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Examined
Dept. of Chemistry
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Estimation of the percentage of $CaCO_3$ and $MgCO_3$ Present in supplied ore (Dolomite) :-

Theory :- Both Ca^{2+} and Mg^{2+} form stable complexes with EDTA at pH = 7-8, but Ca-EDTA complex is more stable that Mg-EDTA complex, again Mg-indicator complex is more stable than the Ca-indicator complex. So at first EDTA reacts with free Ca^{2+} ions, then with free Mg^{2+} ions and there after wine red coloured Mg-indicator complex to set free blue indicator. So a change in coloured from wine red to blue marks the end point.

$$Ca^{2+} + H_2Y^{2-} \rightleftharpoons CaY^{2-} + 2H^+$$
$$Mg^{2+} + H_2Y^{2-} \rightleftharpoons MgY^{2-} + 2H^+$$
$$MgD^- + H_2Y^{2-} \rightleftharpoons MgY^{2-} + HD^{2-} + H^+$$

Wine-red Blue

Chemical required :-

(i) $\left(\frac{M}{50}\right)$ $Zn(OAc)_2$ Solution in 2% NH_4Cl solution.

(ii) NH_4Cl-NH_4OH buffer solution of pH 10; Prepared by 70g NH_4Cl + 570 mL liq. NH_3 and diluted to 1000mL with distilled water.

(iii) EBT indicator 0.1% solid mixture of EBT in 100 mL alcohol.

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(iv) $(\frac{M}{50})$ EDTA Solution

(v) 0.1 (M) NaOH

(vi) Ca^{2+} and Mg^{2+} stock solution.

Results:-

(i) Preparation of 250 mL standard $(\frac{M}{50})$ $Zn(OAc)_2$ solution:-

Weight of $Zn(OAc)_2$ taken (g)	Weigh of $Zn(OAc)_2$ to be taken (g)	Strength of $Zn(OAc)_2$ Solution. (S_1)
1.1	1.1	$S_1 = \left(\frac{1.1}{1.1} \times \frac{1}{50}\right) M$
		$S_1 = 0.02 (M)$

(ii) Standardization of EDTA Solution:-

Volume of Standard $Zn(OAc)_2$ Solution (mL) (V_1)	Volume of EDTA Consumed (mL) (V_2)
25	17

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Now applying the formula :-

$$V_1S_1 = V_2S_2$$

$$\Rightarrow 25 \times 0.02 = 17 \times S_2$$

$$\Rightarrow S_2 = \frac{25 \times 0.02}{17}$$

$$\Rightarrow S_2 = 0.03\,(M)$$

$\therefore$ Strength of EDTA = 0.03 (M)

Estimation of Ca^{2+} ions :-

volume of stock soln (mL)	volume of EDTA consumed (mL)
25	16.5

Calculation :- $V_1S_1 = V_2S_2$

$$\Rightarrow 16.5 \times 0.03 = 25 \times S_2$$

$$\Rightarrow S_2 = \frac{16.5 \times 0.03}{25}$$

$$\Rightarrow S_2 = 0.0198$$

Amount of Ca^{2+} = (0.0198 × 40.08) = 0.79gm

Amount of Mg^{2+} = (0.0198 × 21) = 0.475 gm

Total amount of Ca^{2+} and Mg^{2+} =

(0.79 + 0.475) gm

= 1.265 gm.

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