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Platform Session IV

In-situ Electrochemical EPR Studies of p-benzoquinone on Lipid Coated Electrodes

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Charge transfer reaction of p-benzoquinone (BQ) on a bare Pt and a lipid coated Au electrode has been studied in an aqueous solution using the in-situ electrochemical electron paramagnetic resonance (EPR) technique. In-situ method in an aqueous solution produced the intermediates, BQ anion radical (BQ^{-•}) and semiquinone radical (BQH[•]), which were the one electron reduction products of BQ. The EPR spectra recorded for a bare Pt electrode in a flat cell containing 1.0 mM BQ/0.1 M KCl, represented the narrow 5 hyperfine lines as applying the potential of -0.3 V and -0.6 V vs. Ag/AgCl. The spectra for electrochemical reduction intermediates of BQ exhibited $\Delta H = 0.980 \pm 0.011\text{G}$ and $g = 2.0040$ for BQ anion radical (BQ^{-•}) and $\Delta H = 0.504 \pm 0.006\text{G}$ and $g = 2.0042$ for semiquinone radical (BQH[•]). Above pH 7.0 the EPR signal disappeared because the reduction intermediates of BQ were not stabilized. In contrast, the lipid (phosphatidylcholine (PC), dilauroyl) modified Au electrode in the well buffered solution (pH 7.0) showed the anion radical (BQ^{-•}) EPR peak, but did not show the semiquinone radical (BQH[•]) peak, which caused by the proton deficiency by the hydrophobic property of lipid. These results agreed with the previous electrochemical data (CVs) and FT-IR spectra, that the reduction product of BQ was incorporated into the lipid layer. These were due to the interaction of the phosphate group of lipid and the reduction product of BQ. In addition, we calculated and compared with the rate constants for the reduction of BQ in

various pH conditions, such as unbuffered solution (pH 3.0, pH 3.05, pH 4.0) and well buffered solution (pH 3.0, pH 7.0, pH 8.0).