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**Simultaneous determination of codeine and caffeine using single-walled carbon nanotubes
modified carbon-ceramic electrode**

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Abstract

In the present paper, the simultaneous determination of codeine (CO) and caffeine (CF) is described by the use of single-walled carbon nanotubes modified carbon-ceramic electrode (SWCNT/CCE); prepared via a simple and rapid method. The results show that the SWCNT/CCE exhibits excellent electrochemical catalytic activity towards the oxidation of these compounds with respect to the bare CCE and offers two anodic peaks at 1.05 and 1.38 V vs. saturated calomel electrode for oxidation of CO and CF, respectively. Differential pulse voltammetry was used for simultaneous determination of CO and CF at micromolar concentration level. In the optimum conditions, it is found that the calibration graphs for CO and CF are linear in the concentration ranges 0.2-230 and 0.4-300 μM with detection limits of 0.11 and 0.25 μM for CO and CF, respectively. The SWCNT/CCE presents good stability, reproducibility, and repeatability and the proposed method has been successfully applied for determination of CO and CF in some pharmaceutical, drinking and biological samples with high recovery rate.

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