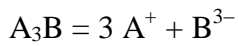


Problem 13-17 Boiling point elevation of electrolyte solutions, dissociation degree

The boiling temperature of the solution of a weak electrolyte A_3B (concentration 0.6 mol kg^{-1}) is by 0.45° higher than the normal boiling point of pure solvent. The ebullioscopic constant of the solvent is $0.535 \text{ K kg mol}^{-1}$. Calculate the degree of dissociation of A_3B in this solution.

[$\alpha = 0.134$]

Solution:



$$\underline{m}_0(A_3B) = 0.6 \text{ mol kg}^{-1}$$

$$\underline{m}(A_3B) = \underline{m}_0 \cdot (1 - \alpha)$$

$$\underline{m}(A^+) = 3 \underline{m}_0 \cdot \alpha$$

$$\underline{m}(B^{3-}) = \underline{m}_0 \cdot \alpha$$

$$\underline{m}_2 = \underline{m}_0 \cdot (1 + 3 \alpha)$$

$$\Delta T_b = K_b \cdot \underline{m}_2 = K_b \cdot \underline{m}_0 \cdot (1 + 3 \alpha) = 0.86 \cdot 0.6 \cdot (1 + 3 \alpha) = 0.45^\circ$$

$$\alpha = \frac{1}{3} \cdot \left(\frac{\Delta T_b}{K_b \cdot \underline{m}_0} - 1 \right) = \frac{1}{3} \cdot \left(\frac{0.45}{0.535 \cdot 0.6} - 1 \right) = 0.134$$