Degradation of the anti-inflammatory piroxicam using a bismuth titanate/cadmium sulfide photoanode as an optimized photo-electrocatalytic mineralization strategy based on a factorial design

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Considering the impact that emerging contaminants can cause to the environment, it is essential to develop new environmental remediation strategies for several target compounds, such as the anti-inflammatory piroxicam. Piroxicam belongs to the group of non-steroidal anti-inflammatory drugs, commonly used in the treatment of chronic diseases[1]. In this work, a full factorial design was used as a method optimization strategy, with the construction of a degradation model. For this purpose, a photoanode based on FTO/$Bi_4Ti_3O_{12}$/CdS was constructed and applied in the photoelectrocatalytic degradation of piroxicam. The 2^4 factorial design, totaling 16 experiments, considered the following variables: support electrolyte (v_1), pH (v_2), pollutant concentration (v_3) and working potential (v_4). The results showed that the best experimental condition promoted a degradation rate higher than 90.0 % in 120 minutes, with a pseudo-first order constant of 3.02×10^{-2} min^{-1}. Data analysis indicated that the concentration of piroxicam and the pH of the solution are the variables that most influence the efficiency of the compound degradation.

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References:

1. Feng, L., et al., *Evaluation of process influencing factors, degradation products, toxicity evolution and matrix-related effects during electro-Fenton removal of piroxicam from waters.* Journal of Environmental Chemical Engineering, 2019. **7**(5): p. 103400.