

TP CH5
Aspects théoriques

2.1. Dégénérescence de l'ordre.

Orde β par rapport à H_2O_2

$$\Rightarrow [H_2O_2]_0 \ll [I^-]_0, [H^+]_0$$

2.2, $\Rightarrow [I^-] \approx [I^-]_0$ et $[H^+] \approx [H^+]_0$

10⁻¹ est,

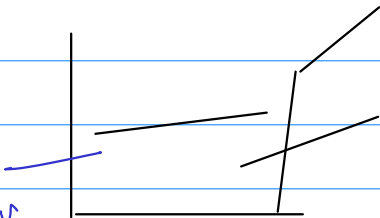
$$v = k [I^-]^2 [H_2O_2]^\beta [H^+]^\alpha$$

$$\approx k [I^-]_0^2 [H^+]_0^\alpha [H_2O_2]^\beta$$

k app.

3.1.

$$V = v_1 + v_2 + v_3 = 100 \text{ mL}$$



$v_1 = 80 \text{ mL } H_2O(l)$

$v_2 = 5 \text{ mL de } H_2SO_4 \text{ à } C_1 = 1 \text{ molL}^{-1}$

$v_3 = 5 \text{ mL de } K^+, I^- \text{ à } c_2 = 5 \times 10^{-2} \text{ molL}^{-1}$

$v_4 = 10 \text{ mL de } H_2O_2 \text{ à } c_3 = 10^{-2} \text{ molL}^{-1}$

arrête H^+

Concentrations initiales:

$$* [H^+]_0 = \frac{n_{H^+}}{V} = \frac{c_1 v_1}{V} \approx \frac{1 \times 5 \times 10^{-3}}{10^{-1}} \approx 5 \times 10^{-2} \text{ molL}^{-1}$$

$$* [I^-]_0 = \frac{n_{I^-}}{V} = \frac{n_{KI}}{V} = \frac{m_{KI}/M_{KI}}{V} = \frac{c_2 v_2}{V \times M_{KI}}$$

$$\approx \frac{5 \times 10^{-2} \times 5 \times 10^{-3}}{10^{-1} \times 15 \times 10^{-3}} \approx \frac{25}{15} \times \frac{10^{-2}}{1} \approx 3 \times 10^{-2} \text{ molL}^{-1}$$

$$* [H_2O_2]_0 \approx \frac{n_{H_2O_2}}{V} = \frac{c_3 v_3}{V} \approx \frac{10^{-2} \times 10^{-2}}{0.1} \approx 10^{-3} \text{ molL}^{-1}$$

Donc $[I^-]_0, [H^+]_0 \gg [H_2O_2]_0 \Rightarrow$
dégénérescence de l'ordre.

3.1.

$$2\text{H}_2\text{O}_2(\text{aq}) + 6\text{I}^-(\text{aq}) + 4\text{H}_3\text{O}^+(\text{aq}) = 8\text{H}_2\text{O}(\text{l}) + 2\text{I}_3^-(\text{aq})$$

| | | | | |
|-----------------|-----|-----|-------|-----------|
| C_0 | x | x | excès | 0 |
| $C_0 - 2\alpha$ | x | x | excès | 2α |

D'où $[\text{H}_2\text{O}_2] = C_0 - 2\alpha$
 $[\text{I}_3^-] = 2\alpha$

D'où : $[\text{I}_3^-] = C_0 - [\text{H}_2\text{O}_2]$

3.2. Loi de Beer-Lambert :

$$A = \epsilon(\lambda) l [\text{I}_3^-]$$

$$\Rightarrow A = \epsilon(\lambda) l (C_0 - [\text{H}_2\text{O}_2])$$

3.3. $t \rightarrow +\infty$, $[\text{H}_2\text{O}_2]_\infty = 0$

D'où $A_\infty = \epsilon(\lambda) l C_0$

$$A = \underbrace{\epsilon(\lambda) l C_0}_{A_\infty} - \epsilon(\lambda) l [\text{H}_2\text{O}_2]$$

$$\Rightarrow [\text{H}_2\text{O}_2] = \frac{A_\infty - A}{\epsilon(\lambda) l}$$

3.3. (1) $\beta=0$? $[\text{H}_2\text{O}_2]$?

$$v = \frac{1}{-2} \frac{d[\text{H}_2\text{O}_2]}{dt} \quad \text{et} \quad v = k_{app}$$

$$\Rightarrow \text{d'où} \quad -\frac{1}{2} \frac{d[\text{H}_2\text{O}_2]}{dt} = k_{app}$$

$$\Leftrightarrow d[\text{H}_2\text{O}_2] = -2k_{app} dt$$

$$\Rightarrow \int_{c_0}^{[H_2O_2](t)} d[H_2O_2] = -2k_{app} \int_0^t dt$$

$$\Rightarrow [H_2O_2] - c_0 = -2k_{app} t$$

$$\Rightarrow \boxed{[H_2O_2] = c_0 - 2k_{app} t}$$

$$\text{Or } A = A_\infty - \epsilon(\lambda) l [H_2O_2]$$

$$\Rightarrow A = \cancel{A_\infty} - \epsilon l c_0 + \underbrace{2\epsilon l k_{app} t}_{\cancel{A_\infty}}$$

$$\boxed{A = 2\epsilon l k_{app} t}$$

① $\beta = 1$? $[H_2O_2](t)$?

$$v = -\frac{1}{2} \frac{d[H_2O_2]}{dt} \quad \text{et} \quad v = k_{app} [H_2O_2]$$

$$\Rightarrow \frac{d[H_2O_2]}{dt} = -2k_{app} [H_2O_2]$$

$$\Leftrightarrow \frac{d[H_2O_2]}{[H_2O_2]} = -2k_{app} dt$$

$$\Rightarrow \int_{c_0}^{[H_2O_2](t)} \frac{d[H_2O_2]}{[H_2O_2]} = -2 \int_0^t k_{app} dt$$

$$\Leftrightarrow \boxed{\ln\left(\frac{[H_2O_2]}{c_0}\right) = -2k_{app} t}$$

$$\text{Or } [H_2O_2] = \frac{1}{\epsilon l} (A_\infty - A(t)) \quad \text{et} \quad c_0 = \frac{A_\infty}{\epsilon l}$$

$$\Rightarrow \boxed{\ln\left(\frac{A_\infty - A}{A_\infty}\right) = -2k_{app} t}$$