Comparação do tratamento da Mistura de Diuron-Hexazinona por processos CDEO e eletro-Fenton usando um ânodo de diamante e cátodo de difusão gasosa

Comparison of mixture of Diuron and Hexazinone treatment by CDEO and electro-Fenton process using a diamond anode and an oxygen-diffusion cathode

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Abstract: The occurrence of pesticides in the environmental has become as one of the main environmental concerns by regulatory agencies. These substances exhibit bio-recalcitrant properties, high toxicity, and persist in the environment. Consequently, considerable efforts have been devoted to the development of efficient and cost effective treatment methods. Electrochemical technology has proven to be very efficient in the pollution control through direct or mediated oxidation based on the power of an oxidant species generated in situ. The electro-Fenton reaction provides an excellent example of a cooperative system in which in situ cathodic production of hydrogen peroxide is coupled with oxidative anodic processes. In this work, a solution of commercial herbicide in acid medium containing 53.3% and 6.7 % w/w of diuron and hexazinone respectively, was used in the degradation experiments. The electrochemical cell was a one-compartment filter-press reactor consisting of a disk of Ti/BDD as anode and a carbon-PTFE air-diffusion electrode as cathode. All the process evaluated were carried out galvanostatically using 2 dm^3 of a solution containing 100 mg dm^{-3} of formulation. The investigated variables in the electrochemical degradation of the pesticides were: i) Fe^{2+} concentration, UV irradiation, electro-Fenton, fotoelectro-Fenton (PEF) and applied current density (10 – 100 mA cm^{-2}). Results show that the oxidation of the both herbicide with BDD($^{\bullet}OH$) in conductive diamond electro-oxidation (CDEO) process was very soft comparing to a others process. CDEO process was able to degradated 70 % of hexazinone and 80 % diuron after 180 minutes. The electrochemical process with hydrogen peroxide generation in cathode accelerates the degradation process to both pesticides from 74 % to 99% for hexazinone and from 77 % to 92% for diuron. There is a fast decay of concentration in AOP–H_2O_2/UV attributed to the increased of hydroxyl radical production from the photolysis of H_2O_2 that accelerates the oxidation rate of all organic compounds present in the medium. Complete removal is attained at only 90 minutes of treatment. A quicker disappearance of hexazinone and diuron was observed with the PEF process, leading to 100% hexazinone reduction at 45 minutes and diuron removal at 90 min. The PEF treatment destroyed much more rapidly the herbicide up to its total disappearance, indicating a very positive oxidation with additional $^{\bullet}OH$ generated from the photocatalytic reaction.

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References:

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