

Kinetic study in a CSTR

Determine the rate constant assuming second order elementary reaction $\text{NaOH} + \text{CH}_3\text{COOC}_2\text{H}_5 \rightarrow \text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$

Reactor Data : Volume of reactor=2.815 liiter

Reaction : $\text{NaOH} + \text{CH}_3\text{COOC}_2\text{H}_5 \rightarrow \text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$

$\text{NaOH} = \text{A}$, $\text{CH}_3\text{COOC}_2\text{H}_5 = \text{B}$

Chemicals given:

Strength of Succinic acid = $(\text{N}/50) = 0.02\text{N}$;

Strength of NaOH = $(\text{N}/20)$ (secondary standard)

Strength of Ethyl Acetate = $(\text{N}/10)$

Phenolphthalein indicator

$C_{\text{A}0} = 0.05 \text{ mol/L}$; $C_{\text{B}0} = 0.1 \text{ mol/L}$

[A] Standardization of raw NaOH

5 ml of this NaOH is titrated with standard $(\text{N}/50)$ Succinic acid and volume of Succinic acid required is 12.3 ml.

[B] CSTR Sample Analysis

5 ml sample from reactor outlet is titrated with $(\text{N}/50)$ succinic acid and titration is repeated thrice for both flow rates.

1. Flow rate of NaOH = Flow rate of Ethyl acetate= 5lit/hr= 0.0833lit/min
Sample volume for titration=5ml

No.	Titre volume(ml)
1	1.7
2	1.65
3	1.72

2. Flow rate of NaOH = Flow rate of Ethyl acetate= 7.5 lit/hr= 0.125lit/min
Sample volume for titration=5ml

No.	Titre volume(ml)
1	2.1
2	2.2
3	2.0

3. Flow rate of NaOH = Flow rate of Ethyl acetate=10 lit/hr = 0.16667lit/min
Sample volume for titration=5ml

No.	Titre volume(ml)
1	2.6
2	2.5
3	2.4