CAPSULES
preliminary notes and applications from Bioanalytical Systems, Inc.

Determination of Tetramethrin in Soil and Water by Adsorptive Stripping Voltammetry

Purpose

Tetramethrin I (F1) is a synthetic insecticide. It has low toxicity to mammals, although an atmospheric level of 2 ppm caused some temporary behavioral changes in rats. However, like many other pesticides, it can accumulate in the environment, and hence environmental levels need to be carefully monitored.

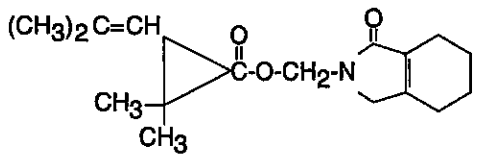

Figure 1. Molecular structure of tetramethrin

Reference

Determination of Tetramethrin by Adsorptive Stripping with Square Wave Voltammetry, P. Hernandez, F. Galan-Estella and L. Hernandez, Electroanalysis 4 (1992) 45-49.

Method

The basis of electrochemical trace analysis is the accumulation (or preconcentration) of the analyte at the working electrode before the potential scan. In Adsorptive Stripping Voltammetry (AdSV), this accumulation occurs via non-electrolytic adsorption of the analyte on the surface of the working electrode (the mercury drop electrode is most commonly used).

The preparation of the soil samples for analysis involved extraction of the tetramethrin from the soil using methanol. The methanol solution was diluted with the supporting electrolyte (see below) before the analysis.

Results

The adsorption of I on the surface of a mercury drop electrode is shown by the square wave voltammogram in F2. The peak current of the voltammogram recorded after a 60 s accumulation time is much higher than the peak current with no accumulation time. The experimental conditions were optimized as follows: 0.4 M acetate buffer (pH 4.0), accumulation potential = -0.5 V and square wave frequency = 120 Hz.

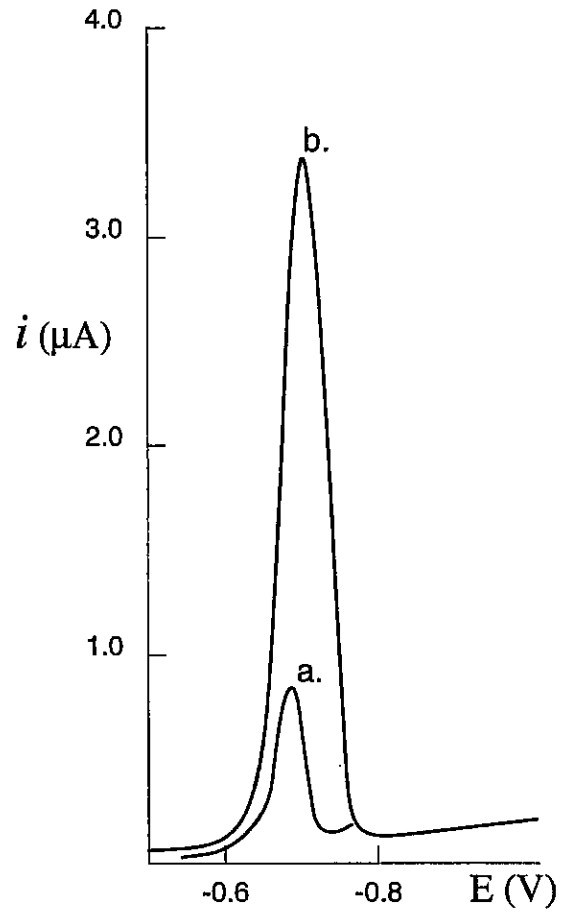

Figure 2. Square wave voltammogram of tetramethrin. Accumulation time = 0 s (a), 60 s (b) (see text for experimental conditions). Figure adapted from Reference.

Calibration plots (F3) were constructed using accumulation times of 30 s and 60 s. For a 60 s accumulation time, the standard deviation was 5.6% and the

determination limit was 1.7 ppb. The above assay was used to analyze soil and water samples.

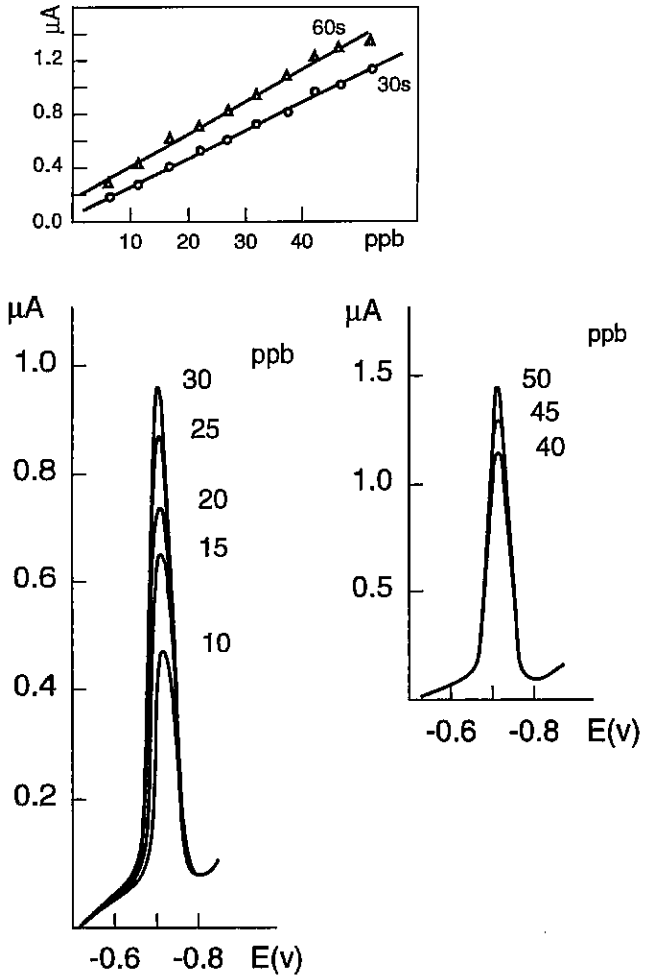

Figure 3. Calibration curves for tetramethrin using accumulation times of 30 s and 60 s (voltammograms shown for 60 s accumulation time). Figure adapted from Reference.