Abstract

This work focused on optimizing the determination of the pesticide chlortoluron using HPLC with coulometric detection on carbon nanotube working electrode. The results obtained from two different electrochemical measurement cells were compared: one where the reference silver chloride electrode was placed outside the cell in an overflow vessel, and another one where the reference antimony electrode was integrated directly within the measurement cell. Both electrodes were 3D-printed. For the cell with the silver chloride reference electrode, the optimal conditions were determined to be a pH of 3 and a potential of 1.3 V. For the cell with the antimony reference electrode, the optimal conditions were a pH of 3 and a potential of 1.5 V.

A series of ten injections were measured, showing that the working electrode did not need to be renewed. Calibration curves were recorded, and for the cell with the reference silver chloride electrode, a detection limit of $1.7 \cdot 10^{-6}$ mol·dm^{-3} and a quantification limit of $6.7 \cdot 10^{-6}$ mol·dm^{-3} were calculated. For the cell with the antimony electrode, the detection limit was $4.1 \cdot 10^{-7}$ mol·dm^{-3} and the quantification limit was $1.3 \cdot 10^{-6}$ mol·dm^{-3}.

Except for reproducibility, the cell with the reference antimony electrode exhibited better properties, and it was used to measure chlortoluron samples in a soil matrix. The detection limit was calculated to be 0.1 μg·g^{-1}, and the quantification limit was 0.4 μg·g^{-1}. The extraction recovery ranged from 55% to 111%. If this method is to be applied, better extraction must be ensured.