

Answer on Question #43453 - Chemistry - Other

Question:

in an experiment 5g CaCO₃ on heating gave 2.8g CaO and 1120ml of CO₂ at STP show that these results are in agreement with law of conservation of mass

Answer:

Balanced equation for CaCO₃ heating:



The law of conservation of mass states that the mass of the system must remain constant over time, as system mass cannot change quantity if it is not added or removed. The law implies that during any chemical reaction in an isolated system, the total mass of the reactants or starting materials must be equal to the mass of the products.

To check if the result of the experiment is in agreement with this law, we should calculate the mass of CO₂ produced.

Number of moles of CO₂ equals:

$$n(\text{CO}_2) = \frac{V}{V_m} = \frac{1120 \text{ ml}}{22.4 \text{ L/mol}} = \frac{1.120 \text{ ml}}{22.4 \text{ L/mol}} = 0.05 \text{ mol}$$

Then the mass of CO₂ produced equals:

$$m(\text{CO}_2) = n(\text{CO}_2) \cdot M(\text{CO}_2) = 0.05 \text{ mol} \cdot 44 \frac{\text{g}}{\text{mol}} = 2.2 \text{ g}$$

The total mass of the products is:

$$m = m(\text{CaO}) + m(\text{CO}_2) = 2.8 + 2.2 = 5.0 \text{ g}$$

We see that heating of 5 g of CaCO₃ produces 5 g of the products (2.8 g of CaO and 2.2 g of CO₂), i.e. the total mass of the reactants is equal to the mass of the products. So, the result of the experiment is in agreement with law of conservation of mass.