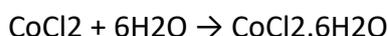


Answer on the Question #67257, Chemistry / Inorganic chemistry

5.95g of cobalt(II) carbonate were added to 40cm³ of hydrochloric acid, concentration 2.0mol/dm³

[1] Calculate the maximum yield of cobalt(II) chloride-6-water and show that the cobalt(II) carbonate was in excess.



} maximum yield:

} number of moles of HCl used =

} number of moles of CoCl₂ formed =

} number of moles of CoCl₂·6H₂O formed =

} mass of one mole of CoCl₂·6H₂O = 238g

} maximum yield of CoCl₂·6H₂O =g

to show that cobalt(II) carbonate is in excess:

number of moles of HCl used = (use your value from above)

mass of one mole of CoCO₃ = 119g

number of moles of CoCO₃ in 5.95g of cobalt(II) carbonate =

(ii) Explain how these calculations show that cobalt(II) carbonate is in excess.

Solution:

(i) Maximum yield of CoCl₂·6H₂O:

Number of moles of HCl used:

$$n(\text{HCl}) = \frac{c(\text{HCl}) \cdot V(\text{HCl})}{1000} = \frac{2.0 \cdot 40}{1000} = 0.08 \text{ mole}$$

Number of moles of CoCl₂ formed:

$$n(\text{CoCl}_2) = \frac{1}{2} n(\text{HCl}) = 0.04 \text{ mole}$$

Number of moles of CoCl₂·6H₂O formed:

$$n(\text{CoCl}_2) = n(\text{CoCl}_2 \cdot 6\text{H}_2\text{O}) = 0.04 \text{ mole}$$

Maximum yield of CoCl₂·6H₂O:

$$m(\text{CoCl}_2 \cdot 6\text{H}_2\text{O}) = n \cdot M = 0.04 \cdot 238 = 9.52 \text{ g}$$

To show that Cobalt (II) carbonate is in excess:

Number of moles of HCl used = 0.04 mole

Number of moles of CoCO₃ in 5.95g of cobalt(II) carbonate:

$$n(\text{CoCO}_3) = \frac{m(\text{CoCO}_3)}{M(\text{CoCO}_3)} = \frac{5.95}{119} = 0.05 \text{ mole}$$

(ii) Cobalt (II) carbonate is in excess because of mole number of this compound is more than HCl.