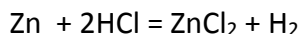


Answer on the question #42044, Chemistry, Physical Chemistry

Question:

A 6.11g sample of Cu-Zn alloy reacts with HCL to produce hydrogen gas. If the hydrogen gas has a volume of 1.26L, temperature of 22 C and a pressure of 728 mm Hg, what is the percent of Zn in the alloy? (Copper does not react with HCL.)

Solution:



According to the reaction equation, the amounts of zinc and hydrogen relate as:

$$n(\text{Zn}) = n(\text{H}_2)$$

According to ideal gas law, the amount of gas and its volume at temperature T and pressure p relate as:

$$pV = nRT$$

$$728 \text{ mm Hg} = 133,322 \text{ Pa} \cdot 4 \cdot 728 \text{ Pa} = 97.0587 \text{ kPa}$$

$$n(\text{H}_2) = \frac{pV}{RT} = \frac{97058.7 \text{ Pa} \cdot 1.26 \cdot 10^{-3} \text{ m}^3}{8.314 \frac{\text{J}}{\text{mol} \cdot \text{K}} \cdot (273.15 + 22) \text{ K}} = 0.04984 \text{ mol}$$

$$n(\text{Zn}) = 0.04984 \text{ mol}$$

$$m(\text{Zn}) = n(\text{Zn}) \cdot M(\text{Zn}) = 0.04984 \cdot 65.38 = 3.258 \text{ g}$$

$$w(\text{Zn}) = \frac{m(\text{Zn})}{m(\text{alloy})} \cdot 100\% = \frac{3.258}{6.11} \cdot 100\% = 53.3 \%$$

Answer: 53.3%