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Electrochemical Degradation of Antivirus Drug-Lamivudine Formulation: Photo Electro Coagulation, Peroxi-Electrocoagulation and Peroxi-Photoelectrocoagulation Processes

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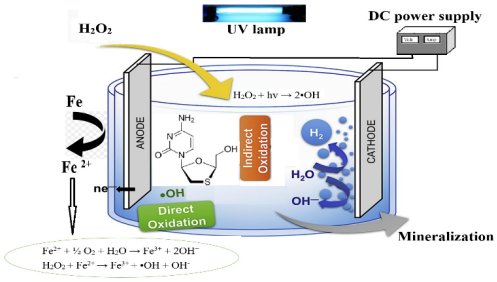
This study evaluates the performance of photoelectrocoagulation, peroxi-electrocoagulation and peroxi-photoelectrocoagulation for the removal of the antiviral drug lamivudine formulation from wastewater by a stainless-steel electrode. To investigate matrix effects for this oxidation process, the influence of substrates such as urea and simulated wastewater (SWW) was studied. Moreover, degradation kinetics and energy efficiency are also discussed. Results indicate that the removal efficiency was in the order of peroxi-photoelectrocoagulation > peroxi-photoelectrocoagulation (in the presence of urea) > peroxi-photoelectrocoagulation (in the presence of SWW) > peroxi-electrocoagulation > photoelectrocoagulation. In peroxi-photoelectrocoagulation, the 96% degradation of lamivudine formulation indicates a nearly complete degradation of lamivudine. In this process, the presence of urea and SWW resulted in a substantial reduction of chemical oxygen demand (COD) decay. Kinetic studies using linear pseudo-first and pseudo-second-order reaction kinetics showed that the pseudo-first-order equation effectively described the removal of lamivudine formulation. The highest energy consumption per kg-COD decay (i.e., kWh $kgCOD^{-1}$) was obtained for the photoelectrocoagulation process, while the lowest energy consumption was obtained for peroxi-electrocoagulation, for all electrolysis times. The peroxi-photoelectrocoagulation process was shown to be an effective and energy-efficient technique for removing the antiviral drug lamivudine formulation from wastewater.



Biography

Samuel Fekadu is pursuing a Ph.D. degree at Chemical Engineering Department, KU Leuven, Belgium, since 2018. His research area focuses on pharmaceutical environmental occurrences and advanced oxidation process as a treatment. He obtained MSc. degree, in Environmental Sanitation from Ghent University, Belgium in 2011, following a BSc in Environmental Health from Jimma University in Ethiopia. Since August 2006, he is a Lecturer at Jimma University, Department of Environmental Health Science and Technology. He has more than ten years' experience of teaching, research advising and field supervision for graduate and undergraduate students. He has more than ten publications on international peer-reviewed journals.