Abstract

In this study, silver nanoparticles (AgNs) were prepared using new methodology, and carbon quantum dots (CQDs) were prepared from waste plastics. For nitenpyram analysis, modified electrodes based on CQDs/AgNs/ sodium dodecyl sulfate (SDS) have been developed. There was no reduction peak observed on bare glassy carbon electrode (GCE), whereas nitenpyram underwent reduction at $-450\ \mathrm{mV}$ on the CQDs/AgNs/SDS-modified electrode, which is much lower compared with previous reports. Further, its improved electrocatalytic activity is demonstrated by a higher sensing current. The detection limit was found to be 0.1 nM [signal to noise ratio ($S/N = 3$)], which is much lower than other reports to date. Because the film remains intact and can detect nitenpyram for many days without losing sensitivity, it is suitable for long-term use. Standard and commercial pesticide recovery rates were evaluated in tomatoes and paddy food samples. Validation of electrochemical results has been achieved by comparing them with high-pressure liquid chromatography (HPLC) results. There was good agreement between the results and those obtained by HPLC. This proposed method was also used to verify the purity of the commercial nitenpyram sample, which agrees well with HPLC results. The proposed sensor opens up new possibilities for sensing of nitenpyram in environmental samples.