



Fast detection of antioxidants

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Introduction

Antioxidants have a positive effect on human health because they restrict the activity of oxygen radicals. The presence of antioxidants can reduce emergence of heart-vascular diseases and some types of cancer. The best known antioxidants are Vitamin A, C, E, coenzyme Q10, bioflavonoids, polyphenols etc. Green tea, coffee and wine contain polyphenols and flavonoids therefore these drinks should show antioxidant positive effect. Antioxidation activity was measured and compared for four commercial bagged tea, two instant coffee, two black coffee and two types of wine. Celaskon tablets 100 mg (Acidum ascorbicum) were measured too at different concentrations.

Cyclic voltammetry as an easy and cheap method for qualitative determination of antioxidant activity was used. Redox characteristics of solution were evaluated by cyclic voltammetry. Two parameters from cyclic voltamogram can characterize antioxidant. First parameter is potential of anodic oxidation peak. The lower value of anodic oxidation peak the better antioxidant. Second parameter, anodic current, is corresponding to concentration of antioxidant. Screen printed electrochemical sensors (BVT Technologies) with glassy carbon working electrode and potentiostat EA161 (eDAQ) with e-coder ED210 (eDAQ) was used for the fast detection of antioxidants.

Measurement set-up and Sensor

Electrochemical sensor with glassy carbon working electrode (BVT Technologies) was inserted into a glass vessel. Vessel was filled by 8 ml of sample. Potentiostat EA161 (eDAQ) with e-coder ED210 (eDAQ) was used for measurement.

Experiment

The electrochemical sensors with glassy carbon working electrode (BVT Technologies) were chosen because of their wider potential window in comparison with platinum working electrode.

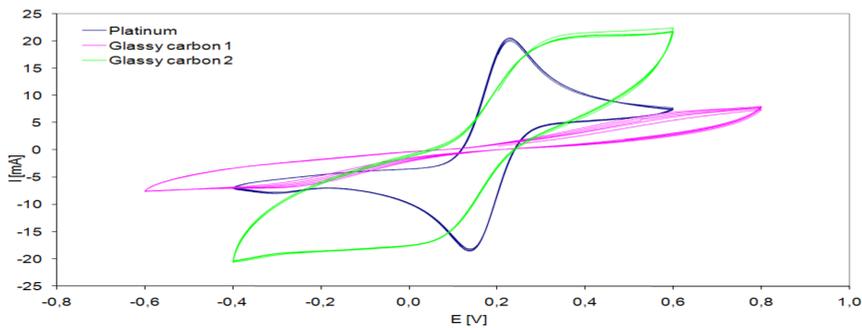


Fig. 1: Cyclic voltamogram of the electrochemical sensor with platinum and glassy carbon working electrodes, 0,01 M ferro-ferri cyanide

Glassy carbon (commercial glassy carbon - SPI - Structure probe inc.) was grinded down and mixed with the paste. The paste containing glassy carbon was applied on a surface of working electrode (BVT AC1.W2.RS). Usable results and well measuring sensors were obtained if paste contained at least 60 % of glassy carbon (see Fig. 1: Glassy carbon 2).

Results

The fifth scan was evaluated when the signal was stabilized in all experiments.

Celaskon tablets 100 mg (Acidum ascorbicum) was diluted in MOPSO to concentrations:

- 11,36 mM
- 22,72 mM
- 34,09 mM
- 45,45 mM
- 56,80 mM

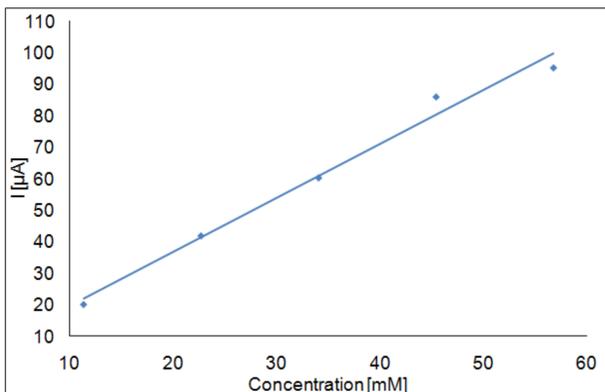


Fig. 3: Dependence of current value on the Celaskon concentration

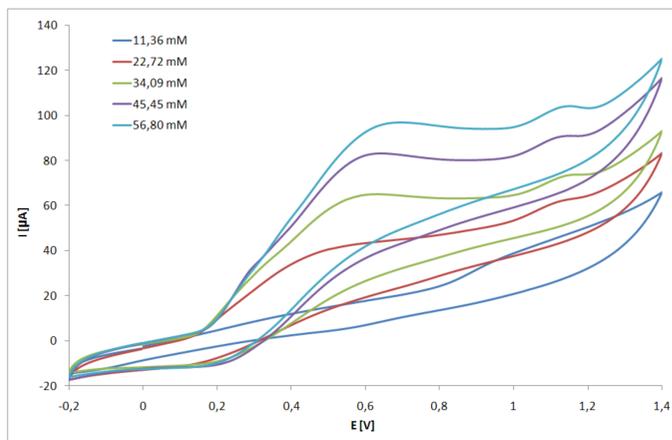


Fig. 2: Different concentration of the Celaskon

Conclusion

BVT electrochemical sensors with glassy carbon working electrode can be used as simple and cheap tool for fast detection of antioxidant and antioxidation activity. Method is sufficiently qualitative and robust. Glassy carbon working electrode provides more stable response of anodic oxidation peak potential compared to platinum.

