Chapter 3 − Problem 90

Michael Brodskiy

Instructor: Mr. Morgan

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90. A 5.025[g] sample of calcium is burned in air to produce a mixture of two ionic compounds, calcium oxide and calcium nitride. Water is added to this mixture. It reacts with calcium oxide to form 4.832[g] of calcium hydroxide. How many grams of calcium oxide are formed? (2) How many grams of calcium nitride? (1)

$$8\,\text{Ca} + \text{O}_2 + 2\,\text{N}_2 \longrightarrow 2\,\text{CaO} + 2\,\text{Ca}_3\text{N}_2$$

$$\text{g}_{\text{Ca}} = .0653 \cdot 40$$

$$5.025 - 2.612 = 2.413[\text{g}_{\text{Ca}}]$$

$$\text{mol}_{\text{Ca}} = \frac{2.413}{40} \tag{1}$$

$$= .0603[\text{mol}_{\text{Ca}}]$$

$$m_{\text{Ca}_3\text{N}_2} = \frac{.0603}{3} \cdot 148$$

$$= 2.97[\text{g}_{\text{Ca}_3\text{N}_2}]$$

$$\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2$$

$$\text{mol}_{\text{Ca(OH)}_2} = \frac{4.832}{74}$$

$$= .0653[\text{mol}_{\text{Ca(OH)}_2}] \to .0653[\text{mol}_{\text{CaO}}] \tag{2}$$

$$m_{\text{CaO}} = .0653 \cdot 56$$

$$= 3.66[\text{g}_{\text{CaO}}]$$