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Nanostructured nickel (II) phthalocyanine—MWCNTs as viable nanocomposite platform for electrocatalytic detection of asulam pesticide at neutral pH conditions

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ABSTRACT

This work reports for the first time that nanostructured nickel (II) phthalocyanine/multiwalled carbon nanotubes composite supported on a basal plane pyrolytic electrode (NiPcNP/MWCNT-BPPGE) could potentially serve as a viable platform for the sensitive electrocatalytic detection of asulam pesticide at phosphate-buffered solution (pH 7.0 conditions). Comparative electron transfer dynamics, using ferrocyanide/ferricyanide as outer sphere redox probe, were examined and interpreted using the Davies–Compton theoretical framework dealing with voltammetry at spatially heterogeneous electrodes. The NiPcNP/MWCNT-BPPGE exhibits fast electron transport and excellent electrocatalytic behavior toward asulam, with an onset potential of about 150 mV lower than observed for the electrode without MWCNTs or bare BPPGE. Also, NiPcNP/MWCNT-BPPGE displayed good analytical performance for asulam, with a detection limit of 0.285 μM , a linear concentration range of 91–412 μM , and a sensitivity of 44.6 $\mu\text{A mM}^{-1}$.