

Answer on Question #50516, Chemistry, Inorganic Chemistry

SO₂ in the atmosphere contributes to acid rain. The equation for the formation of the acid is represented by: 2SO₂ (g) + O₂ (g) + 2H₂O (l) -----> 2H₂SO₄ (aq)

What mass of sulphuric acid will form from 50.0L of sulphur dioxide at SLC (Standard Laboratory Conditions)?

Solution:

Standard Laboratory Conditions is 1 atm (101.325 kPa) and 25°C (298.15 K). Using Mendeleev - Clapeyron equation:

$$p \times V = n \times R \times T$$
$$n = \frac{p \times V}{R \times T}$$

R is ideal gas constant, 8.31 J/(mol×K)

It is obvious that

$$n(\text{SO}_2) = n(\text{H}_2\text{SO}_4)$$
$$n = \frac{m}{M_r}$$

M_r(H₂SO₄) = 98,079 g/mol

$$\frac{m}{M_r} = \frac{p \times V}{R \times T}$$
$$m = \frac{p \times V \times M_r}{R \times T}$$
$$m = \frac{101325 \text{ Pa} \times 0.05 \text{ m}^3 \times 98.079 \text{ g/mol}}{8.31 \frac{\text{J}}{\text{K} \times \text{mol}} \times 298.15 \text{ K}} = \frac{496892.73375}{2477.6265} = 200.55 \text{ g}$$

Answer:

200.55 g of sulphuric acid

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