GLOBAL E-CONFERECE ON
CHEMISTRY AND CHEMICAL ENGINEERING
APRIL 05-06, 2023 | WEBINAR

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Application of flow injection system with modified electrode for caffeine detection

A simple flow injection system for caffeine determination on a modified glassy carbon electrode was optimized. The electrode was modified with MnCo2O4 nanoparticles and Nafion [1]. Cyclic voltammetry was used for comparison of the caffeine oxidation on bare and electrode modified by Nafion only and a combination of Nafion and nanoparticles. Cyclic voltammograms showed increased sensitivity of modified (Nafion + MnCo2O4) electrode toward caffeine oxidation and obtained anodic current was 5 times higher compared to the bare electrode. The flow injection system was optimised regarding working potential, gasket thickness, sample loop volume, and reaction coil volume. Under optimal FIA conditions: 1.5 V vs. Ag/AgCl, 50 µl injection volume, 100 µl for reaction coil and 0.1 mol/L H2SO4 as reagent 1 ml/min flow rate the sensor gave linear response for up to 75 µmol/L of caffeine. The corresponding equation was I = 0.0856c + 0.0423 (r2 0.9996), and the calculated limit of detection (as 3σ/s) was 1.5 µmol/L of caffeine, which corresponds to 14.6 ng of caffeine. The FIA system was applied to caffeine determination in coca cola, energy drinks, coffee and tea samples. Obtained results were in good agreement with the declared values. And spectrophotometric method was used as the reference method. T-test showed no significant difference at the 0.05 level.

Keywords: Flow injection analysis, amperometry, nanoparticles, electrode modification, caffeine, real samples

Biography:

Prof. Aleksandar Lolic, was born in 1971 in Zadar, Croatia. He got his bachelor's degree at the University of Belgrade – Faculty of Chemistry (UBFC). His master's degree and doctoral degree were finished at the Department of Analytical Chemistry at UBFC. In 2019 he was promoted in Associate Professor in the same Department. Within his scientific research, Aleksandar deals with the application of different electrode modifications for electroanalytical determination and the development and application of flow injection analysis systems with gas-diffusion and amperometric detection.

doi.org/10.51219/URForum.2023.Aleksandar-Lolić

ISBN-978-1-7393132-7-2