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A Chemometrical Analysis of Voltammetric Data for Simultaneous Determination of Phenobarbital Sodium and Paracetamol Obtained at a Gold Electrode

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The electrochemical behavior of phenobarbital sodium (PBS), paracetamol (PCM) and their binary mixtures was investigated using cyclic voltammetry (CV) and square wave voltammetry (SWV) at a bare gold electrode in a 0.05 M bicarbonate solution. A calibration curve of PBS obtained by SWV had two linear ranges, from 1.0 to 3.0 μM and from 5.0 to 35.0 μM with a limit of quantification (LOQ) of 0.62 μM and a limit of detection (LOD) of 0.19 μM, while a calibration curve of PCM was determined within the range from 10.0 to 50.0 μM with a LOQ of 8.53 μM and a LOD of 2.56 μM. Both drugs underwent oxidation by irreversible, diffusion controlled process. The SW voltammograms of the drug mixtures produced complex, overlapping profiles and a chemometric method was applied for their decomposition. Two different artificial neural network (ANN) architectures, namely back-propagation neural network (BPNN) and general regression neural network (GRNN) were employed for the simultaneous prediction of the concentrations of the drugs in a synthetic sample. The BPNN model had higher accuracy (mean absolute percentage error values were in the range of 3.6–8.4%) and thus it can be used for the simultaneous determination of PBS and PCM.

Keywords: phenobarbital, paracetamol, voltammetry, chemometrics

FULL TEXT