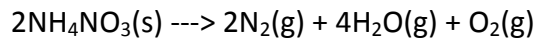**Answer on Question #49592 - Chemistry – Other**

Question

When heated at 405 C at 0.850 atm, ammonium nitrate decomposes to produce nitrogen, water and oxygen gases. using the ideal gas law equation, calculate the volume in milliliters, of water vapor produced when 85.0 g of NH_4NO_3 decomposes?

$2NH_4NO_3(s)$ ---> $2N_2(g)$ + $4H_2O(g)$ + $O_2(g)$

Answer:

Number of moles of NH_4NO_3 is:

$$\frac{m}{M} \quad \frac{85.0}{80} \quad 1.06 \; moles$$

According to the reaction, 2 moles of NH_4NO_3 produce 4 moles of H_2O, therefore, 1.06 moles of NH_4NO_3 produce 2.12 moles of H_2O.

Ideal gas law equation is:

$$PV \quad RT$$

Then the volume of water vapor produced when 85.0 g of NH_4NO_3 decomposes is:

$$V \quad \frac{RT}{P} \quad \frac{2.12 \cdot 0.082 \cdot (405 + 273)}{0.850} \quad 138.663 \; L \quad 138663 \; mL$$

Answer: 138663 mL