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Influence of nitrogen on boron doped diamond electrodes in the nitrate electrochemical response

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Diamond films grown by chemical vapor deposition has been optimized during recent years because of their excellent physico-chemical properties. Due to its wide working potential window and high corrosion resistance, diamond electrodes have been proposed to be beneficial in a range of electroanalytical applications, which are depending of the material aspects[1]. One of these aspects is the film doping, which can be carried out using boron or nitrogen to turn the diamond films as a semiconductor. Boron doped diamond (BDD) electrodes has been already studied as a new material with extraordinary properties that turn them as a chemical sensors[2]. Particularly, high overpotential presented by BDD electrodes for hydrogen evolution has demonstrated to be a decisive attribute for studying the detection and reduction of several chemical species. Besides, the nitrogen addition during the BDD growth process (N and B co-doped electrodes) may also enhance this cathodic overpotential[3]. This work presents the influence of nitrogen on BDD electrodes in response of nitrate ions reduction. Actually, the large use of nitrogen-based compounds in agriculture has increased their ion concentration in the biosphere promoting a significant pollution problem. The working potential window of the N and B co-doped diamond electrode in 1.0 M H_2SO_4 (Fig. 1A) about of 3.0 V, justifies their performance improvement for nitrate reduction and detection. Furthermore, the variation of N_2 concentration during the BDD growth process was crucial in their electrochemical behavior. Increasing the N_2 concentration favored the occurrence of the nitrate reduction without the interference of hydrogen evolution reaction (Fig. 1B).

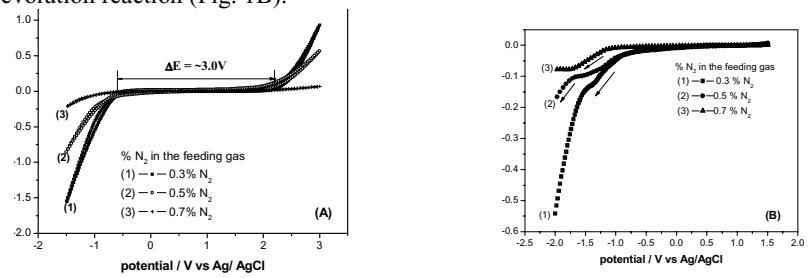

Fig 1: **(A)** cyclic voltammograms and **(B)** linear sweep voltammograms of nitrate reduction for the BDD electrodes grown in different N_2 concentration. Solutions used (a) 1.0 M H_2SO_4 and (B) 0,1 M KNO_3 and scan rate at 0.1 Vs^{-1}

1. Yu. Y. Pleskov, Russian. J. Electrochem., 38 (2002) 1273
2. C. M. Welch, M. E. Hyde, C. E. Banks, R. G. Compton, Anal. Sci., 21 (2005) 1421.
3 L. L. G. Silva, V. J. Airoldi, E. J. Corat, P. T. A. Sumodjo, Diamond and Related Materials, 16 (2007) 174.