Two-Phase Electrochemical Detection of L-Tryptophan as a Kynurenic Acid Analog

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The purpose of this project is to develop a low-cost electrochemical sensor capable of detecting concentrations of an analog similar to kynurenic acid (L-tryptophan). This was accomplished by using a homemade Arduino potentiostat, using an electrochemical setup of a 0.7mm pencil graphite working electrode, a 2.8mm pencil graphite counter electrode and a 24 AWG silver/silver chloride wire reference electrode and a two-part experimental procedure: the first part included testing the best analog chemical and the second part included testing the best variables to make the sensor as efficient as possible. Throughout the first part, L-tryptophan, had shown the most similarities to kynurenic acid. As a result, L-tryptophan was chosen to represent kynurenic acid (not accessible for this project). During the second part of the experiment, each experimental variable was optimized independently. Based on the results of each separate study, the best conditions for the sensor were identified as: a potential window of 0 V to 1.5 V, chlorinating the reference electrode through anodization, a layer of L-alanine on the working electrode, and 0.05 M KCl as the supporting electrolyte. Overall, this experiment demonstrates that a low-cost, Arduino-based electrochemical sensor with pencil graphite electrodes is possible and can demonstrate reliable results. Future work will involve integrating all of the variables into a single sensor, allowing the evaluation of the combined effects on sensitivity, reproducibility and overall performance.

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