

Answer on Question #43191 - Chemistry - Inorganic chemistry

Question:

1 gram of a mixture of CaCO_3 and NaCl reacts completely with 120ml of 0.1N HCl . What is the percentage of NaCl ?

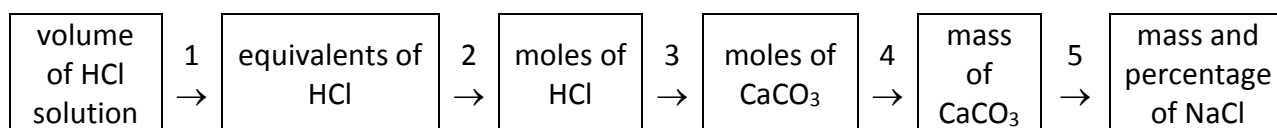
Solution:

HCl reacts only with one component (CaCO_3) of the two components of mixture ($\text{CaCO}_3 + \text{NaCl}$) according to the equation:



If we calculate the mass of CaCO_3 that reacts with HCl , we can determine the mass and percentage of NaCl .

Our path:



- 0,1N HCl means that is 0,1 equivalents of HCl per 1 liter of solution,
0,1 eq $\text{HCl}/1 \text{ l}$,
120 ml = 0,12 l,
0,12 l \times 0,1 eq $\text{HCl}/1 \text{ l}$ = 0,012 eq HCl
- In case of HCl 1 equivalent = 1 mole,
then 0,012 equivalents = 0,012 moles
- From the balanced equation we see that 1 mole of CaCO_3 reacts with 2 moles of HCl :
1 mol $\text{CaCO}_3/2 \text{ mol HCl}$;
then 0,012 moles of HCl react with:
 $0,012 \text{ mol HCl} \times 1 \text{ mol CaCO}_3/2 \text{ mol HCl} = 0,006 \text{ mol CaCO}_3$;
- Mass of 1 mole of CaCO_3 is $40 + 12 + 16 \times 3 = 100 \text{ g}$
100g $\text{CaCO}_3/1 \text{ mol CaCO}_3$;
mass of 0,006 moles of CaCO_3 is
 $0,006 \text{ mol CaCO}_3 \times 100 \text{ g CaCO}_3/1 \text{ mol CaCO}_3 = 0,6 \text{ g CaCO}_3$;
- Mass of NaCl = (mass of mixture) – (mass of CaCO_3)
1-0,6=0,4 g
percentage of NaCl = (mass of NaCl)/(mass of mixture) \times 100%
 $w_{\text{NaCl}} = 0,4/1 \times 100\% = 40\%$

Answer: The percentage of NaCl is 40%.