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Study of the fulvic acid interference in the electro-oxidation of tetracycline

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Pharmaceuticals were a central role in the pollution of water bodies and can interact with humic substances present in rivers, forming stable complexes that are difficult to degrade [1]. This study aimed at the electrochemical degradation of tetracycline (TEC) in the presence of fulvic acid (FA). An anodic electro-oxidation was carried out using a filter press cell, with a flow system, and a commercial mixed metal oxide (MMO) anode with an area of 14.81 cm². The optimized conditions were: current density 40 mA cm⁻², pH 3.0, and time 240 min. The degradation products were analyzed by high-performance liquid chromatography (HPLC) and UV-Vis spectrophotometry. It was observed that the removal of TEC was 97% in 15 min, while the removal of FA was about 25% in 60 min. For the combined TEC and FA (TECAF), the removal was 54% in 60 min, as shown in Fig. 1a. After 60 min of TECFA degradation, an increase in the HPLC signal with a band shift was noted. This behavior was also observed in the UV-Vis for the 357 nm band, where the concentration decay was only until 60 min, and after this time, a new band at 290 nm, characteristic of complex formation, was noted, as shown in Fig. 1b. Thus, it can be concluded that the degradation of tetracycline in the presence of fulvic acid is hindered but is a feasible process with good results.

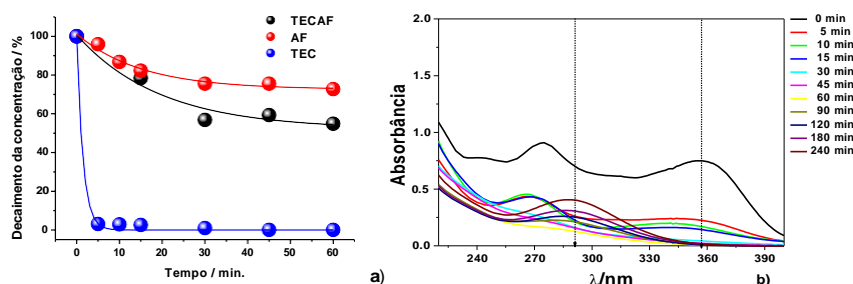


Fig. 1: a) decay of TEC, AF, and TECAF concentrations b) Time-dependent UV-Vis spectrum evolution of TECAF during electrolysis

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References:[1] Soares, A. F. S.; Souza, L. P. Revista De Direito Sanitário, 20(2), p.100-133. 2020