

## Electroanalytical detection of imidacloprid on stearic acid modified glassy carbon electrode

Hewagampalage J. M., and Navaratne A. N.\*

*Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka.*

\* [ayanthin@sci.pdn.ac.lk](mailto:ayanthin@sci.pdn.ac.lk)

Extensive use of pesticides in modern agriculture has become a hidden global threat. Imidacloprid, which is one of the world's most widely used insecticides poses a serious impact on the environment due to its long term persistence in groundwater and soil. In addition, contamination of food with imidacloprid residues can pose health risks to both humans and animals. Hence, its detection in environmental and food samples is essential. Among various analytical techniques, electroanalytical techniques offer a simple and cost effective method for imidacloprid detection. In this study, a simple, cost effective electrochemical method based on stearic acid was developed for the determination of imidacloprid. Stearic acid is non electro-active hence, it forms a barrier on the electrode surface preventing electrode fouling, improving the analytical performance of the electrode. It acts as a cost effective electrode modifier when compared to some commonly used electrode modifiers such as metal nanoparticles, metal oxides, and carbon nanotubes. The glassy carbon electrode was modified with stearic acid using simple drop casting method. Electroanalytical

techniques such as cyclic voltammetry and steady state amperometry were utilized to investigate the electrochemical behavior of imidacloprid at the stearic acid modified glassy carbon electrode. Cyclic voltammetric analysis results in a single reduction peak at -1.2 V, indicating the electro-activity of imidacloprid. In amperometric studies, the noise level observed with the bare electrode has significantly reduced with the modification of the electrode with stearic acid. Therefore, the developed modified electrode provides an amperometric sensor for detection of imidacloprid with a linear dynamic range of  $1.19 \times 10^{-4}$  mol dm<sup>-3</sup> to  $6.97 \times 10^{-4}$  mol dm<sup>-3</sup>. The proposed amperometric sensor exhibited a minimum detection limit of  $6.81 \times 10^{-5}$  mol dm<sup>-3</sup> and a limit of quantification of  $2.27 \times 10^{-4}$  mol dm<sup>-3</sup>, offering a potential tool for imidacloprid detection in environmental samples.

### Keywords:

Amperometry; cyclic voltammetry; modified electrode; stearic acid