# Design of a photocatalytic process for the removal of persistent organic micropollutants (POMs) for the drinking water's production

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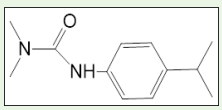
## Context of the study

- Conventional drinking water's treatments are inefficient for the elimination of persistent organic micropollutants (POMs):
  - Endocrine disrupting effect and toxic effects for th living beings (carcinogenic effect, endocrine disruptor effect, etc.)

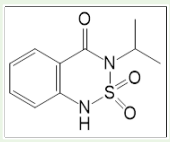
➔ Need of an efficient treatment such as advanced oxidation processes (AOPs) to mineralized POMs

## Selected POMs

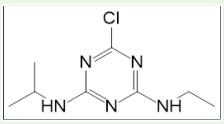
Pesticides with specific structures and chemical properties:



*Isoproturon*
Weedkiller

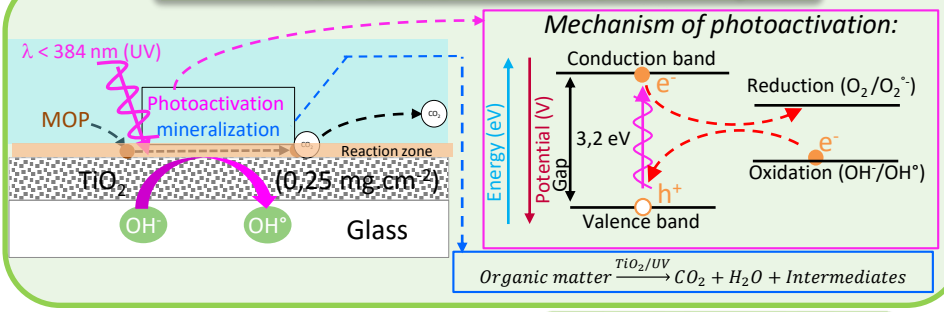


*Bentazon*
Weedkiller



*Atrazine*
Weedkiller
Forbidden use in Europe

## Photocatalysis principle with supported $TiO_2$

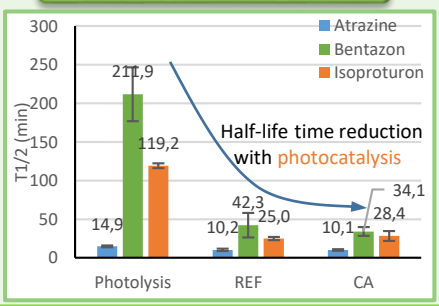



## Photocatalytic formulations

| Formulations | REF* | AC** |
|---|---|---|
| TEOS (wt%) | >10% | >10% |
| $TiO_2$ (wt%) | <30% | <30% |
| Ludox AS 40 (wt%) | >50% | >50% |
| Activated carbon (wt%) | - | ≈3% |

Spray-coating of an aqueous reference formulation (REF*) or with activated carbon (AC**) to promote the adsorption property

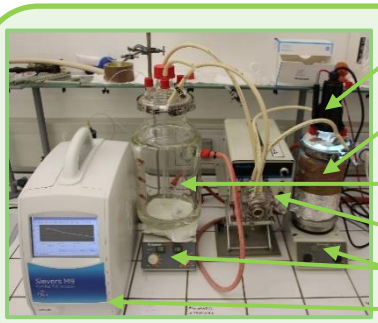
## Preliminary study

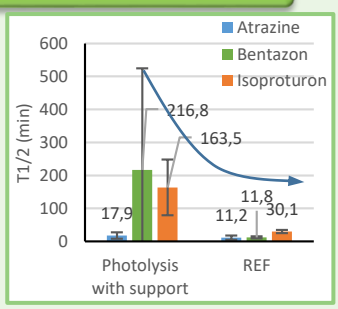




*Main results:*

- Promotor effect of the supported $TiO_2$
- No positive effect with the addition of activated carbon
- Other Process parameters investigated:
  - No negative matrix effect
  - Optimum photocatalytic activity with a maximally 0,6 mg.cm$^{-2}$ of photocatalyst

## Experimental study




*Main results:*

- Effectiveness of supported photocatalyst
- Increase of performances for the isoproturon with mineral water (in agreement with the Petri dish assays)
- Slow mineralisation (TOCmeter) kinetic (by- products toxicity risks)
- Other Process parameters investigated:
  - Decrease of $T_{1/2}$ with higher power lamp and distance between support and the UVC lamp

## Conclusions

- ✓ An efficient photocatalytic formulation was chosen
- ✓ The AC addition did not improve the photocatalytic degradation during the photocatalysis time-scale
- ✓ Experimental apparatus showed good removal rate of pesticides but slow mineralisation
- ✓ Possibility to optimize the process (power lamp, distance between the UVC lamp and the support)

## Prospects

- Simulation/Scaling-up of the process with kinetic data using MATLAB/SIMULINK® software
- Experimental tests with the best conditions (40 W power lamp, higher distance between support/UVC lamp)

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