

## Electrolytic ESR - Quantity dependence of supporting electrolyte -

Product used : Electron Spin Resonance spectrometer (ESR)

### ■ Supporting electrolyte

A large amount of supporting electrolyte must be added to the sample solution in order to give it higher conductivity and to effectively apply the electrolysis voltage to the electrode interface. The supporting electrolyte should be soluble in the solvent, not reactive with reactants or products, and resistant to redox reaction. The solvent should have a property of dissolving the reaction reagent and the supporting electrolyte. It should be stable during electrolysis. The helix electrode electrolytic cell (ES-EL30) was used in this study. Please refer to the application notes ER090001E on this cell, and ER180012E for voltage dependence on this system.

### ■ Quantity dependence of supporting electrolyte

The sample was prepared by mixing the following reagents.

Sample : Anthraquinone 2 mM

Supporting Electrolyte : Tetrapropylammonium Bromide  
100, 150, 200, and 300 mM

Solvent : Acetonitrile

ESR signal of anthraquinone anion radical (Figure 1) was observed by varying the quantity of the supporting electrolyte at the voltage of 1.3 V.

Then ESR signal intensity (A in Figure 1) was plotted against electrolysis time for each supporting electrolyte concentration, as shown in Figure 2.

It was observed that the higher the electrolyte concentration, the lower the resistance in the liquid and the easier the flow of current, so that radical was generated in a shorter time. At 300 mM of the supporting electrolyte, ESR signal intensity fluctuated temporarily. This seems to be due to soot generated by the supporting electrolyte to accumulate on the electrode which temporarily stops electrolytic reaction. Such phenomenon tends to occur at higher electrolyte concentration.

- ◆ The generation of radicals can be observed in a shorter time by increasing concentration of the supporting electrolyte.
- ◆ By using appropriate concentration of the supporting electrolyte near the lower limit voltage of electrolysis, electrolytic reaction proceeds slowly.

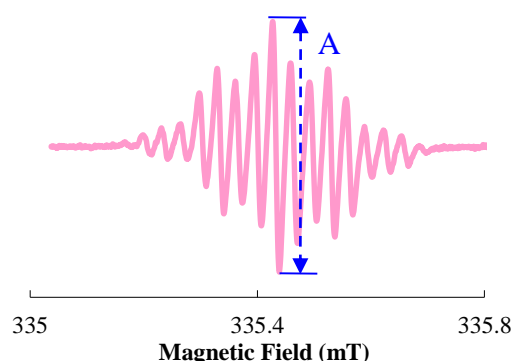


Figure 1. ESR spectrum of anthraquinone anion radical.

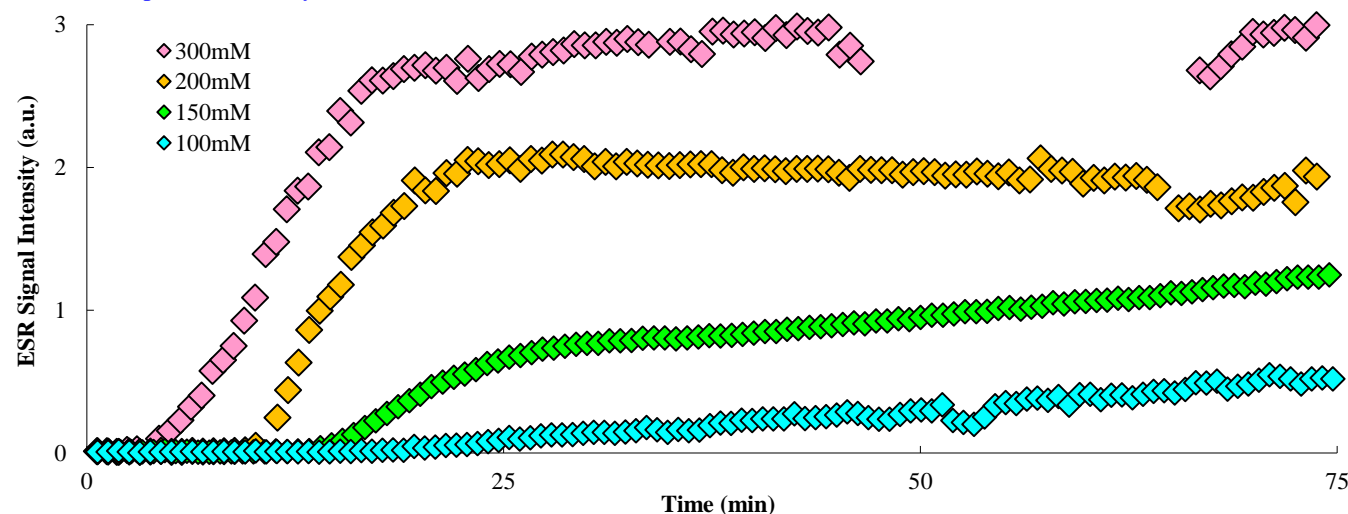


Figure 2. Time dependence of ESR signal intensity for different concentration of the supporting electrolyte (Voltage: 1.3 V ).

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