Photocatalytic degradation of dexamethasone in water solution

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Introduction
Pharmaceuticals are considered a new class of pollutants. Negative effects on terrestrial and aquatic environments have been attributed recently to their presence in the ecosystems. Studies pointed out the occurrence of endocrine deregulators in discharged effluents as a cause for sexual disturbance in fish of water streams1. Active substances were found in hospitals effluents after primary treatment2. Glucocorticoids (GC) are used in medicine or in veterinary medicine mainly because of their anti-inflammatory properties. The most potent GC cortisone derivate used in hospitals and clinics is Dexamethasone (DEX).

Objective
This work has the main objective to study and optimize the photodegradation process for the removal of DEX in water.

Experimental part
The TiO₂ concentration (0; 250; 500; 750 and 1000 mg l⁻¹), the DEX concentration (10; 20; 30; 40 and 50 mg l⁻¹) and pH (3; 5; 7; 9 and 12) were considered. Statistical experimental design and response surface methodology (RSM) were applied to optimize the operational conditions of photodegradation process for the removal of DEX. The process efficiency were evaluated trough DEX and DOC (Dissolved Organic Carbon) abatement. The monitoring of the DEX concentration was carried out with a liquid chromatography with diode array detector (HPLC-DAD) aid. The DOC was determined according to German standard methods for the examination of water, wastewater and sludge (DIN, 1996). It was used a photoreactor with 1 liter of capacity and the irradiation was performed with a mercury vapor lamp of 125 W aid. The temperature was maintained at 25±1 °C in all experiments. The samples were taken in 0, 1, 2, 4, 8, 12, 16, 20, 26, 32, 48, 64, 96 and 128 min in optimized conditions.

Conclusion
The obtained results showed that there was apparently a total degradation or phototransformation of the DEX after 4 min of photodegradation treatment. However, there was not total mineralization. At end of the treatment (128 min) just 10% of DOC was removed. This was attributed to the deactivation of functional groups leading to the wrong interpretation as DEX abatement.

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References