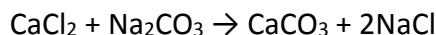


Answer on the Question #65080, Chemistry / General chemistry

In the reaction between calcium chloride and sodium carbonate, what is the present yield of calcium carbonate if the actual yield is 120 g? You are given 1.5 moles of calcium chloride and 2 moles of sodium carbonate. Molar mass of Ca is 40 g/mol and Na is 23 g/mol.

Solution:

The chemical reaction between calcium chloride and sodium carbonate:



The first step is determination of limited reagent. The ratio between the mole number of each reagent to lowest value of mole number (in this task it is 1.5 moles) equal to 1, it means that this reagent is limited.

$$\frac{n(\text{CaCl}_2)}{1.5 \text{ moles}} = 1; \frac{n(\text{Na}_2\text{CO}_3)}{1.5 \text{ moles}} = 1.33;$$

In this case CaCl_2 is limited reagent.

By the law of equivalence the mole number of calcium chloride equals to the mole number of calcium carbonate:

$$n(\text{CaCl}_2) = n(\text{CaCO}_3) = 1.5 \text{ moles}$$

When the mole number of CaCO_3 is known, the theoretical mass (yield) is:

$$m(\text{CaCO}_3) = n(\text{CaCO}_3) \cdot M(\text{CaCO}_3) = 1.5 \text{ moles} \cdot 100 \frac{\text{g}}{\text{mol}} = 150 \text{ g}$$

Percent yield is the ratio between the actual and theoretical mass (yield) multiplied by 100 %:

$$\eta = \frac{m_{act}}{m_{theor}} \cdot 100 \% = \frac{120 \text{ g}}{150 \text{ g}} \cdot 100\% = 80\%$$

Answer: the theoretical yield of calcium carbonate is 150 g, the percent yield equal to 80 %.

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