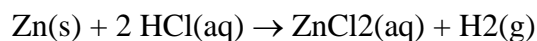


An Example of Indirect Mass Determination Using Volumetric Analysis

Problem 4-85

A small piece of zinc is dissolved in 50.00 mL of 1.035 M HCl.



At the conclusion of the reaction, the concentration of the 50.00-mL sample is redetermined and found to be 0.812 M HCl. What must have been the mass of the piece of zinc that dissolved?

Solution:

First, write down what you know:

$$C_{\text{HCl}}^{\text{initial}} = 1.035 \text{ M} \quad V_{\text{HCl}} = 50.00 \text{ mL}$$

$$C_{\text{HCl}}^{\text{final}} = 0.812 \text{ M}$$

Let's calculate about the only things we know: the molar quantities of HCl,

$$n_{\text{HCl}}^{\text{initial}} = 1.035 \text{ M} \times 0.05000 \text{ L} = 0.05175 \text{ mol HCl initially}$$

$$n_{\text{HCl}}^{\text{final}} = 0.812 \text{ M} \times 0.05000 \text{ L} = 0.04060 \text{ mol HCl after reaction}$$

$$n_{\text{HCl}}^{\text{reacted}} = 0.05175 \text{ mol HCl} - 0.04060 \text{ mol HCl} = 0.01115 \text{ mol HCl reacted}$$

Now determine the molar quantity and mass of Zn that reacted with the HCl:

$$n_{\text{Zn}} = 0.01115 \text{ mol HCl} \times \frac{1 \text{ mol Zn}}{2 \text{ mol HCl}} = 0.005575 \text{ mol Zn}$$

$$m_{\text{Zn}} = 0.005575 \text{ mol Zn} \times 65.39 \frac{\text{g}}{\text{mol}} = 0.365 \text{ g Zn}$$