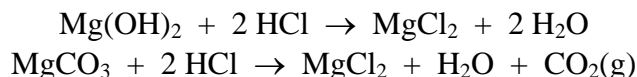


Stoichiometry in Simultaneous Reactions

Problem 4-71

How many grams of HCl are consumed in the reaction of 425 g of a mixture containing 35.2% MgCO_3 and 64.8% Mg(OH)_2 , by mass?



Solution:

Start by recognizing that the percentages will give you the masses of Mg(OH)_2 and MgCO_3 .

$$m_{\text{MgCO}_3} = 425 \text{ g mix} \times 0.352 \frac{\text{g MgCO}_3}{\text{g mix}} = 149.6 \text{ g MgCO}_3$$

$$m_{\text{Mg(OH)}_2} = 425 \text{ g mix} \times 0.648 \frac{\text{g Mg(OH)}_2}{\text{g mix}} = 275.4 \text{ g Mg(OH)}_2$$

Convert those quantities to their respective molar amounts and calculate the stoichiometric amount of HCl that will react with each salt.

$$n_{\text{HCl reacting with MgCO}_3} = \left(\frac{149.6 \text{ g MgCO}_3}{84.316 \frac{\text{g}}{\text{mol}}} \right) \times \frac{2 \text{ mol HCl}}{1 \text{ mol MgCO}_3} = 3.5486 \text{ mol HCl}$$

$$n_{\text{HCl reacting with Mg(OH)}_2} = \left(\frac{275.4 \text{ g Mg(OH)}_2}{58.465 \frac{\text{g}}{\text{mol}}} \right) \times \frac{2 \text{ mol HCl}}{1 \text{ mol Mg(OH)}_2} = 9.4210 \text{ mol HCl}$$

Sum the two to get the total quantity of HCl that reacts:

$$n_{\text{Total}} = 3.5486 \text{ mol} + 9.4210 \text{ mol} = 12.970 \text{ mol HCl}$$

And calculate the mass:

$$m_{\text{HCl}} = 12.970 \text{ mol HCl} \times 36.461 \frac{\text{g}}{\text{mol}} = 473 \text{ g HCl}$$