CHEMICAL MODIFICATION OF CARBON ELECTRODE ELECTROCHEMICALLY MODIFIED WITH ARYL GROUPS.

Ouassim Ghodbane, Gwenael Chamoulaud and Daniel Bélanger[1].

Département de Chimie, Université du Québec à Montréal, Case Postale 8888, succursale Centre-Ville, Montréal (Québec) Canada H3C 3P8.
1. belanger.daniel@uqam.ca

Carbon material such as glassy carbon electrodes can be derivatized with 4-substituted phenyl groups by electrochemical reduction of the corresponding phenyl diazonium tetrafluoroborate salt dissolved with an appropriate electrolyte in acetonitrile [1, 2]. The reaction of the grafting process can be described according to:

$$\text{Carbon} + {}^{+}N_2C_6H_4R + e^{-} \longrightarrow \text{Carbon}/C_6H_4R$$

A variety of the terminal substituents (R group) were investigated and the properties as well as the applications of the resulting modified electrodes were found to depend on the nature of these groups. For example, these modified electrodes were used for the attachment of glucose oxidase on carbon surfaces, for electrochemical determination of dopamine and as template for the formation of metal particles [3]. Very recent reports have also described reactions of aryl modified electrodes to generate novel chemical architecture that could be even used as possible supports for combinatorial chemistry [4].

The present work focuses on the electrochemical modification of glassy carbon electrode with 4-bromophenyl groups and further reactions of these modified electrodes.

The first step of this work dealt with the determination of the experimental conditions that should be used to obtain a controlled deposition of 4-bromophenyl groups at the surface of a glassy carbon electrode. This was performed because there is strong evidence that multilayers of aryl groups can be generated in some specific conditions [5]. Thus, one objective was to obtain monolayer coverage or a thin layer of grafted groups since it seems plausible to assume that more reproducible chemistry of the grafted groups with solution species could be obtained in these conditions. The deposition of 4-bromophenyl groups was investigated as a function of the electrode potential. The electrochemical grafting was carried out in the presence of the corresponding diazonium salt in acetonitrile. A relative estimate of the surface coverage was determined by electrochemical technique such as cyclic voltammetry and electrochemical impedance spectroscopy and surface sensitive technique such as X-ray photoelectron spectroscopy.

Subsequently, the 4-bromophenyl modified electrode were further modified by reaction with selected molecules. These molecules were chosen to provide specific moieties that will allow their detection by spectroscopic techniques.

The results of the latter experiments as well as those related to the electrochemical grafting step with 4-bromophenyl groups will be presented.

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