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# A feasibility analysis of carbon felt as gas diffusion electrode: a case study for norfloxacin degradation

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Pharmaceutical compounds are environmental contaminants frequently found in water bodies, particularly due to the inefficiency of wastewater treatment plants in removing recalcitrant contaminants [1]. Electrochemical advanced oxidation processes (EAOPs) have emerged as effective technologies for the removal and mineralization of these pollutants [2]. *In situ* hydrogen peroxide ($H_2O_2$) generation is crucial, as it yields hydroxyl radicals. The use of carbon-based gas diffusion electrodes (GDE) has proven promising for contaminants degradation [2]. In this study, the effect of cathode material as a GDE for $H_2O_2$ electrosynthesis was investigated with a focus on its application for the treatment of water contaminated with naproxen (NPX) at different pH. Thus, a modified carbon felt designed to act as a GDE (felt-GDE) was compared to carbon cloth (cloth-GDE). The applicability of felt-GDE was explored under different current densities (7.5-50 mA $cm^2$) and pH (3-11). Experiments were conducted using two GDEs, each tested with both a platinized foil electrode and a dimensionally stable anode (DSA®). At a current density of 25 mA $cm^{-2}$, the felt-GDE exhibited a faradaic efficiency 25.7%, which was similar to the 26.6% achieved by cloth-GDE. However, increasing the current density to 50 mA $cm^{-2}$ resulted in a performance reduction for the felt-GDE, whereas the cloth-GDE showed improved efficiency. Give that a current density of 25 mA $cm^{-2}$ generated sufficient $H_2O_2$ for water treatment applications, this value was selected for further investigations into pH effects and NPX degradation. The pH of the electrolytic solution significantly affected the $H_2O_2$ generation, with optimal production occurring at pH 5 and 9. The feasibility of felt-GDE was compared to cloth-GDE for NPX degradation by UVC/$H_2O_2$ process. Both systems, using DSA anodes exhibited similar NPX removal kinetics, demonstrating their suitability for this contaminant treatment. Therefore, under mild operating conditions, felt-GDE proves to be a viable and competitive alternative for use in electrochemical reactors as a GDE for water and wastewater treatment.

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