Laboratory exercise

Cyclic voltammetry study of ferrocyanide redox reaction.

- Aims:
  - experimentally find electrochemical potential for ferrcyanide redox reaction
  - check peak current dependence on concentration and voltage scan rate
  - observe transition from reversible to irreversible behaviour, find α for the reaction (if possible ☺)

Laboratory exercise

- Theory

reversible limit

$$\Delta E_{pp} = 2.218\frac{RT}{F} \approx 57mV\,(at\,298K)$$

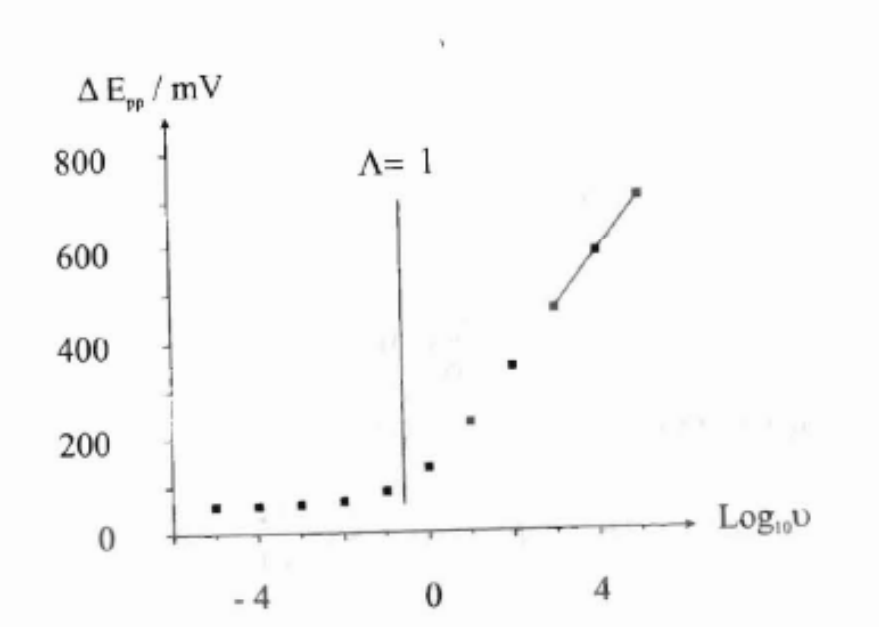
$$I_p = 0.446FA[C_0]\sqrt{\frac{FDv}{RT}}$$

irreversible limit

$$\Delta E_{pp} \propto \frac{RT}{\alpha F}\ln v; \Delta E_{pp} = \frac{59.4mV}{\alpha F}\log_{10} v + const\,(at\,298K)$$

$$I_p = 0.496\sqrt{\alpha}FA[C_0]\sqrt{\frac{FDv}{RT}}$$

peak-peak distance



reversible limit irreversible limit

Laboratory exercise

Experiment

- prepare solutions
  - 100mM KCl
  - 100mM $K_3Fe(CN)_6$ (stock) and 100mM $K_4Fe(CN)_6$ (stock)
- Measurements:
  - Pt film working and counter electrodes, Ag/AgCl reference
  - working concentrations 2mM, 5mM, 10mM, 20mM (at 100 mV/s)
  - scan rates 50mV/s, 100mV/s, 200mV/s, 500mV/s, 1V/s, 2V/s, 5V/s, 10V/s (at 5mM)
- Processing:
  - use diffusion coefficient from Roffel and Graaf article.