



Development of the electrochemical sensor for highly sensitive levodopa determination

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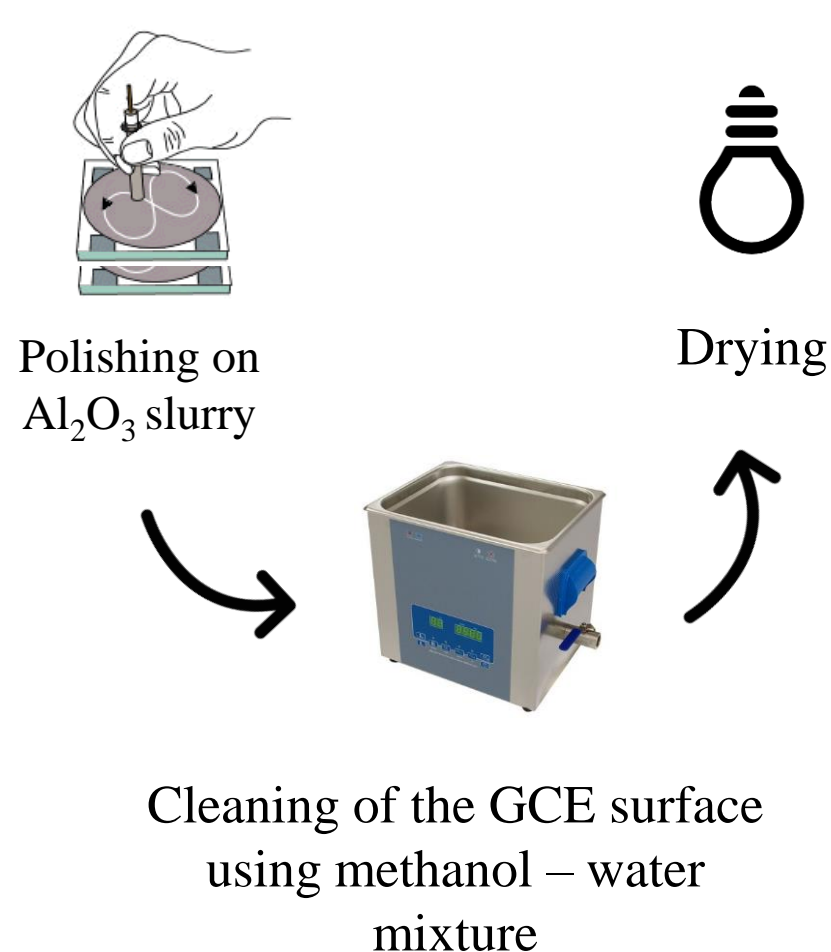
