) TiO₂ 15 nm

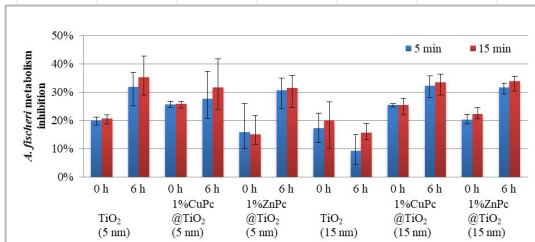


Fig. 2. Cell viability decrease of *A. fischeri* cells upon addition of ibuprofen solutions before (0 h) and after (6 h) photodegradation experiment with different photocatalysts, when irradiated with UV light ($\lambda_{max} = 365$ nm).

ZnPc reduces the ibuprofen degradation rate.

No degradation was observed when the material was exposed to the red light.

As can be seen in Fig. 2, the toxicity of the ibuprofen solutions photoremediated with UV light slightly increases in comparison with IBU solutions before the irradiation.

MATERIALS & METHODS

PREPARATION OF THE PHOTOCATALYTIC MATERIAL

nano- TiO₂ (5 and 15 nm) was suspended in a solution of

- copper (II) phthalocyanine (CuPc)
 - zinc (II) phthalocyanine (ZnPc)
- in dichloromethane (DCM)

→ the mixture was stirred overnight
→ DCM evaporated
→ resulting solid dried at room temperature

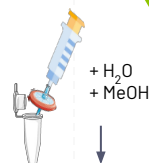
PHOTODEGRADATION

ibuprofen 10 mg/L



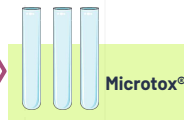
UV 365 nm, R 665 nm

PREPARATION OF THE SAMPLES



LC-MS/MS ANALYSIS

TOXICITY ASSESSMENT



bacterial suspension used: *Aliivibrio fischeri*

CONCLUSIONS

Photocatalytic degradation of ibuprofen occurs according to the first-order kinetics.

Using UV radiation and CuPc@TiO₂ it is possible to almost completely degrade the ibuprofen content.

LITERATURE:

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