

Electrochemical Study of Butyl-Pyrene Nitrobenzoate Derivatives Trapped on MWCNT Nanostructured Electrodes

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Abstract

In the scope of our studies tending to find new nanostructured electrodic platforms containing nitroaromatic compounds (NACs) capable of generating in situ electrocatalytic redox couples, we synthesized and electrochemically studied three related 4-(pyren-1-yl)-butyl-substituted nitrobenzoates (2-NBPy, 3-NBPy and 4-NBPy). The design of the compounds is based on a combination of a) an adsorptive tail (-butyl-pyrene) capable of interacting via π - π stacking with the MWCNT nanostructured electrodes and b) nitroaromatic compounds (NACs) capable of electrochemically activating to form a RNHOH/NO redox couple trapped on the nanostructured electrodic platform. Morphological and structural analyses of the nanostructured interfaces were performed by SEM and WAXS/SAXS analysis. All of the NBPy compounds trapped on the nanostructured electrodic platform were susceptible to reduction, generating the corresponding hydroxylamine derivative. The order of ease of reduction for the nitrocompounds is 4-NBPy > 2-NBPy > 3-NBPy. After electrochemical activation, all compounds generated an RNHOH/NO redox mediator couple with the following order of stability of the mediator couple: 2-NBPy > 3-NBPy > 4-NBPy. For the 2-NBPy and 3-NBPy derivatives, excellent stability of the couple was observed, and a decrease in the peak current of 6% was observed after 60 min. © 2021 The Author(s). Published on behalf of The Electrochemical Society by IOP Publishing Limited.