The best antioxidant from measured teas was Teekanne Green Tea, from coffees Douwe Egberts Excelsa black coffee and from wines the Svatý Urban was better than Frankovka.

Tea was extracted into 200 ml of boiling water for 3 minutes and then diluted 2 times in the pH 7 MOPSO buffer.

- Green teas – Pickwick Green Tea – 2 g bag
- Teekanne Green Tea – 1,75 g bag
- Black teas – Lipton Earl Grey – 1,5 g bag
- Old England Black Tea – 2 g bag

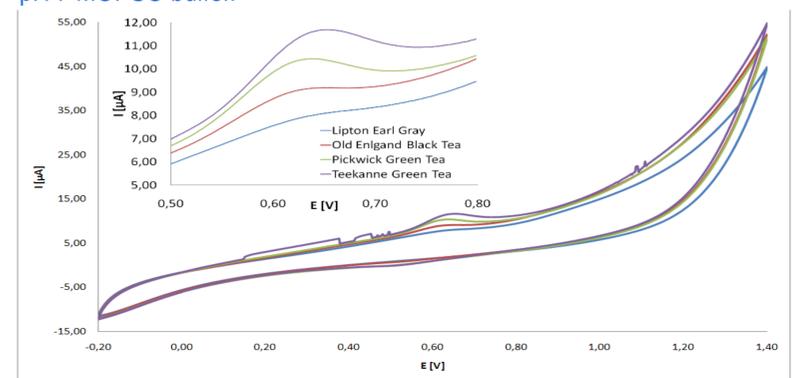
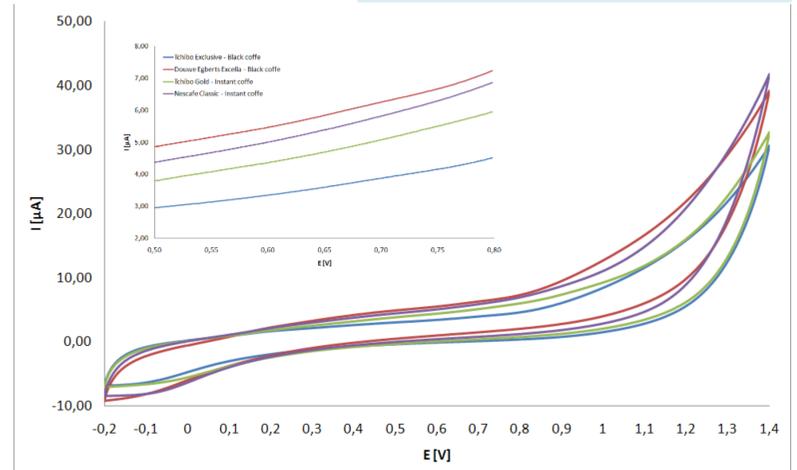


Fig. 4: Antioxidation activity for different type of tea

Coffee was extracted into 200 ml of boiling water and then diluted 2 times in the pH 7 MOPSO buffer.

- Instant coffee – Tchibo Gold – 2 g
- Nescafe classic - 2 g
- Black coffee – Tchibo Exclusive – 2 g
- Douwe Egberts – 2 g



Wine was diluted 2 times in the pH 7 MOPSO buffer.

- Red wine – Frankovka
- Svatý Urban

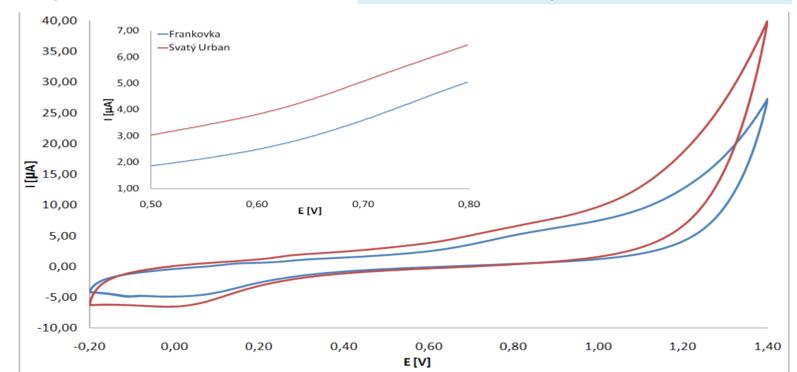


Fig. 5: Antioxidation activity for different type of the wine

Acknowledgement

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