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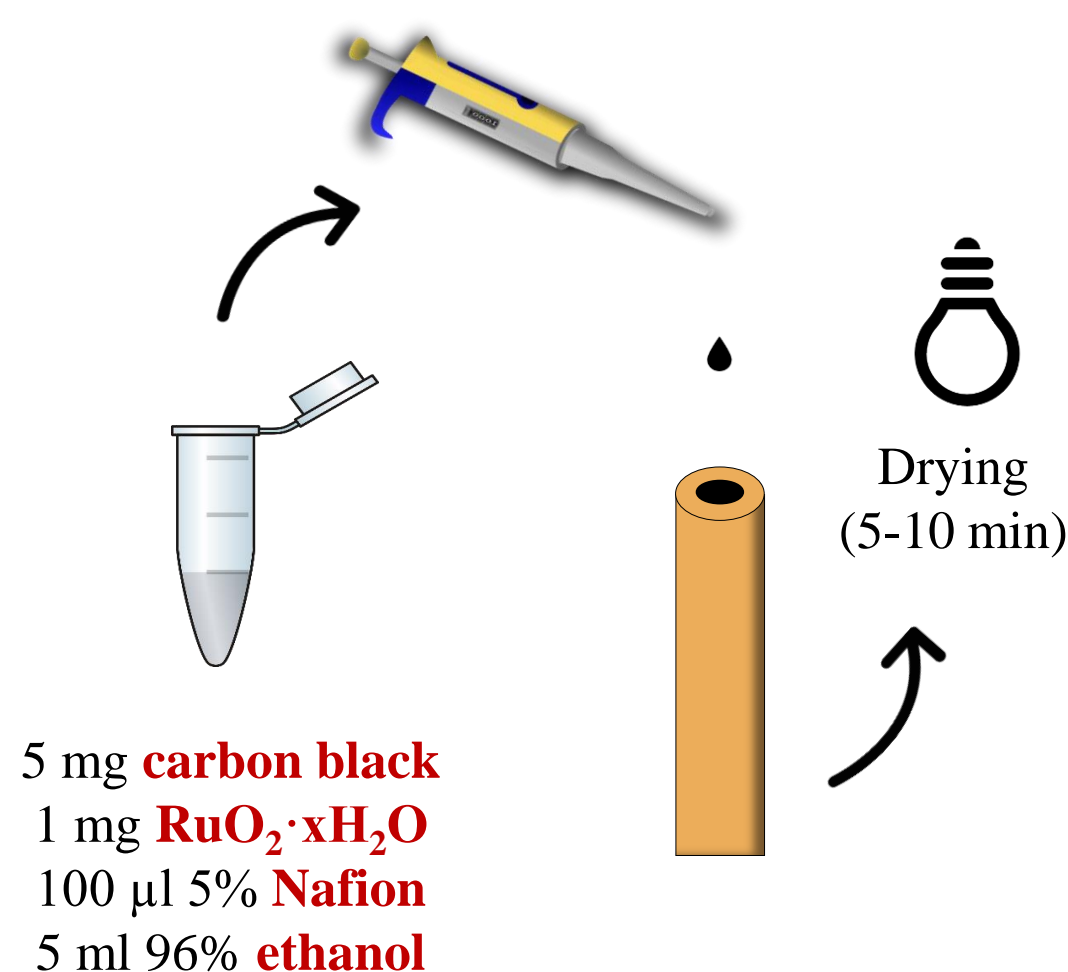
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Carbon black, RuO₂·xH₂O and Nafion modified glassy carbon electrode (GCE)

