

Application of Poly(α -naphthylamine)/Nickel Modified Carbon Paste Electrode to Electrocatalytic Quantification of Carbohydrates

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Determination of carbohydrates are important in many medical, biological and industrial applications. In this sense an electrochemical detection of carbohydrates would be devised due to simplicity, selectivity and low cost of the method. Recent researches had demonstrated that coating the electrode surface with polymeric films can be an attractive approach for enhancing the power and scope of electrochemically modified electrodes. In this work a poly(1-naphthylamine)/nickel modified carbon paste electrode was optimized to carbohydrate quantification aiming biotechnological purposes. The work electrode was optimized with glucose as standard, 0.44% of α -naphthylamine and 67/32.46% of graphite powder/Nujol. The electrode was initially electropolymerized in 0.2M HClO₄ by holding a potential of 720mV for 250s. Ni(II) ions were incorporated into the polymeric film using 0.1M NiCl₂ with constant stirring. The oxidation of carbohydrates was studied by cyclic voltammetry in 0.1M NaOH, with scan rate of 50mV/s and 150 to 580mV of potential range. Linear least squares applied to concentration ranges from 16 compounds (mono, di and polysaccharides) showed a mean correlation coefficients of 0.998. The modified electrode provided quantification limits from 17.8 μ g·mL⁻¹ for fructose to 0.95mg·mL⁻¹ for inulin. An arbitrary sensivity scale showed values of 0.73, 0.21, 0.28, 0.69, 0.19, 0.81, 0.64, 0.47, 0.34, 0.24, 0.77, 0.78, 0.02 and 0.01, for glucose, lactose, maltose, rhamnose, sucrose, galactose, arabinose, fucose, mannose, threalose, xylose, kefir growth factor (KGF), fructooligosaccharides from chicory and inulin, as compared as fructose. The modified electrode was successfully used in amylase-linked starch hydrolysis, suggesting its potential application in biotechnology processes.

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