An Electrochemical Sensor Based on Chitosan Molecularly Imprinted Polymers for the Selective Detection of Diphenylamine

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Diphenylamine (DPA) is mainly utilized as a scald inhibitor in fruits, and its residues are found in different fruit and environmental samples. Those residues, even in the smallest concentrations pose a hazard to human health since DPA is classified as a probable human carcinogen. Thus, in this study, a novel molecularly imprinted polymer (MIP) sensor was developed for the detection of diphenylamine. The surface of a boron-doped diamond electrode was modified by chitosan electrodeposition using DPA as template. Electrodeposition was carried out using chronoamperometry. The molecularly non-imprinted polymer (NIP) was prepared similarly to the MIP in the absence of DPA. Different parameters including deposition time, concentration of template and incubation time were optimized. The performances of the MIP and NIP-modified electrodes were compared using differential pulse voltammetry. Electrochemical signal was registered using DPA response. Under optimum conditions, a linear concentration range towards DPA was obtained by the MIP-modified electrode between 25 and 200 µM with a good sensitivity. The possibility of reusing the electrodes was also tested and a recovery range of more than 80% was obtained in PBS buffer.

Keywords: diphenylamine, molecularly imprinted polymer, electrodeposition, chitosan, differential pulse voltammetry