Electrochemical sensor for sucralose and its genotoxic ester. A mathematical description

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Sucralose is one of the most used sweeteners in Portugal and throughout the European Union, in the food and pharmaceutical industries, as a flavor corrector under registration number E955. It is a trichlorosubstituted derivative of galactosucrose, and has twice the sweetness of saccharin, triple the sweetness of aspartame and is up to a thousand times sweeter than common sugar. Sucralose is synthesized from sucrose by a three-stage process. Although sucralose is considered safe for use by diabetics and athletes, its harmful effects on human health and the environment are still little explored, and some of its negative effects have only begun to be studied now. Furthermore, it is necessary to consider the presence of its genotoxic precursor, 6-acetylsucralose, in industrial samples and even in foods. For this reason, the electrochemical determination of 6-acetylsucralose in the presence of sucralose is an option to be considered, and, although the anodic process is also viable, the cathodic process would be more effective from an electroanalytical point of view. The electroanalytical and electrocatalytical process, used to remove both chloroorganic compounds, which are sucralose and its 6-acetyl derivative, may be realized on the graphene electrode, modified by the polymer of mycotoxin necatorin from the *L. Necator* mushroom. This process becomes interesting from the point of view both genotoxicology and circular economy. In this work the electrochemical process for surcalose and its ester on poly(necatorin)-modified cathode is theoretically evaluated. Analysis of the behavior of the system, described by the set of differential equations confirms the effectiveness of this electrochemical process for both the detection of compounds and their removal.

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