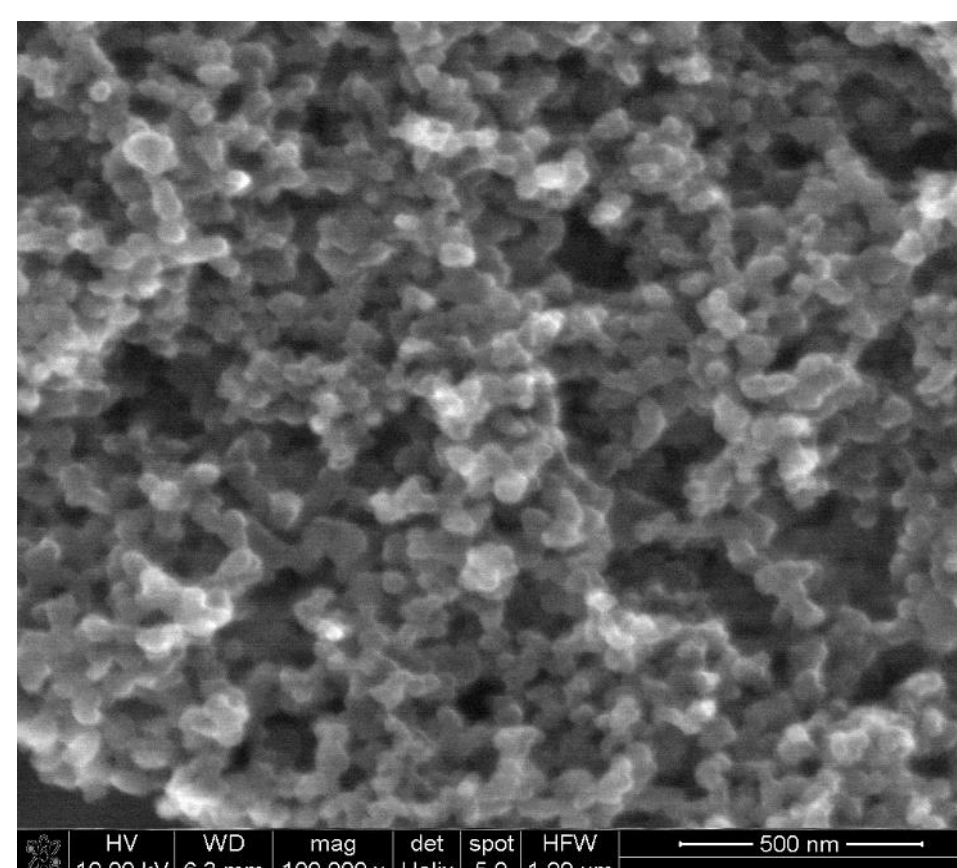
PREPARATION OF GCE



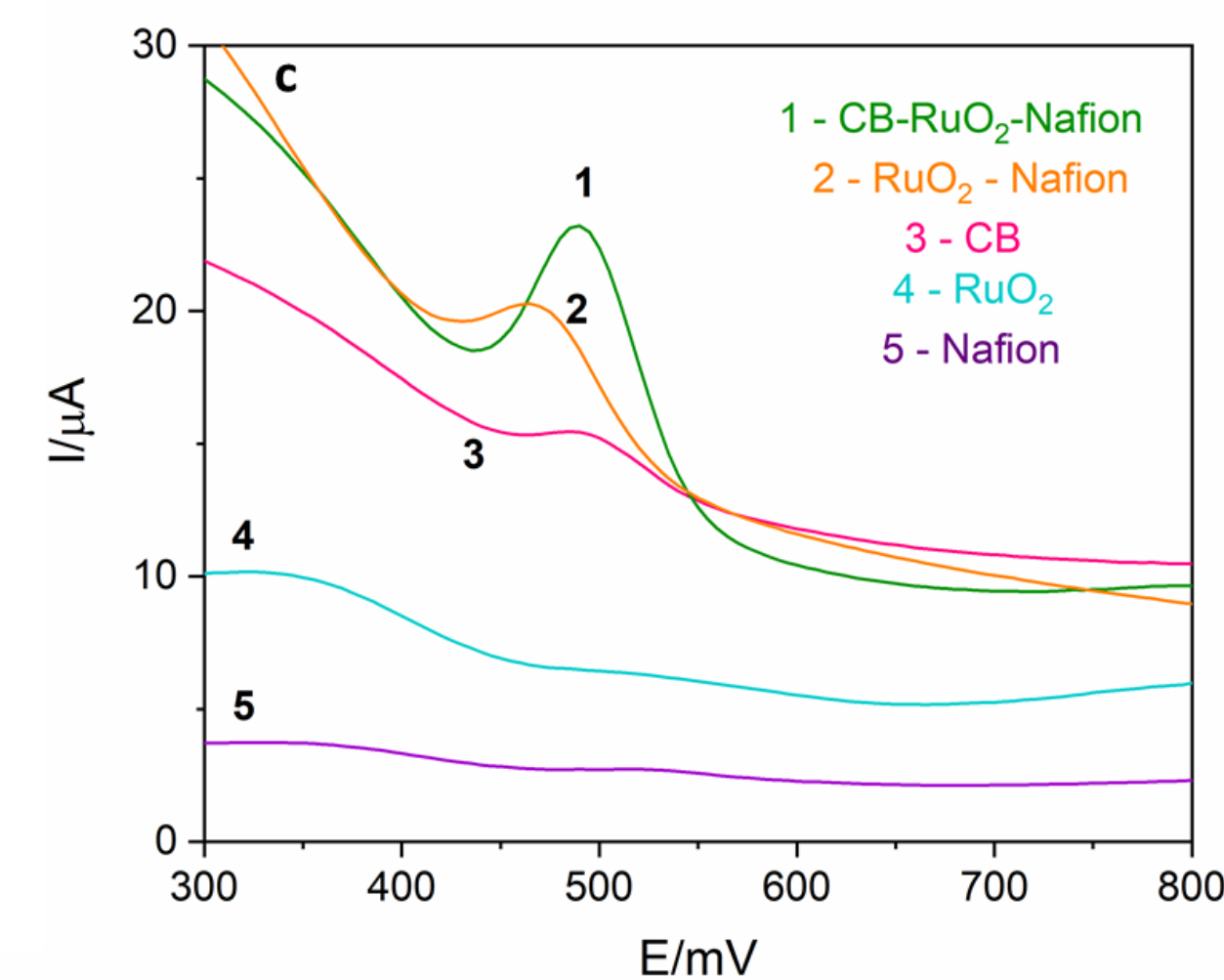
APPLICATION OF THE MODIFIER



MICROSTRUCTURE OF CB-RuO₂-Nafion GCE



