Nanocomposite-modified screen-printed electrode based on *f*-MWCNT/AgNPs for diuron detection in Brazilian agricultural products

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In this work, a screen-printed electrode (SPE) modified with a nanocomposite based on functionalized multi-walled carbon nanotubes (*f*-MWCNTs), chitosan (CS) and silver nanoparticles (AgNPs) was developed for the electrochemical detection of diuron (DIU), a widely used herbicide in agricultural practices. The AgNPs were synthesized by a greener route using lemon leaf extract as a natural reducing and stabilizing agent. The composite *f*-MWCNT@CS-AgNPs was drop-cast onto the working area of the SPE, resulting the sensing platform SPE/*f*-MWCNT@CS-AgNPs. Physicochemical and electrochemical characterizations revealed a significant increase in the electroactive area and heterogeneous electron transfer constant, especially when 0.70% CS was used. DFT calculations showed that modifying *f*-MWCNT@CS with AgNPs lowered its Gibbs free energy. The electrochemical behavior of DIU was studied by DPV, revealing a pH-dependent irreversible oxidation consistent with a $2e^-/2H^+$ mechanism[1] after optimization. The analytical curve was linear in the range of 0.02 to 50.0 μmol L^{-1}, with a limit of detection (LOD) of 5.0 nmol L^{-1}. The platform showed high selectivity in the presence of common interferents and excellent recovery values (up to 115.6%) in real agricultural matrices – tomato, orange, tangerine and sugarcane. These results demonstrate the potential of the proposed platform as a simple, low-cost, and reproducible sensor for monitoring pesticide residues in food matrices.

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Reference: [1] R.S. Oliveira, H.B. da Silva, C.C. de Souza, W.B. Veríssimo, M.A.C. Matos, T.P. Lisboa, R.C. Matos, Development of an electrochemical sensor utilizing recycled ABS filaments for 3D printing in the determination of diuron, **Microchemical Journal** 201 (2024) 110454.