

Voltammetric determination of capsaicin in real food samples using multi-walled carbon nanotubes based screen printed electrodes (SPE)

1. Aim of the work

The aim of the work is the electroanalytical determination of capsaicin in samples of dried chili peppers or chili-containing sauce on screen-printed electrodes modified with multi-walled carbon nanotubes (MWCNT-SPE). Differential pulse voltammetry with adsorptive preconcentration of the sample (Ad-SDPV - adsorptive stripping differential pulse voltammetry) will be used for the analysis.

MWCNT-SPE is a commercial detection device that is simple, inexpensive, accurate, and repeatable!

2. Preparation of the exercise:

A standard reference solution of capsaicin (0.4 mg mL^{-1} in methanol) was prepared from analytical grade capsaicin.

a. Prepare a series of standard solutions of potassium iodide with concentrations: $0.13 \text{ } \mu\text{M}$, $0.26 \text{ } \mu\text{M}$, $0.52 \text{ } \mu\text{M}$, $1.04 \text{ } \mu\text{M}$, $2.08 \text{ } \mu\text{M}$, $4.16 \text{ } \mu\text{M}$ in $1000 \text{ } \mu\text{L}$ (please use the pipette and small vials). Please calculate the necessary additions of 0.4 mg mL^{-1} capsaicin to $1000 \text{ } \mu\text{L}$ of phosphate buffer (pH 7.4). Solutions with the concentrations mentioned should be prepared by the subsequent dilution method.

b. Start the measuring system (follow the instructor's instructions)

c. Record the cyclic voltammograms (CV) and DPV of the working electrode in the base electrolyte (phosphate buffer). $60 \text{ } \mu\text{L}$ of buffer should be dropped on the surface of SPE. **Note:** all 3 electrodes should be in contact with electrolyte.

d. Make a series of differential pulse voltammograms for subsequent capsaicin solutions - $60 \text{ } \mu\text{L}$ of prepared capsaicin solutions in phosphate buffer.

e. Weight the accurate amount of chili pepper powder (typically 0.2 g), transfer to vial and add 10 mL of methanol. Insert the suspension into the ultrasound for 10 min in order to prepare the extract of capsaicin in methanol.

f. Such a prepared real sample in concentrated. Before the electrochemical analysis, it should be diluted! Record the voltammogram for the real sample.

Issues for learning:

Reduction/oxidation reactions, reversibility of electrode reactions, electromotive force, half-cell potentials, electroanalytical methods (amperometry, voltamperometry), electrochemical properties of microelectrodes.