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BOOK OF ABSTRACTS

ASSOCIATION OF CHEMISTRY AND THE ENVIRONMENT

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Photoactivity of Immobilized Titanium Dioxide (TiO_2) in Lindane Degradation

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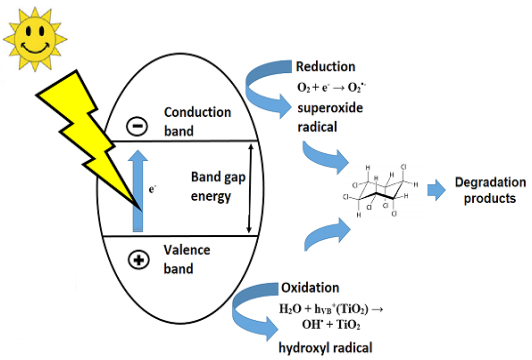

Introduction and study objectives

Lindane is a generic name for γ-hexachlorocyclohexane, one of the isomers from the group of Hexachlorocyclohexanes (HCH) [1]. Due to its neurotoxic activity, it had a very wide application, from agricultural to non-agricultural purposes.

As a result of its lipophility, lindane can easily pass through the blood-brain barrier. The reason of his neurotoxicity is that it can interact with $GABA_A$ receptors and obstruct GABA neurotransmitter signaling in nervous system. People who have been exposed to lindane for a long time can experience serious health problems, such as: poor liver function, cardiac arrhythmias, and irregular menstruation. Due to its adverse health effect, lindane is classified as a "pregnancy category C" chemical [2]. It is also one of the Persistent Organic Pollutants (POPs) that were listed under the Annex A (elimination) of the Stockholm Convention with a specific exemption for use as a human health pharmaceutical [3].

The aim of this paper was the assessment of the immobilized titanium dioxide photocalytic properties in lindane degradation.

Methodology

Spray pyrolysis method was used for a synthesis of thin titanium oxide films on the foils of the stainless steel [4]. The lindane solution was incubated with TiO_2 and exposed to UV/VIS light. Aliquots were taken from the reaction mixture after 0, 2, 4, 6, 8, 10 and 12 hours. Lindane was extracted according to the EPA method 505 [5], and analyzed using an Agilent 7890A gas chromatograph (GC) connected to an electron capture detector (ECD). The GC was equipped with a Thermo Scientific™ TraceGOLD™ TG-5MT capillary column (60 m × 0.25 mm ID × 0.25 µm). The temperature program used for gas chromatography was: Initial heating temperature: 50 °C for 3 minutes, then heating at a rate of 30 °C/min to 210 °C for 20 minutes. Hydrogen with a flow rate of 60 mL/min was used as the carrier gas.

Results and conclusions

Photoactivity of immobilized titanium dioxide in the degradation of lindane was measured as a percentage of lindane's degradation compared to its initial concentration.

The obtained results demonstrated that after two hours 45.32 % of lindane was degraded, while after twelve hours the percentage of degradation increased to 98.20 %.

In this study we proved that the immobilized titanium dioxide can be used as a productive and fast photocatalyst for lindane photodegradation.

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