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ABSTRACT

In this work, electrochemical biosensors based on field effect transistors (FET) with single-walled carbon nanotubes (SWCNT) were constructed as disposable analytical devices to detect alkylphenols through immunoreaction using 4-nonylphenol (NP) as model analyte, and validated by comparison with enzyme-linked immunosorbent assay (ELISA). The calibration curve displays a working range with five concentrations between 5 and 500 µg L^{-1}, and for each concentration, five biosensors were analyzed for reproducibility estimation and two analytical measurements were performed for each biosensor for repeatability estimation. The accuracy of the biosensors was validated by analyzing NP contents in ten spiked artificial seawater samples and comparing these results to those obtained with the traditional ELISA methodology. Excellent analytical performance was obtained with reproducibility of 0.56±0.08%, repeatability of 0.5±0.2%, limit of detection for NP as low as 5 µg L^{-1}, and average recovery between 97.8 and 104.6%. This work demonstrates that simple biosensors can be used to detect hazardous priority substances in seawater samples, even at low concentrations.

Keywords: Alkylphenols; Electrochemical Biosensor; Carbon Nanotubes; Field Effect Transistor; Nonylphenol; Seawater.