

# Electrochemical sensor for monitoring nitrites based on glassy carbon paste electrode modified with electrochemically reduced graphene oxide

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**Abstract.** Nitrites, known as food additive potassium nitrite (E 249) and sodium nitrite (E 250), have a broader usage in food preserving, especially in meat technology [1,2]. A completely new, sensitive and selective voltametric method is presented as a suitable analytical tool for monitoring of nitrites content in meat products. This highly selective electroanalytical method utilizes a specific reaction of nitrites with ranitidine in an acidic environment to form an electroactive N-nitrosodimethylamine and 2-methylfuran cation with the corresponding side chain in the fifth position [3]. A cathodic reduction at  $-0.210$  V of 2-methyl-2H-furan-3-one at GCE covered with a thin layer of ERGO and adsorbed SDBS surfactant was preferred to anodic oxidation of NDMA at  $+0.8$  V due to the desired selectivity [4]. For evaluation using peak height, two linear ranges from  $6.2$  to  $125 \mu\text{mol L}^{-1}$  and from  $150$  to  $300 \mu\text{mol L}^{-1}$  nitrites characterized by  $R^2$  of  $0.9991$  and  $0.9963$  with a detection limit of  $1.89 \mu\text{mol L}^{-1}$  nitrites were found, respectively. If the peak-area-based evaluation is preferred, only one linear dependence described by a regression equation  $A_{p^c} (\mu\text{A V}) = 0.0079c (\mu\text{mol L}^{-1}) - 0.0442$  with the  $R^2$  of  $0.9996$  will be obtained. Results of model samples and meat products shown that this electroanalytical method provides statistically identical values with the commercially available spectrophotometric assay, called as Griess Reagent Kit (G-7921).

## References

- [1] G.H. Oliveira-Paula, L.C. Pinheiro, J.E. Tanus-Santos, Mechanisms impairing blood pressure responses to nitrite and nitrate, *Nitric Oxide* 85 (2019) 35–43, <https://doi.org/10.1016/j.niox.2019.01.015>.
- [2] P. Jakszyn, C.A. Gonzalez, Nitrosamine and related food intake and gastric and oesophageal cancer risk: a systematic review of the epidemiological evidence, *World J. Gastroenterol.* 12 (2016) 4296–4303, <https://doi.org/10.3748/wjg.v12.i27.4296>.
- [3] Y.D. Liu, M. Selbes, C. Zeng, R. Zhong, T. Karanfil, Formation mechanism of NDMA from ranitidine, trimethylamine, and other tertiary amines during chloramination: A computational study, *Environ. Sci. Technol.* 48 (2014) 8653–8663, <https://doi.org/10.1021/es500997e>.
- [4] S.Y. Toh, K.S. Loh, S.K. Kamarudin, W.R.W. Daud, Graphene production via electrochemical reduction of graphene oxide: Synthesis and characterisation, *Chem. Eng. J.* 251 (2014) 422–434, <https://doi.org/10.1016/j.cej.2014.04.004>.