Electrolytic ESR - Generation of p-Benzoquinone anion radical -

Product used：Electron Spin Resonance spectrometer (ESR)

■ Overview of Electrolytic ESR Cell

ESR has been applied to inorganic and organic compounds in an attempt to capture the reaction product of the oxidation or reduction of a single electron by an electrochemical reaction in solution. In this study, the helix electrode electrolytic cell (ES-EL30) was used for the electrolytic ESR. In this cell, the gold wire is coiled to increase the effective area of the working electrode and to suppress microwave absorption by the dielectric liquids. Since this electrolytic cell has high electrolytic efficiency, it can produce anion and cation radicals easily. This cell can be used with a variable temperature controller.

■ Generation of p-Benzoquinone anion radical

The sample was prepared by mixing the following reagents.

Sample：p-Benzoquinone ($C_6H_4O_2$) 1 mM

Supporting Electrolyte：Tetrapropylammonium Bromide 100 mM

Solvent：Dimethylformamide

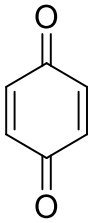

Figure1. p-Benzoquinone structure.

ESR signal was observed by applying a constant voltage between two electrodes in the electrolytic cell. ESR spectrum of five lines with a splitting constant of 0.24 mT and a signal intensity ratio of 1:4:6:4:1 was observed by applying a voltage of 1.0 V for about 17 minutes. This spectrum shows the generation of p-Benzoquinone anion radical ($BQ^{-\cdot}$) due to its hyperfine structure by the four equivalent protons on the benzene ring[1].

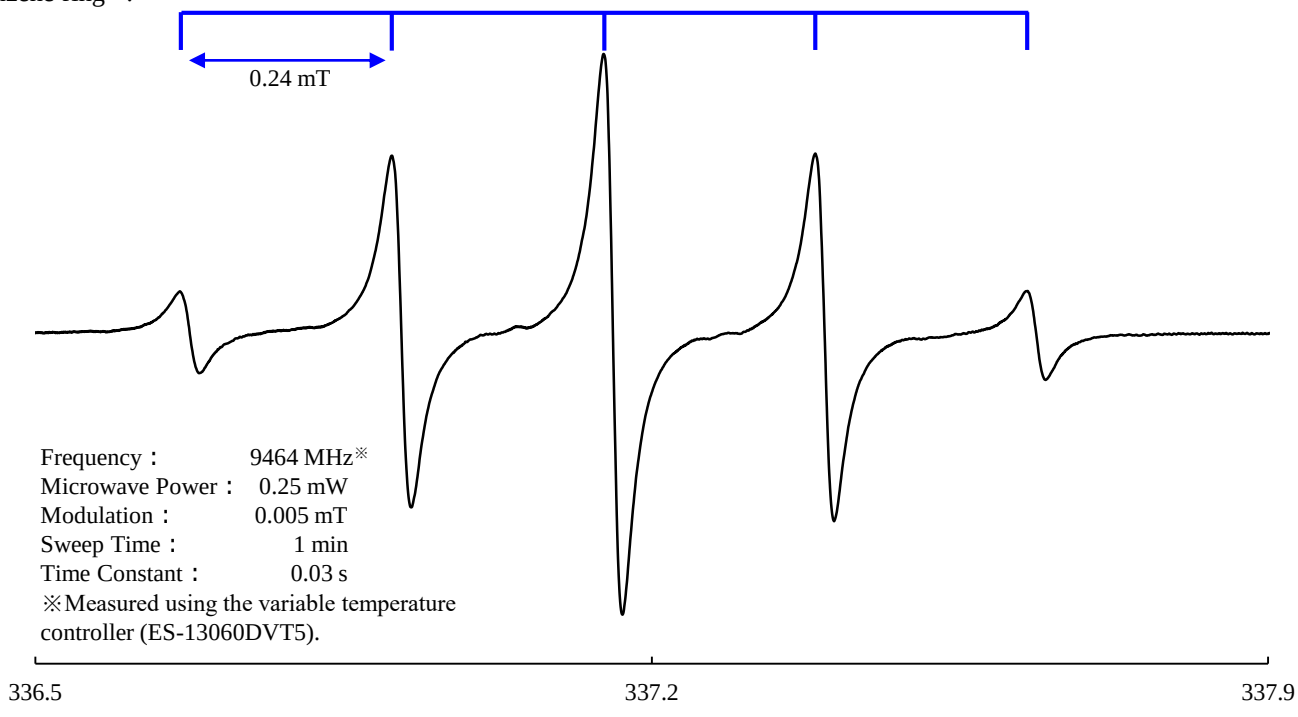

Figure 2. ESR spectrum of p-Benzoquinone anion radical (Voltage：1.0V).

Reference

[1] H.Park et al (2002): In-Situ ESR Detection of Radical Species of p-Benzoquinone in Aqueous Media, *Electroanalysis*, **14**, No21, 1501-1507.

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