COMPARISON OF CB-RuO₂-Nafion GCE WITH DIFFERENT MODIFICATIONS OF GCE



Optimal volume of surface modifier: **5 µL**

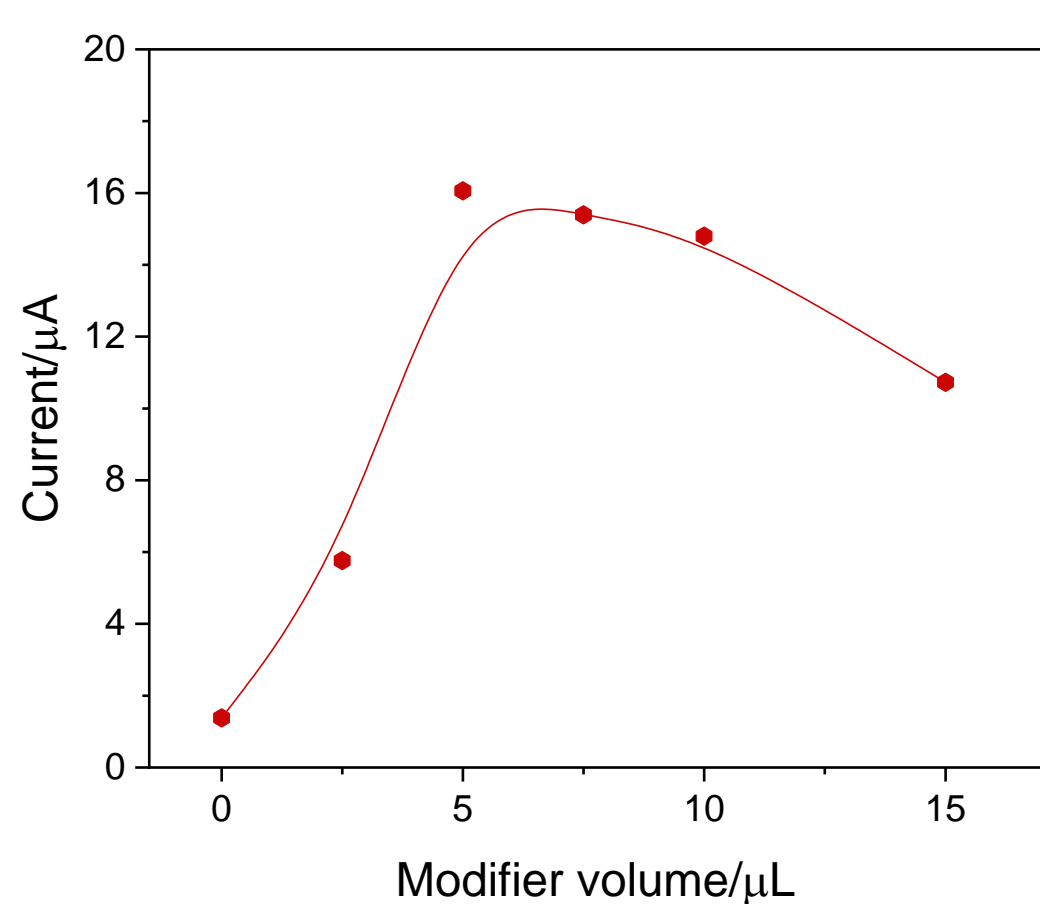


Fig. 1. Optimization of modifier volume applied on the surface of GCE.

