

Abstract

In the presented bachelor thesis, the functionality of a flow-through multitubular boron-doped diamond electrode (mtBDDE) was verified on two selected neurotransmitters, DA and NE, using the HPLC technique with isocratic elution. An aqueous solution of Britton-Robinson (B-R) buffer was chosen as the mobile phase and a Kinetex EVO C18 reverse column (150 x 4.6 mm) as the stationary phase. The flow rate of the mobile phase was set at 1 ml/min. For electrochemical detection, mtBDDE was used and UV detection at 280 nm was applied as an assistant to the main detector. The electrochemical response of the DA and NE solution ($c_0 = 1 \cdot 10^{-4} \text{ mol/dm}^3$) was investigated in the form of hydrodynamic voltammograms over a potential range from 0.1 V to 1.3 V in different pH ranges of the mobile phase (2.5; 4.0; 6.0; 8.0 and 10.0). It was found that the potential wave shifts to lower potentials with increasing pH of the mobile phase, while the response of individual analytes does not change significantly with pH. Under optimal conditions, i.e., mobile phase B-R buffer at pH = 6 and a potential loaded on the mtBDDE of 0.6 V, the repeatability and reproducibility of the measurement results were verified. The electrode gave repeatable results (RSD < 4 %) comparable to the UV detector used (RSD \leq 4 %) over the series of measurements. A decrease in peak heights of up to 20 % and RSD of 7.7 % and 13.5 % for NE and DA, respectively, was observed in the reproducibility measurements; however, even in this case the values are comparable to the UV detection measurements (RSD 9.3 % and 11.2 % for NE and DA, respectively). Thus, the probable reason was not due to the electrode condition. The LOD and LOQ of mtBDDE were determined from the calibration dependence of the current (i.e. peak height) on the concentration of DA and NE solution, respectively. The respective dependences were linear over the whole concentration range from $1 \cdot 10^{-4} \text{ mol/dm}^3$ to $8 \cdot 10^{-7} \text{ mol/dm}^3$. The limits of detection and quantification were in the order of 10^{-7} mol/dm^3 for both types of detectors. By comparing the peak widths, it was found that the peak width from the ECH detection was approximately twice that of the UV detection, an effect apparently due to both the electrode design and the serial connection of the detectors used. mtBDDE showed a relatively high conversion rate (12%) due to its design and overall proved to be an efficient and effective working electrode in electrochemical detection in combination with HPLC techniques.