

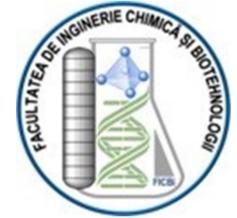
## Ivermectin removal from wastewater by photocatalytic degradation

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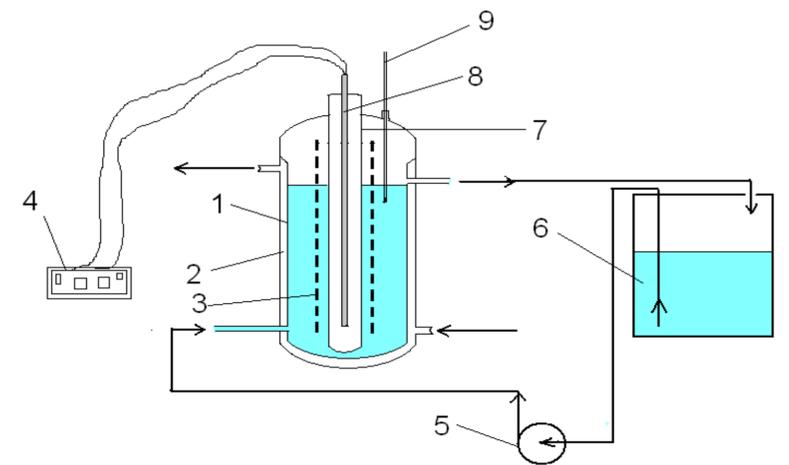
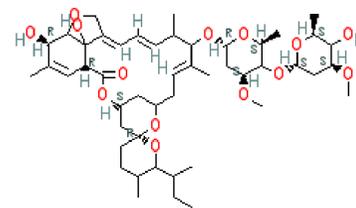
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### Methodology

- ❖ Removal of ivermectin (IVT) from aqueous solutions by photocatalytic degradation;
- ❖ The UV photocatalytic reactor (volume 1.5 L, UV lamp 120 W) equipped with TiO<sub>2</sub>/fiberglass – rubber photocatalytic membrane was operated in the following conditions:
  - recirculation flow rate 2.0 L/min
  - pH of IVT working solution of 3
  - H<sub>2</sub>O<sub>2</sub>/IVT molar ratio of 1.
- ❖ The working solution was continuously recirculated at room temperature through a vessel using an external centrifugal pump;
- ❖ The removal process of IVT was studied by monitoring changes in organic substrate concentration using COD analysis function of the reaction time;
- ❖ For this purpose, samples of 10 mL were taken at predetermined irradiation times (0,5,15,30,60,90,120 minutes) and were subjected to COD analyses through the colorimetric method;
- ❖ The experiments were performed at room temperature using synthetic solutions of IVT with initial concentration equivalent to chemical oxygen demand value of 380 mg O<sub>2</sub>/L.



1. Reactor
2. Water jacket
3. Photocatalytic membrane
4. UV lamp power supply
5. Recirculating pump
6. Working solution vessel
7. Quartz tube
8. UV lamp
9. Thermometer

### Results and discussions

- ❖ Most of the organic substrate was degraded in approximately the first 30 minutes of photocatalysis, thus demonstrating the high photocatalytic activity of the TiO<sub>2</sub>/fiberglass – rubber membrane.
- ❖ Compounds that are still found in the irradiated ivermectin solution after the first 30 minutes, could be organic intermediates with high stability.
- ❖ The degradation of the organic substrate follows a pseudo-first order kinetics in two stages. In the first stage (first 30 minutes), the organic substrate is degraded at a high rate ( $k_1 = 0.176 \text{ min}^{-1}$ ), being reduced to simple organic compounds, which in the second stage undergo a slow degradation ( $k_2 = 0.006 \text{ min}^{-1}$ ).

### Conclusions

- ✓ The experimental results indicated a good photocatalytic activity of the TiO<sub>2</sub>/fiberglass – rubber membrane;
- ✓ The degradation of the organic substrate takes place according to pseudo-first order kinetics in two stages.
- ✓ The first stage is that one in which the organic substrate is degraded around 85%, followed by a slow degradation followed by a weak degradation of the organic intermediates formed.

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### Photocatalytic degradation of ivermectin: a. evolution of the organic substrate concentration as a function of the irradiation time; b. pseudo-first order kinetics

