Investigating the Effects of Primary Amine Linkers with Different Carbon Chain Lengths on the Acid Dissociation Constant (pKa) for Covalently Immobilized Anthraquinone at the Electrode Surface Using Linear and Non-Linear Fittings

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Abstract

Electrografting of primary amine linkers is a widely used technique to covalently immobilize redox molecules or biomolecules at the electrode surface as it can produce a uniform and highly stable monolayers. Herein, we discussed the effects of having primary amine linkers with different carbon chain lengths as a medium to attach anthraquinone (AQ) at the electrode surface to study its acid dissociation constant (pKa); anthraquinone was covalently attached to glassy carbon (GC) electrodes in aqueous buffer solutions at different pH values ranging from pH 1 to pH 13. In this study, ethylenediamine (EDA, C2) and hexanediamine (HDA, C6) were used as the primary amine linkers. The pKa values of the surface-bound AQ were determined from the linear and non-linear fittings performed on the graphs of the mid potential (E-mid) of the redox peaks for AQ against the pH. The pKa values obtained from the linear fittings were using the value at the intersection point of two linear slopes between two pH gradients, whilst the pKa values for the non-linear fittings were determined according to the Nernst pH reduction theory. Overall, the non-linear fittings can provide us with a reliable and accurate approach in determining the pKa values of AQ. (C) The Author(s) 2019. Published by ECS.

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