Title:

Nanomaterial-based Electrochemical Sensor for the Detection of Sodium Metabisulfite in Stimulated Digestive Fluids

Authors:

Sharmila Durairaj[1], Venkatesh Manikandan[1], Serena Dingle[2] and Qi Wang[2], Aicheng Chen[1]

Affiliation:

[1]Electrochemical Technology Centre, Department of Chemistry, University of Guelph, 50 Stone Road East, Guelph ON N1G 2W1

[2]Agriculture and Agri-Food Canada, Guelph Research and Development Centre, 93 Stone Road West, Guelph ON N1G 5C9

Abstract:

Deoxynivalenol (DON) is a mycotoxin, which is produced by the *Fusarium* genus and widely found in in cereal grains such as wheat and corn. Swine are sensitive to DON; even a small amount (1 ppm) can make swine sick (e.g., upset stomach, vomit, less feed intake). Sodium metabisulfite (SMBS) is a promising feed additive in swine farming to overcome the issues caused by DON. Currently, high performance liquid chromatography, mass spectroscopy, UV-Visible spectroscopy and infrared spectroscopy are used for the quantification of SMBS. However, all these techniques are expensive and time-consuming; they cannot be used in field analysis. Here we report on an advanced electrochemical sensor based on fluorinated reduced graphene oxide modified with gold nanoparticles (Au/F-rGO) for rapid detection and monitoring of SMBS. Scanning electron microscopy and energy dispersive X-ray spectroscopy were employed to characterize the morphology and the composition of the fabricated Au/F-rGO electrode. Cyclic voltammetry, linear sweep voltammetry and differential pulse voltammetry were used to investigate the electrochemical performance of the Au/F-rGO sensor. Our study has shown that the optimized Au/F-rGO electrode exhibits a wide linear range of responses, a low limit of detection, high sensitivity and high stability for the SMBS detection. The sensor has been further tested with different digestive fluids (e.g., stimulated salivary fluid, stimulated intestinal fluid and stimulated gastric fluid), showing high selectivity and promising practical applications.