

Answer on Question #62387 - Chemistry - General Chemistry

Question

When hydrocarbons are burned in a limited amount of air, both CO and CO₂ form. When 0.410 g of a particular hydrocarbon was burned in air, 0.425 g of CO, 0.668 g of CO₂, and 0.410 g of H₂O were formed.

- 1) How many grams of O₂ were used in the reaction?
- 2) How many grams would have been required for complete combustion?

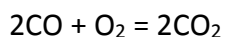
Solution:

1) Using the Law of conservation of mass:

$$m(\text{C}_x\text{H}_y) + m(\text{O}_2) = m(\text{CO}) + m(\text{CO}_2) + m(\text{H}_2\text{O})$$

$$m(\text{O}_2) = m(\text{CO}) + m(\text{CO}_2) + m(\text{H}_2\text{O}) - m(\text{C}_x\text{H}_y) = 0.425 + 0.668 + 0.410 - 0.410 = 1.093 \text{ (g)}$$

2) If we want to complete combustion, we need to oxidize CO to CO₂



$$m_{\text{add}}(\text{O}_2) = M(\text{O}_2) \cdot \vartheta(\text{O}_2) = M(\text{O}_2) \cdot \vartheta(\text{CO})/2 = M(\text{O}_2) \cdot \frac{m(\text{CO})}{2M(\text{CO})} = 32 \cdot \frac{0.425}{2 \cdot 28} = 0.243 \text{ (g)}$$

$$m_{\text{total}}(\text{O}_2) = m(\text{O}_2) + m_{\text{add}}(\text{O}_2) = 1.093 + 0.243 = 1.336 \text{ (g)}$$

Answer: 1) $m(\text{O}_2) = 1.093 \text{ (g)}$ were used in the reaction

2) $m(\text{O}_2) = 1.336 \text{ (g)}$ would have been required for complete combustion