New amperometric microsensors for the analysis of serotonin in urine samples

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New amperometric microsensors based on carbon materials, e.g., carbon nanopowder (CN), graphite (G), TiO_2, and phthalocyanines: basic phtalocyanine (Pc) and Fe^{III}phthalocyanine (FePc) are proposed for analysis of serotonin (5-HT) in biological fluids, using differential pulse voltammetry (DPV). Cyclic voltammetry (CV) was used to optimize the working conditions, e.g., pH, and electrolyte for the proposed microsensors. The optimum electrolyte was KCl (0.1mol L^{-1}) in a pH=4.0 (phosphate buffer). The linear concentration ranges for 5-HT were between 10^{-6} and 10^{-2} (G), 10^{-6} and 10^{-2} (G-TiO_2), 10^{-6} and 10^{-3} (G-TiO_2-Pc), 10^{-6} and 10^{-3} (G-TiO_2-FePc), 10^{-5} and 10^{-3} mol L^{-1} (CN, CN-TiO_2, CN-TiO_2-Pc and CN-TiO_2-FePc), with detection limits of 1.0×10^{-7}, 1.25×10^{-7}, 5.3×10^{-7}, 4.2×10^{-7}, 1.9×10^{-6}, 2.2×10^{-6}, 1.5×10^{-6}, and 2.8×10^{-6} mol L^{-1}, respectively. The sensors were used for the reliable analysis of serotonin in urine samples, with recoveries higher than 93.00%.