

Answer on Question #44825–Chemistry–Inorganic Chemistry

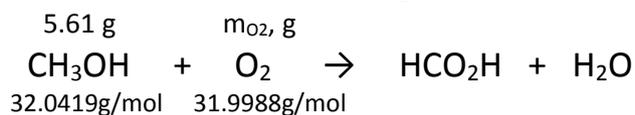
Question

?CH₃OH + ?O₂ → ?HCO₂H + ?H₂O. What is the maximum amount of HCO₂H (46.0254 g/mol) which could be formed from 5.61 g of CH₃OH (32.0419 g/mol) and 17.65 g of O₂ (31.9988 g/mol)?

Solution

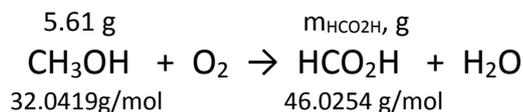
Balanced chemical equation is CH₃OH + O₂ → HCO₂H + H₂O, so methanol and oxygen react in equimolar ratio.

Let us calculate the mass of O₂ needed to react with 5.61 g of CH₃OH



$$m_{\text{O}_2} = \frac{m_{\text{CH}_3\text{OH}} \cdot M_{\text{O}_2}}{M_{\text{CH}_3\text{OH}}} = \frac{5.61 \text{ g} \cdot 31.9988 \frac{\text{g}}{\text{mol}}}{32.0419 \frac{\text{g}}{\text{mol}}} = 5.60 \text{ g}$$

Thus, 5.60 g of O₂ are needed to completely oxidized 5.61 g of methanol. Since 17.65 g of O₂ are taken for reaction, we can state that oxygen is in excess and part of it remains unreacted. So, the amount of HCO₂H formed should be calculated based on the mass of methanol.



$$m_{\text{HCO}_2\text{H}} = \frac{m_{\text{CH}_3\text{OH}} \cdot M_{\text{HCO}_2\text{H}}}{M_{\text{CH}_3\text{OH}}} = \frac{5.61 \text{ g} \cdot 46.0254 \frac{\text{g}}{\text{mol}}}{32.0419 \frac{\text{g}}{\text{mol}}} = 8.06 \text{ g}$$

Answer: 8.06 g