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Ultrasensitive label-free immunosensor based on electrodeposited poly 2, 5-dimethoxyaniline doped with gold nanoparticles-dotted nitrophenylazo functionalized graphene for sensitive determination of deoxynivalenol in cereals

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An electrochemical affinity sensor for the determination of deoxynivalenol mycotoxins (DON) in cereal samples, using signal enhanced nanocomposite of poly 2, 5-dimethoxyaniline doped with gold nanoparticles-dotted nitrophenyl azo functionalized graphene on glassy carbon electrode as sensing platform is reported in this work. The electrochemical impedance spectroscopy of the nanocomposite was used as a marker. Under optimized conditions, the formation of immune-complexes inhibited electron flow and increased the charge transfer resistance of the sensing interface linearly. The change in impedance was proportional to DON concentrations in the range of 0 to 36 mg/mL with a sensitivity and detection limit of 43.445 ΩL/ng and 1.1098 pg/L respectively. The DON values of the sensor to certified reference materials (corn, wheat and roasted coffee) were comparable to those obtained with ELISA technique as well as the quantity advertised by the vendor. The sensor had a stability of 89.7%, reproducibility of 7.2% and very good selectivity in DON standard solution containing different interfering agents).

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