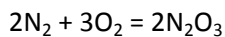


Answer on Question#39136, Chemistry, Organic Chemistry

Question

49.0 grams of dinitrogen trioxide was produced in a synthesis reaction using 31.0g N₂ and 49.0g of O₂. determine the percent yield for this reaction

Answer



$$n(\text{N}_2) = m(\text{N}_2)/M(\text{N}_2) = 31 \text{ g} / 28 \text{ g mol}^{-1} = 1,11 \text{ mol}$$

$$n(\text{O}_2) = m(\text{O}_2)/M(\text{O}_2) = 49 \text{ g} / 32 \text{ g mol}^{-1} = 1,53 \text{ mol}$$

$$\text{Given ratio of reagents: } n(\text{O}_2)/n(\text{N}_2) = 1.53/1.11=1.38$$

$$\text{Stoichiometric ratio of reagents: } n(\text{O}_2)/n(\text{N}_2) = 3/2 = 1.5$$

Hence, N₂ is in excess, and calculations must be done over O₂.

$$\text{Stoichiometric ratio of N}_2\text{O}_3 \text{ to O}_2: 2/3=0.67$$

$$\text{Theoretical quantity of N}_2\text{O}_3: 0.67 \cdot n(\text{O}_2) = 0.67 \cdot 1.53 \text{ mol} = 1.02 \text{ mol}$$

$$\text{Practical quantity of N}_2\text{O}_3: n(\text{N}_2\text{O}_3) = m(\text{N}_2\text{O}_3)/M(\text{N}_2\text{O}_3) = 49 \text{ g} / 76 \text{ g mol}^{-1} = 0.64 \text{ mol}$$

$$\text{Percent yield} = (\text{practical})/(\text{theoretical}) \cdot 100 \% = 0.64/1.02 \cdot 100 \% = 62 \%$$

Answer: 62 %.