

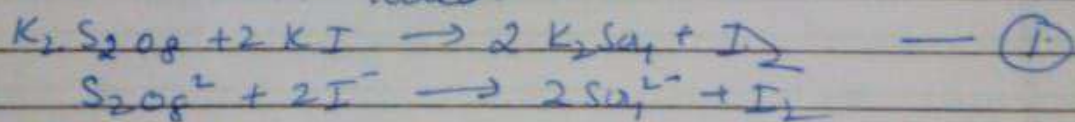
To study the kinetics of Iodide Peroxodisulphate reaction by
8/10/2020 Final Date

Aim :- To study the kinetics of the reaction
between Potassium Iodide (KI) + potassium
peroxodisulphate (persulphate) solution.
 $K_2S_2O_8$

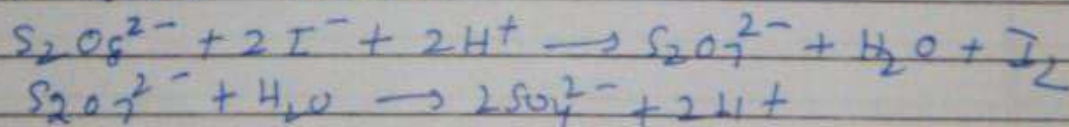
- Requirements :-
- ① 4 Conical flasks of 250ml capacity
 - ② 3 Measuring flasks 250ml capacity
 - ③ 3 Measuring flask of 100ml capacity
 - ④ 10ml pipettes.

- Chemical Required :-
- ① 0.05M $K_2S_2O_8$ sol
 - ② 0.1M KI sol.
 - ③ 0.01M $Na_2S_2O_3$ sol.
 - ④ 2.0M CH_3COOH .
 - ⑤ Starch solution
 - ⑥ crushed ice

Theory :- The reaction betⁿ Potassium Persulphate
and Potassium Iodide.



In acid medium-



This is second order reaction since concentration
of both reactants are in rate equation
of the reaction.

During the reaction I_2 is liberated
therefore progress of reaction can be
determined by titrated liberating the
liberated I_2 in 10ml of reaction
mixture against standard thiosulphate

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Solution at different intervals of time.
The titre values are proportional to
Iodine formed & to the amount of
Peromangic acid which has disappeared
from 10ml of reaction mixture.
It gives value of the 'x' at different
intervals of time.

Procedure: -

(1) 0.05 M $K_2S_2O_8$ Molar Mass = 270 g/mole
For 1000 ml $0.05 M \times 270 = 13.5 g$ of $K_2S_2O_8$
We need 100 ml so for that 1000 ml $\rightarrow 13.5 g$
 $13.5 g \quad = 100 ml \rightarrow 13.5 \times 100$
 1000

(2) 0.1 M KI, Molar Mass = 166 g/mole
For 0.1 M $\rightarrow 16.6 g$ (1000 ml). For 100 ml $\rightarrow 1.66 g$

(3) 2 M $CH_3COOH \rightarrow$ Dissolve 11.6 ml of CH_3COOH in 100 ml H₂O
I Keep these solutions in i.e. $K_2S_2O_8$ (100 ml) &
KI (100 ml) + 10 ml CH_3COOH in the 250 ml
conical flasks. Similarly the solutions are
corked & then kept in thermostat i.e. water
bath to maintain room temperature.

After half an hour pour KI solution into
250 ml flask of $K_2S_2O_8$ sol. & stopwatch is
started at same time. Cork the solution &
shake it gently.

I After interval of 5 mins, withdraw 10 ml of
reaction mixture from conical flask &
transfer it into 25 ml conical flask containing
ice cold water. so that reaction is frozen
at that time itself.

(Contd.)

III. Titrate the conical flask solution having liberated I_2 at 5th minute of reaction mixture against 0.01M sodium thiosulphate solution ($Na_2S_2O_3$) using starch as an indicator. Add 1ml of starch solution is added when solution becomes pale yellowish color. The end pt is noted when solution disappeared its violet coloration. The violet color again reappears because the reaction is not completely stopped on cooling with ice cold water.

IV. Continue to extract 20ml of mixture from conical flask (250ml) capacity at interval of 5 mins.

V. After this take, 40ml of reaction mixture into clean flask & add 4g of KI & stoppered. the conical flask & keeps the stoppered flask in a beaker of hot water maintained at 60°C for ~~10 mins~~ & heat it for $\frac{1}{2}$ hr & Cool this mixture & maintain its temp for at least 15 mins in a thermostat. Withdraw 10ml of reaction mixture & titrate it against 0.01M sodium thiosulphate sol. This corresponds to initial concn of $K_2S_2O_8$. Results are to be recorded.

Initial concentration of $K_2S_2O_8$ & KI

Since 100 ml of 0.05M $K_2S_2O_8$ 100 ml of 0.1M KI & 10 ml of 2M CH_3COOH are mixed, hence the concentration of $K_2S_2O_8$ of the mixture is

$$\frac{0.05 \times 100}{210} = 0.0238 M$$

10 ml of 0.0238 M is taken of the reaction mixture.

$$10 \times 0.0238 M = V \times 0.01 M$$

$$V = 47.6 \text{ ml}$$

This is initial concn of $K_2S_2O_8$ in the resultant 10 ml of reaction mixture & it is obtained by titrating with 0.01M.

$Na_2S_2O_3$

Initial concentration $a = 47.6 \text{ ml}$

Titrant (ml)	x Titrant value			$a-x$	$\frac{1}{a-x}$	$K = \frac{1}{a(a-x)}$
	IR	FR	Vol of $Na_2S_2O_3$			
5						
10						
15						
20						
25						
30						

Formula used

$$K = \frac{1}{a-x} - \frac{1}{a}$$

$$E = \frac{1}{b} \left[\frac{1}{a-x} - \frac{1}{a} \right]$$

$K_2S_2O_8$ 13.5g
 KI = 16.6g
 $Na_2S_2O_3$ 5M = 2.5g
 100ml $\rightarrow$ 13.5g
 100 ml $\rightarrow$ 16.6g
 100 ml $\rightarrow$ 2.5g

Interpretation of Result

- (1) The value of k should be constant
- (2) Graph between t & $\frac{L}{a-r}$ should be a straight line.