1/28/15

Standardization of thiosulfate

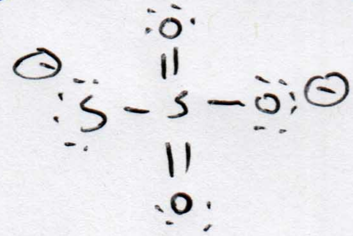
$1\ KIO_3(aq) + 5\ KI(aq) + 3\ H_2SO_4(aq) \rightarrow$

$3\ I_2(aq) + 3\ H_2O(l) + 3\ K_2SO_4(aq)$

The purpose of this reaction is to quantitatively produce iodine (I_2) from iodate (IO_3^-). The disappearance of iodine is the endpoint for the subsequent titration.

$1\ I_2(aq) + 2\ Na_2S_2O_3(aq) \rightarrow$

$2\ NaI(aq) + Na_2S_4O_6(aq)$



thiosulfate

Stoichiometry: $1\ KIO_3 : 6\ Na_2S_2O_3$

$$6\ M_{IO_3}V_{IO_3} = M_{S_2O_3}V_{S_2O_3}$$

Data

Mass of KIO_3 = 0.1087 g

total volume of KIO_3 soln = 0.1000 L

volumes of KIO_3 + $Na_2S_2O_3$ used in Titration

Mass of $Na_2S_2O_3$

$$[KIO_3] = \frac{\text{mass of } KIO_3 / \text{MM of } KIO_3}{\text{total } KIO_3 \text{ solution volume}}$$

$$[S_2O_3^{-2}] = \frac{6\ M_{IO_3}V_{IO_3}}{V_{S_2O_3}}$$

(V_{IO_3}) — not 100 mL!

should be in L

	V_{IO_3}	$V_{S_2O_3}$	$[S_2O_3^{-2}]$
1			
2			
3			
		Average	

$Ca(NO_3)_{2(aq)} + 2KIO_{3(aq)} \rightarrow Ca(IO_3)_{2(s)} + 2KNO_{3(aq)}$

10 mL 0.1M — 9mL 0.2M

1 mmol — 1.8 mmol → limiting reagent

0.9mmol needed — 2 mmol needed

$$\text{theoretical mass} = \frac{M_{KIO_3} V_{KIO_3}}{\text{mol } IO_3^-} \times \frac{1 \text{ mol } Ca(IO_3)_2}{2 \text{ mol } KIO_3} \times \frac{\text{MM } Ca(IO_3)_2}{1 \text{ mol } Ca(IO_3)_2}$$

$$\% \text{ yield} = \frac{\text{mass observed}}{\text{theoretical mass}} \times 100\%$$

K_{sp} of $Ca(IO_3)_2$ — Beaker A

$$[IO_3^-] = \frac{M_{S_2O_3} V_{S_2O_3}}{6 V_{IO_3}}$$

$K_{sp} = [Ca^{+2}][IO_3^-]^2$ — $\frac{1}{2}[IO_3^-] = [Ca^{+2}]$

$= \frac{1}{2}[IO_3^-]^3$ — % error

Beaker B

→ Calculate $[IO_3^-]$

→ Show that $[IO_3^-]$ ~~decres~~ is lower in $Ca(NO_3)_2$ soln versus DI water.