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DATE:

Engineering Chemistry - 2

Fuel - Tutorial 2

→ 1) Given: 1.5 g of coal sample.
Final weight of KOH = 3.92 g
Final weight of $CaCl_2$ = 1.25 g.

∴ (1) Increase in weight of KOH = 3.92 g.

∴ % of carbon = $\frac{\text{Increase in weight of KOH tube} \times 12 \times 100}{\text{weight of coal taken} \times 44}$

$= \frac{3.92 \times 12 \times 100}{1.5 \times 44}$

$= \frac{4704}{66}$

∴ % of Carbon = 71.27 %.

(2) Increase in weight of $CaCl_2$ = 1.25 g.

% of Hydrogen = $\frac{\text{Increase in weight of } CaCl_2 \times 2 \times 100}{\text{weight of coal} \times 18}$

$= \frac{1.25 \times 100 \times 2}{1.5 \times 18} = \frac{250}{27}$

∴ % of hydrogen = 9.25 %.

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2) Given: Weight of coal is 3.2 g.

(1) Volume of acid taken = 40 ml of 0.5 N H_2SO_4

Volume of excess acid = 16 ml

∴ Volume of acid used = (40 - 16)

= 24 ml of 0.5 N H_2SO_4

$$\therefore \%\text{ of nitrogen} = \frac{\text{Volume of acid used} \times \text{Normality} \times 1.4}{\text{Weight of coal}}$$

$$= \frac{24 \times 0.5 \times 1.4}{3.2}$$

% of nitrogen = 5.25 %

(2) Weight of coal sample in quantative analysis = 2.5 g

Weight of $BaSO_4$ = 0.42 g

$$\%\text{ Sulphur} = \frac{\text{Weight of } BaSO_4 \times 32 \times 100}{\text{Weight of coal} \times 233}$$

$$= \frac{0.3 \times 32 \times 100}{1.5 \times 233} = \frac{0.42 \times 32 \times 100}{2.5 \times 233}$$

$$= \frac{960}{349.5} = \frac{1344}{582.5} = 2.307\%$$

~~∴ % of Sulphur = 2.75 %~~

∴ **% of Sulphur = 2.307 %**

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3) Here, weight of coal sample = 1.5 g.

(1) Volume of acid used = 14 ml of 0.1N H_2SO_4

$$\therefore \% \text{ of nitrogen} = \frac{\text{Volume of acid used} \times \text{Normality} \times 1.4}{\text{Weight of coal taken}}$$

$$= \frac{14 \times 0.1 \times 1.4}{1.5} = \frac{1.96}{1.5}$$

$$\therefore \boxed{\% \text{ of nitrogen} = 1.31\%}$$

(2) Weight of $BaSO_4$ ppt = 0.3 g.

$$\% \text{ of Sulphur} = \frac{\text{Weight of } BaSO_4 \text{ ppt} \times 32 \times 100}{\text{Weight of coal} \times 233}$$

$$= \frac{0.3 \times 32 \times 100}{1.5 \times 233}$$

$$= \frac{960}{249.5}$$

$$\therefore \boxed{\% \text{ of Sulphur} = 2.75\%}$$