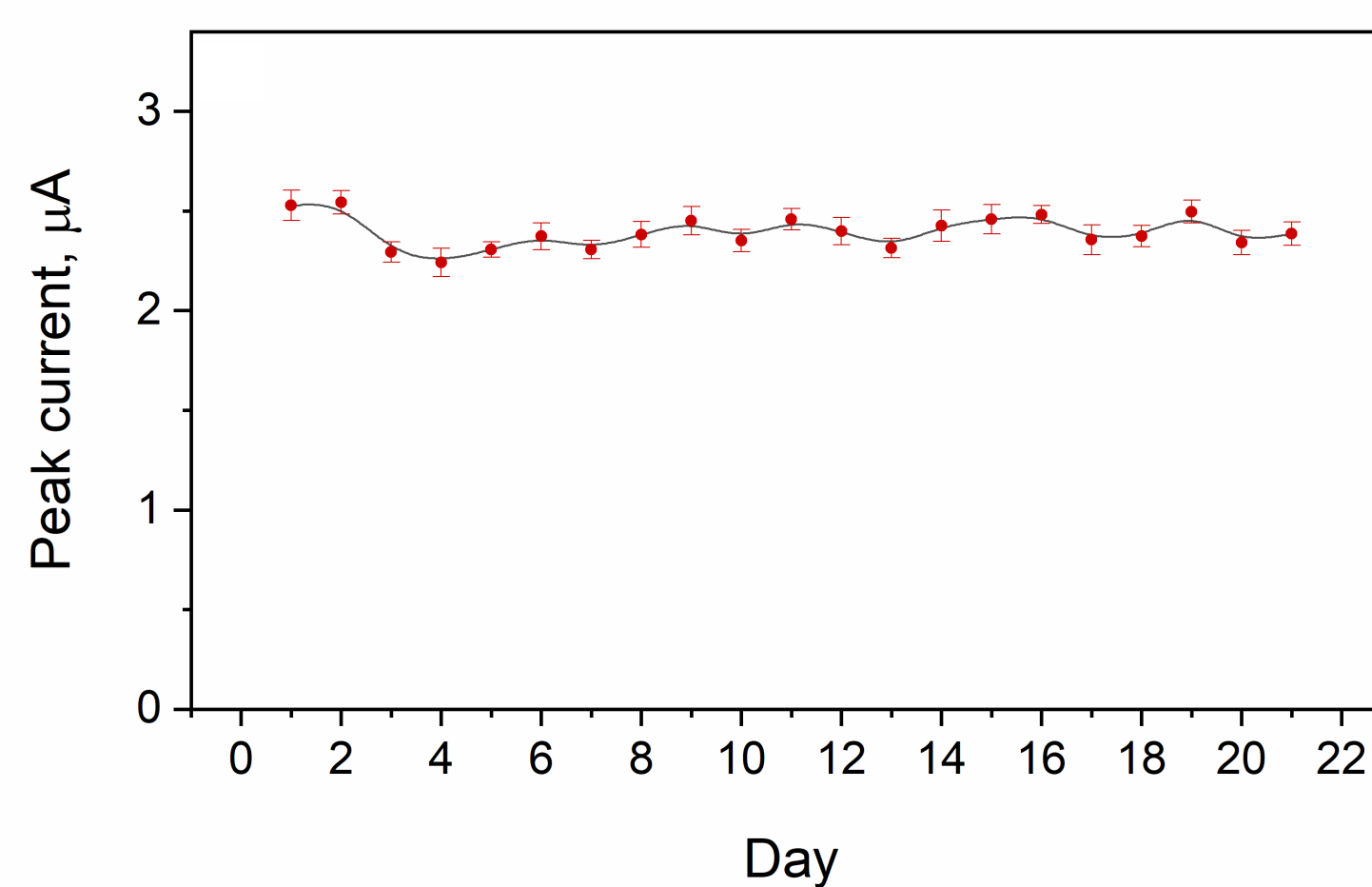
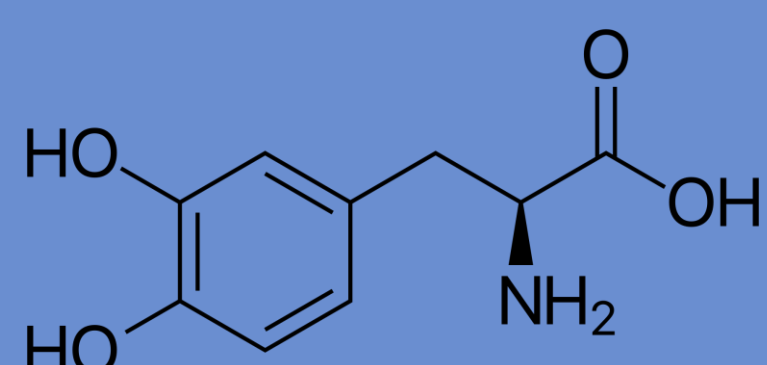


Fig. 2. Stability chart of developed CB-RuO₂-Nafion GCE over period of 21 days.

After tested period of 21 days no significant changes in sensitivity were observed.

