

Problem 13-13 Boiling point elevation of nonelectrolyte solution, molar mass

An addition of 1.6 g of sulphur into 500 g of carbon disulphide (ebullioscopic constant $K_b = 2.50 \text{ K kg mol}^{-1}$) resulted in elevation of boiling point of carbon disulphide by $\Delta T_b = 0.031 \text{ K}$. What is the molar mass of the dissolved sulphur?

$$[M_2 = 258.06 \text{ g mol}^{-1}]$$

Solution:

$$m_2 = 1.6 \text{ g}$$

$$m_1 = 500 \text{ g} = 0.5 \text{ kg}$$

$$K_b = 2.50 \text{ K kg mol}^{-1}$$

$$\Delta T_b = 0.031 \text{ K}$$

$$\Delta T_b = K_b \cdot \underline{m_2}$$

$$\underline{m_2} = \frac{m_2}{M_2 \cdot m_1} = \frac{\Delta T_b}{K_b}$$

$$M_2 = \frac{m_2 \cdot K_b}{\Delta T_b \cdot m_1} = \frac{1.6 \cdot 2.5}{0.031 \cdot 0.5} = 258.06 \text{ g mol}^{-1} \text{ i.e. S}_8$$