Boron Doped Diamond (BDD) films, due its unique properties such as, wide potential working range with low background currents in aqueous and non-aqueous electrolytes and extreme physical and chemical stability that make them one of the most ideal electrode materials for electroanalysis and electrosynthesis [1]. Recently, several chemical species (organics and inorganics) have been analysed and destructured using this type of the material. Nevertheless, the comprehension of the electrochemical behavior has not yet been completely achieved, and many reports, including fundamental and technological aspects, have been published. Besides, the doping level, morphological features (grain boundaries and cristallographics defects) and non-diamond impurity content, the surface modification (surface group functionalities) is one of the factors which can heavily influence the electrochemical performance of BDD films [2]. The electrodeposition of metallic nanoparticles is an electrochemical procedure commonly used to carry out the surface modification. In this sense, this work proposes to study the BDD films surface modification with copper and palladium nanoparticles obtained by electrodeposition. The interest in this study is associated to their application as electrochemical sensor in the control of nitrate ions in wastewater. Particularly, the metallic particles electrodeposition, such as, copper and palladium may improve the BDD films electroanalytical properties for nitrate ions detection due to their higher catalytic activity.

BDD films were grown on Si substrate by chemical vapor deposition (CVD) in a hot filament reactor during 6 hours. It was utilized a gaseous mixture of 99% vol. H₂ and 1% vol. CH₄ with a pressure of 50 torr. The boron doping was performed in order to obtain the desired B/C ratio in CH₄. The H₂ and B₂O₃/CH₃OH/H₂ were controlled in order to obtain a boron doping level of approximately 10²⁰ boron atoms/cm³ [3]. The electrochemical measurements were carried out using Autolab PGSTAT 302 equipment with a three-electrode cell. BDD films were used as a working electrode. A platinum wire serves as a counter electrode and Ag/AgCl electrode was used as reference.

For the Figures 1 and 2, the cyclic voltammograms were carried out using Autolab PGSTAT 302 equipment with a three-electrode cell. The potential sweep to positive direction, approximately at 0.0V, begins the copper dissolution process and two anodic processes were observed. The anodic peak at 0.15V is associated with metallic copper dissolution, while the shoulder at 0.26V may be related to hydrated copper oxide dissolution, possibly formed during the negative potential sweep. The Figure 2 shows the cyclic voltammograms of the palladium on BDD electrode. For onset potential sweep is observed an anodic current due to chloride oxidation. When the sweep reaches the potential of 0.15V begins the palladium deposition. At -0.85V, hydrogen evolution reaction is observed due to water reduction. Reversing the potential sweep to positive direction, several oxidation processes are observed. This behavior may be associated to dissolution of various intermetallic phases of palladium that probably were deposited during the deposition on the polycrystalline BDD surface. The electrodeposition results of copper and palladium showed a great possibility to obtain stable metallic particles on BDD surface and, consequently, to improve their electrocatalytic properties.

We are so grateful to Fapesp and CNPq for financial support.