LEVODOPA



- » Dihydroxyphenylalanine (L-DOPA) – natural amino acid
- » Dopamine (neurotransmitter) precursor
- » Does not occur naturally in our diet
- » Levodopa has the highest therapeutic index of any drug available for Parkinson's disease

Recoveries

105-107%

Levodopa determination on CB-RuO₂-Nafion GCE

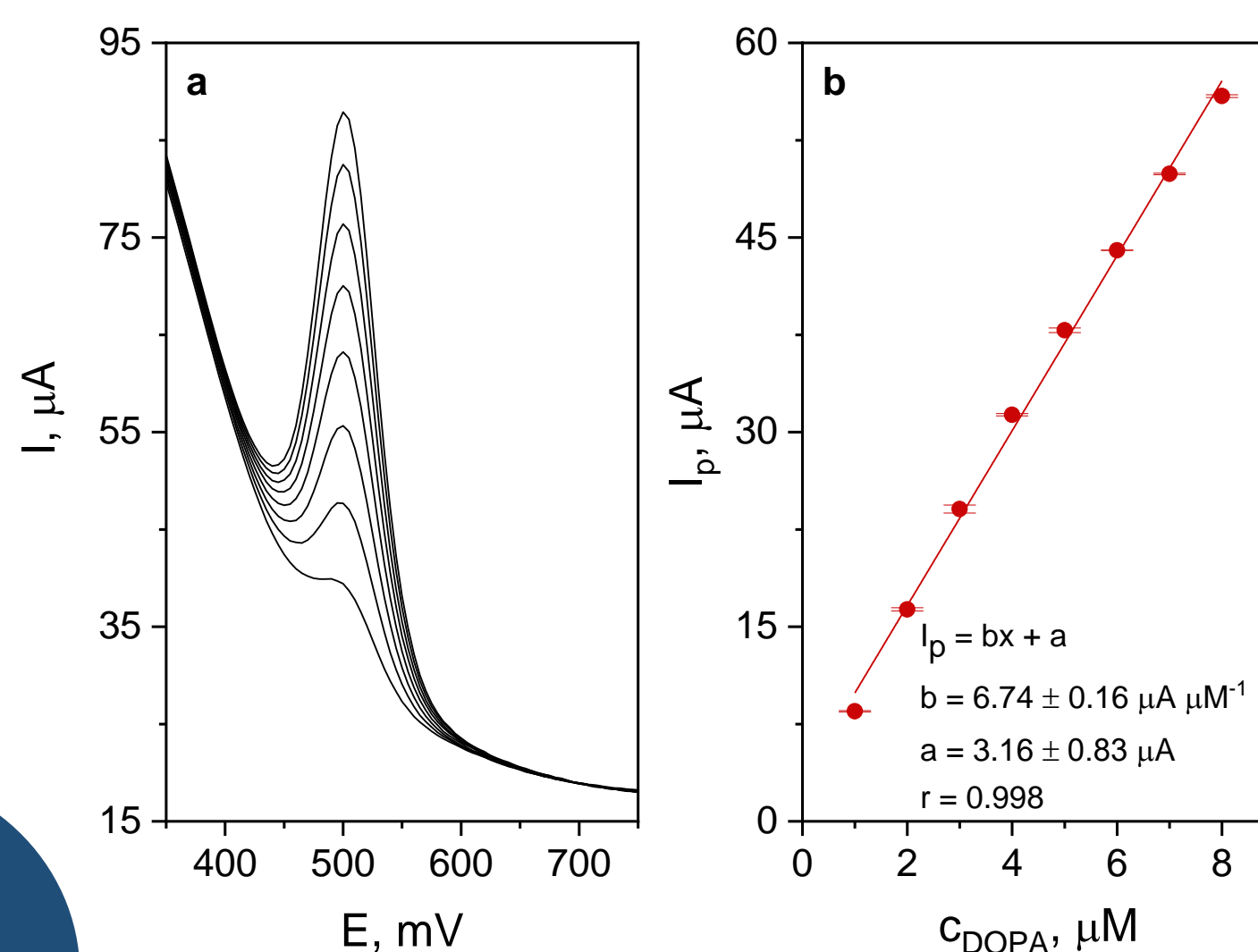


Fig. 3. (a) Calibration conducted for levodopa in the concentration range 1 – 8 µM, (b) Corresponding regression.

