A new electrochemical sensor based on carbon paste electrode/Ru(III) complex for determination of nitrite: Electrochemical impedance and cyclic voltammetry measurements

Achour Terbouche, Siham Lameche, Chafia Ait-Ramdane-Terbouche, Djamila Guerniche, Djahida Lerari, Khaldoun Bachari, Didier Hauchard

PII: S0263-2241(16)30326-8
DOI: http://dx.doi.org/10.1016/j.measurement.2016.06.034
Reference: MEASUR 4154

To appear in: *Measurement*

Received Date: 26 April 2016
Revised Date: 17 June 2016
Accepted Date: 18 June 2016

Please cite this article as: A. Terbouche, S. Lameche, C. Ait-Ramdane-Terbouche, D. Guerniche, D. Lerari, K. Bachari, D. Hauchard, A new electrochemical sensor based on carbon paste electrode/Ru(III) complex for determination of nitrite: Electrochemical impedance and cyclic voltammetry measurements, *Measurement* (2016), doi: http://dx.doi.org/10.1016/j.measurement.2016.06.034

A new electrochemical sensor based on carbon paste electrode/Ru(III) complex for determination of nitrite: Electrochemical impedance and cyclic voltammetry measurements.

Achour TERBOUCHE[a, *], Siham LAMECHE[a,b], Chafia AIT-RAMDANE-TERBOUCHE[a], Djamila GUERNICHE[a,b], Djahida LERARI[a] , Khaldoun BACHARI[a], Didier HAUCHARD[c,d]

[a]*Centre de Recherche Scientifique et Technique en Analyses Physico-chimiques (CRAPC), BP384, Bou-Ismail, RP 42004, Tipaza, Algeria.*

[b]*Laboratoire d'Electrochimie-Corrosion, Métallurgie et Chimie Minérale, Faculté de Chimie, USTHB University, 16111 Algiers, Algeria*

[c]*Institut des Sciences Chimiques de Rennes, UMR CNRS 6226, Ecole Nationale Supérieure de Chimie de Rennes, avenue du général Leclerc, CS 50837, 35708 Rennes Cedex 7, France*

[d]*Université Européenne de Bretagne, 12 avenue Janvier, 35000 Rennes, France*

[*]*Corresponding author: achour_t@yahoo.fr ; Tel.: +213.778.815.933, fax: +213.24.325.774*

Abstract

The modified carbon paste electrode with Ru(III) complex was studied as a novel sensor for the determination of nitrite. The behavior of NO_2^- at the electrode surface was investigated using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV).

EIS provided useful information on the charge transfer resistance (*R*) at the electrode/solution. The EIS measurements showed that *R* is low at oxidation potentials, and decreases with increasing temperature. The increase of the constant phase element with temperature is due to the accumulation of nitrite on the electrode, thus, facilitating the electron transfer between electrode and NO_2^-.

CV was used to study the effect of pH on the electro-catalytic oxidation of NO_2^- and to determine the limit of detection (LOD). CV measurements showed a good linear relationship between the oxidation current and the concentration of NO_2^- over a wide concentration range 0-1.38× 10^{-2} mol L^{-1}. Low detection limit of 1.39×10^{-6} mol L^{-1} towards NO_2^- was obtained. LOD decreased by 23.2% compared to that determined using cavity microelectrode.