Answer on Question #62987 - Chemistry | General Chemistry
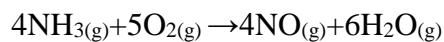
Nitric oxide is made from the oxidation of ammonia. What mass of nitric oxide can be made from the reaction of 8.171 g NH3 with 17.33 g O2?

$$4NH_{3(g)}+5O_{2(g)} \rightarrow 4NO_{(g)}+6H_2O_{(g)}$$

Solution

$m(NH_3) = 8.171$ (g)

$M(NH_3) = 17.031$ (g/mol)

$m(O_2) = 17.33$ (g)

$M(O_2) = 32$ (g/mol)

$M(NO) = 30.01$ (g/mol)

Molar ratios are: $NH_3 : O_2 : NO : H_2O :: 4 : 5 : 4 : 6$

$n(NH_3) = \dfrac{m}{M} = \dfrac{8.171\ g}{17.031\ g/mol} = 0.48\ mol.$

$n(O_2) = \dfrac{m}{M} = \dfrac{17.33\ g}{32\ g/mol} = 0.54\ mol.$

As ammonia is in the smaller ratio it is the limiting reagent. Oxygen is in excess.

So,

$n(NO) = 0.48 \cdot \dfrac{4}{4} = 0.48\ mol$

$m = n \cdot M = 0.48\ mol \cdot 30.01\ g/mol = 14.4\ g$

Answer

$m(NO) = 14.4\ g$