DEGRADATION AND MINERALIZATION OF BISPHENOL A BY THE PHOTO FENTON PROCESS

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Bisphenol A (BPA; 2,2-bis (4-hydroxyphenyl) propane) is an industrial organic chemical basically used in the plastics industry as a monomer for producing epoxy resins and polycarbonates [1,2]. It is also a well-known endocrine disruptor agent that contaminates surface waters even at low concentration [3].

Unfortunately, BPA cannot be entirely removed from water solutions by conventional treatments. Additionally, in some cases, such treatments can lead to a series of by-products with higher endocrine disrupting effect [4].

Advanced Oxidation Processes (AOPs), among them the Fenton and photo-Fenton processes, are efficient methods for BPA photodegradation [1]. However, they are energy-intensive processes and their cost is ought to be improved by reducing the reaction time as well as the consumption of reagents.

In this work, the Fenton and the photo-Fenton degradation of BPA (0.5 L, 30 mg L$^{-1}$) was addressed. The process efficiency was evaluated under different H$_2$O$_2$ and Fe(II) initial concentrations (2.37-6.41 mM H$_2$O$_2$ and 1.42·10$^{-2}$-3.92·10$^{-2}$ mM iron salt), while other variables were fixed (pH=3, 25ºC, UV light source). The treatment performance was assessed for a series of assays from a factorial design and was quantified in terms of the decay rate of total organic carbon (TOC) and the total conversion attained, according to a pseudo first order kinetics [5-6].

Given the initial conditions, the analytical expression for the TOC evolution is:

\[
\left[\text{TOC}\right] = \left[\text{TOC}\right]_0 + \left[\text{TOC}\right]_0 - \left[\text{TOC}\right]_\infty \cdot e^{-kt} \tag{eq. 1}
\]

which can be expressed in terms of conversion ($\xi$) by the following equation:

\[
\xi = \xi_{\infty} (1 - e^{-kt}) \quad \text{being} \quad \xi_{\infty} = \frac{\left[\text{TOC}\right]_0 - \left[\text{TOC}\right]_\infty}{\left[\text{TOC}\right]_0} \tag{eq. 2}
\]

Hence, the performance of the mineralization may be characterized by determining the two parameters of the model, $\xi_{\infty}$ (or $[\text{TOC}]_\infty$) and $k$, which can be obtained by fitting the model to the experimental data under the least squares criterion. The results were plotted in front to identify different clusters and the conditions which produces higher mineralization rates

References:

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