An original functionalization way of a gold electrode for the detection of nitrates at low level in seawater

Emilie Lebon Tailhades, Pierre Fau, Myrtil L. Kahn, Maurice Comtat, Pierre Temple-Boyer, Philippe Behra, Brigitte Dubreuil, Katia Fajerwerg

An original functionalization way of a gold electrode for the detection of nitrates at low level in seawater.

Emilie Lebon Tailhades[1,5], Pierre Fau[1,4], Myrtil Kahn[1], Maurice Comtat[2], Pierre Temple-Boyer[3], Philippe Behra[6], Brigitte Dubreuil[6], Katia Fajerwerg[1,4]

[1]*Laboratoire de Chimie de Coordination (LCC), Toulouse, France (CNRS)*
[2]*Laboratoire de Génie Chimique, Toulouse, France (CNRS/INP/UPS)*
[3]*LAAS-CNRS, Université de Toulouse, CNRS, Toulouse, France*
[4]*Université Toulouse III - Paul Sabatier, Toulouse, France*
[5]*RTRA "Sciences et Technologies pour l'Aéronautique et l'Espace", Toulouse, France*
[6]*Laboratoire de Chimie Agro Industrielle, Toulouse (INRA/INP-ENSIACET), France*
Mail: katia.fajerwerg@lcc-toulouse.fr

Determination and quantification of nitrates are considered to be essential. Indeed, they are a well-known contaminant of ground and stream water. Nitrate is an important environmental and human health analyte[(1,2)]. In the specific area of oceanography, there is a growing demand for the ocean observations and for a better understanding of biogeochemical cycles and mixing of water masses. So, the development of simple, low-power, sensitive, selective and stable analytical *in-situ* sensors appears as a necessity.

The aim of this study is to develop an electrochemical sensor in order to measure nitrates at very low concentrations (nanomolar) in seawater (pH ca 6). We present here an original way for the functionalization of a gold electrode (E_{Au}) using an organometallic silver precursor in order to obtain well dispersed silver nanoparticles (AgNP) with small sizes and narrow distribution.

The advantage of this resulting nanostructured surface combines the electrochemical properties of the gold electrode and the presence of silver nanoparticles AgNPs[(3)] (Figure 1). This was shown in previous works dedicated to electrodeposited Ag nanoparticles (AgNPs) in aqueous medium using a silver salt ($AgNO_3$). The results obtained for different synthetic NO_3^- solutions using the proposed AgNP-modified-gold electrode will be discussed.

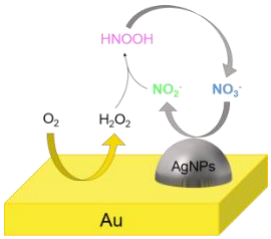

Fig.1. Mechanism of electroreduction of NO_3^- ions on a AgNP-modified gold electrode.

References

(1) M.J. Moorcroft, J. Davis, R.G. Compton, *Talanta*, **2001**, *54*, 785.
(2) M. Sohail, S.B. Adeloju, *Talanta*, **2016**, 153, 83.
(3) K. Fajerwerg, V. Ynam, B. Chaudret, V. Garçon, D. Thouron, M. Comtat, *Electrochem. Commun.*, **2010**, *12*, 1439.