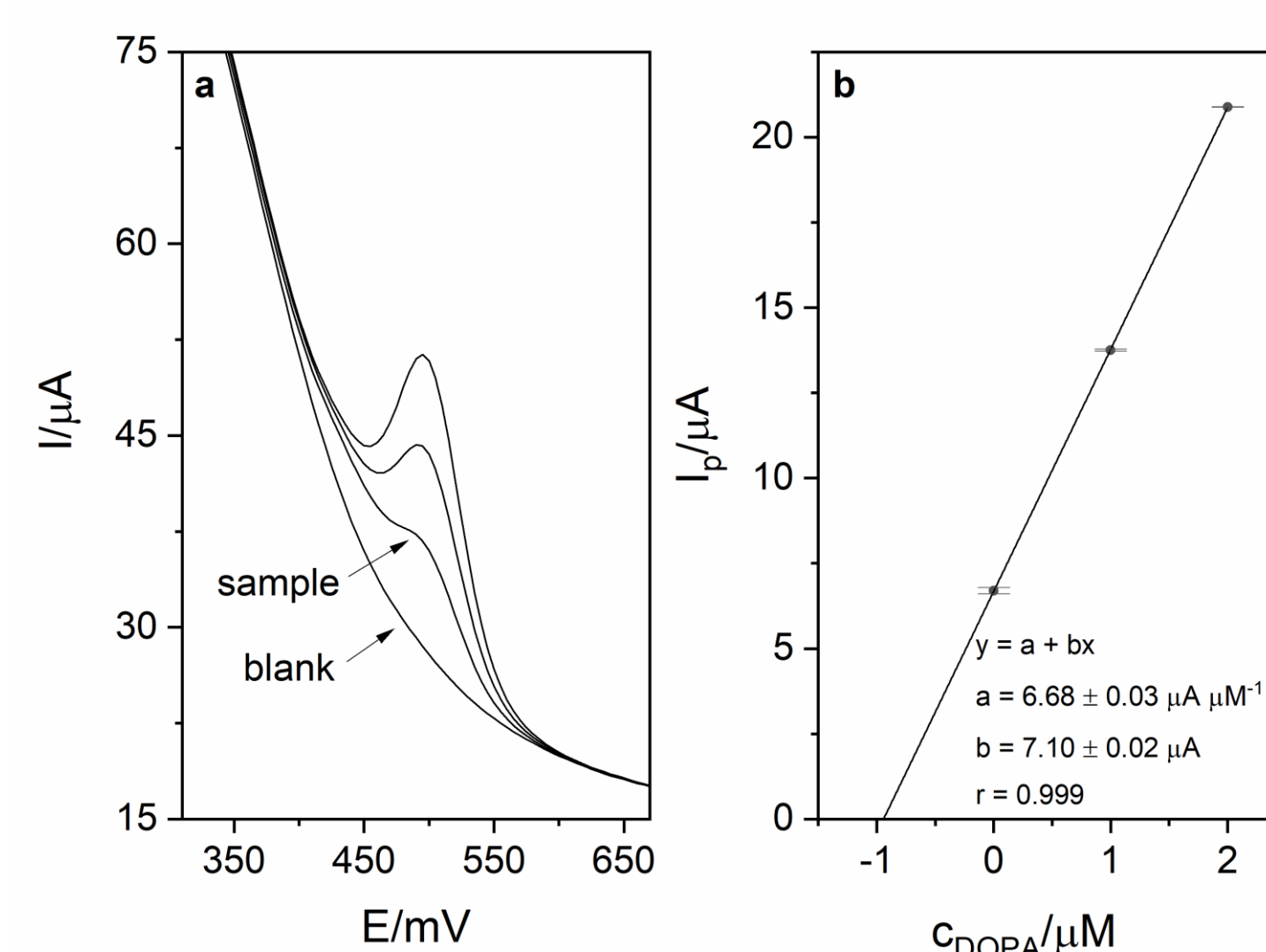


Fig. 4. (a) Voltammograms obtained during measurement of the sample containing levodopa (b) Corresponding regression.

Table 1. Results of levodopa determination in pharmaceutical products and in tap water sample

DOPA added	DOPA found ± s (recovery, %), mg		DOPA found ± s (recovery, %), µg
	Madopar 62.5 ^a	Madopar 125 ^b	Tap water
0	51.2±1.8	101.8±3.4	ND
2 µg	-	-	2.32±0.02
4 µg	-	-	4.51±0.07 (106)
50 mg	107.5±2.2 (107)	-	-
100 mg	-	214.0±7.1 (105)	-

Conclusions

- By using glassy carbon electrode modified with CB, RuO₂·H₂O and Nafion sensitivity was improved by 12 times in comparison with bare glassy carbon electrode.
- Highly sensitive voltammetric method for levodopa determination was developed
- Calculated limit of detection was equal to 17 nM.
- The applicability of the developed method was confirmed by analysis of pharmaceutical products containing levodopa.
- Recoveries were in the range 105-107% what indicates that method might be considered as accurate.