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Simulation and optimization of mineralization of urine by electrooxidation process using artificial neural network and genetic algorithm

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ABSTRACT

Urine can be considered as a special type of effluent; it has a complex composition and high organic load. In recent years the need for improvements in the treatment of human waste has increased, for this reason, electrochemical oxidation is a practical and versatile technique to estimate urine degradation and aid in traditional methods of domestic wastewater treatment. This work aims to use artificial neural networks (ANN) to model urine mineralization kinetics through the electrochemical oxidation process under the influence of the main parameters such as current density (20, 60 and 100 mA cm^{-2}), initial concentration of the dissolved organic carbon (DOC) (1.75, 12.22 and 22.7 g L^{-1}) and reaction time (0 to 480 min). A three-layer neural network with 9 neurons was used in the hidden layer, where a score of mean squared error = 0.0021 and mean absolute error = 0.0345 was obtained. The coupled ANN model and the genetic algorithm was used to find the best operational conditions: Percentage of normalized DOC (above 90%) at a current density of 89 mA cm^{-2}, $[DOC]_0$ of approximately 2.35 g L^{-1} and reaction time of 3.9 h.

Keywords: Artificial intelligence; Urine mineralization; Anodic electrochemical oxidation; Modelling; Wastewater treatment

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