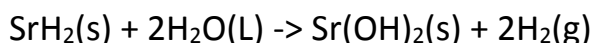


Answer on question #61160, Chemistry / General Chemistry

Strontium Hydride solid reacts with water to form strontium hydroxide and hydrogen gas: $\text{SrH}_2(\text{s}) + \text{H}_2\text{O}(\text{L}) \rightarrow \text{Sr}(\text{OH})_2(\text{s}) + \text{H}_2(\text{g})$.

How many grams of H_2O and SrH_2 are required to produce 500 grams of $\text{Sr}(\text{OH})_2$? Also, find the volume of hydrogen gas that will be produced from the reaction? Assume the condition is at STP.

Solution:



$$M(\text{SrH}_2) = 89.6 \text{ g/mol};$$

$$M(\text{H}_2\text{O}) = 18 \times 2 = 36 \text{ g/mol (because 2 mol H}_2\text{O).};$$

$$M(\text{Sr}(\text{OH})_2) = 121.6 \text{ g/mol};$$

$$M(\text{H}_2) = 2 \times 2 = 4 \text{ g/mol (because 2 mol H}_2\text{)}.$$

We draw up proportion:

$$x \text{ (g)} : 89.6 \text{ (g/mol)} = 500 \text{ (g)} : 121.6 \text{ (g/mol)}$$

Where x - the mass of SrH_2 .

$$x = \frac{89.6 \left(\frac{\text{g}}{\text{mol}}\right) \times 500 \text{ (g)}}{121.6 \left(\frac{\text{g}}{\text{mol}}\right)} = 368.42 \text{ g}$$

$$m(\text{SrH}_2) = 368.42 \text{ (g)}.$$

$$x \text{ (g)} : 36 \text{ (g/mol)} = 500 \text{ (g)} : 121.6 \text{ (g/mol)}$$

Where x - the mass of H_2O .

$$x = \frac{36 \left(\frac{\text{g}}{\text{mol}}\right) \times 500 \text{ (g)}}{121.6 \left(\frac{\text{g}}{\text{mol}}\right)} = 148.02 \text{ g}$$

$$m(\text{H}_2\text{O}) = 148.02 \text{ (g)}.$$

We find how many grams of H_2 can be produced in the reaction.

Using the limiting reactant's value of SrH_2 , because of H_2O can produce a larger quantity of H_2 than of SrH_2

$$x = \frac{4 \left(\frac{\text{g}}{\text{mol}}\right) \times 368.33 \text{ (g)}}{89.6 \left(\frac{\text{g}}{\text{mol}}\right)} = 16.44 \text{ g}$$

Find the volume of H_2 .

Mass of 1 mole of hydrogen is 2 g. One mole of any gas will occupy a volume of 22.4 liters at STP.

We draw up proportion:

$$2 \text{ (g)} : 22.4 \text{ (L)} = 16.44 \text{ (g)} : x \text{ (L)},$$

Where x - the volume of H₂.

$$x = \frac{22.4 \text{ (L)} \times 16.44 \text{ (g)}}{2 \text{ (g)}} = 184.128 \text{ L}$$

$$V(\text{H}_2) = 184.128 \text{ (L)}.$$

Answer: $m(\text{SrH}_2) = 368.42 \text{ (g)}$; $m(\text{H}_2\text{O}) = 148.02 \text{ (g)}$; $V(\text{H}_2) = 184.128 \text{ (L)}$