

Abstract

In this study we focused on the electrochemical and adsorptive behaviour of methyl viologen on electrode of boron doped diamond (BDD) possessing different termination as result of electrochemical or mechanical pretreatment. Namely was performed anodic activation applying +2.4 V in 0.5 mol L⁻¹ sulphuric acid and cathodic pretreatment in the same solution at -2.4 V to obtain predominantly H-terminated surface. While the O-terminated surface is relatively hydrophilic with low surface conductivity, the H-terminated surface is hydrophobic with certain surface conductivity, which results typically in faster heterogenous electron transfer (HET) kinetics. Fast HET kinetics was observed on polished surfaces, that were obtained by polishing with alumina suspension.

Methyl viologen (MV), a widely used herbicide, was used as a model compound because its quasireversible redox transformations result in charge changes of the molecule which includes neutral (MV⁰) or positively charged (MV⁺, MV²⁺) forms. Adsorption was connected with MV⁰ form.

The pilot experiments were performed in aqueous media using cyclic voltammetry (CV). The results indicate that adsorption of MV occurs not only on H-terminated surface, but also on the polished and O-terminated surface. Adsorption of MV⁰ was observed on anodic peaks on all surfaces, by increasing the accumulation time, the highest increase of the anodic signals was on the polished surface, the lowest on the O-terminated surface, while the best accumulation results were obtained by the accumulation that was performed while stirring. The adsorption was confirmed using adsorptive transfer stripping voltammetry (AdTSV).

Key words

Boron doped diamond, Surface pre-treated, Cyclic voltammetry, Adsorptive transfer stripping voltammetry, Methyl viologen