Abstract

This bachelor thesis deals with the optimization of anodic and cathodic pretreatment of BDD electrodes and subsequent comprehensive characterization and comparison of electrochemical parameters of unmodified, O-terminated and H-terminated BDD electrodes.

The study was carried out using cyclic voltammetry of two model inner sphere redox systems $[Fe(CN)_6]^{4-/3-}$ and dopamine/dopamine-*o*-quinone. Boron concentrations in the BDD films ranged from 500 ppm to 8000 ppm.

O-termination of the electrode surface was most effectively achieved when an activation potential of E_{akt} = +3.0 V was inserted for 10 min into 0.5 mol l^{-1} H_2SO_4. For the dopamine/dopamine-*o*-quinone system, the O-terminated BDD electrodes caused deceleration of electron transfer compared to the unmodified BDD electrodes, which was accompanied by an increase in the potential difference with the highest ΔE_p at 500 ppm BBD electrode (ΔE_p = 711 mV).

To achieve the H-terminal surface, single and cumulative reduction was tested by inserting E_{akt} = −3.0 V. A sufficient single reduction time for the $[Fe(CN)_6]^{4-/3-}$ system was determined to be 60 s, whereas in the case of dopamine, the electrochemical parameters did not stabilize at the selected reduction times, but the cathodic and anodic peak signal at the H-terminated 1000 ppm BDD electrode was up to four times higher than at the O-terminated one. Cumulative reduction on the dopamine/dopamine-*o*-quinone system showed that when using a narrower potential window (−200 to +800 mV), there is a decrease in signals after 300 s of reduction compared to the wider potential window (−200 to +1100 mV), where the decrease occurred after 90 s.