ABNORMAL MOLAR MASS

Theoretical molecular mass values, derived from colligative properties in solution calculations, can sometimes diverge from experimentally determined values, resulting in what is commonly known as abnormal molar masses. Van't Hoff proposed an explanation for this phenomenon, elucidating that when solutes dissolve in a solvent, they often dissociate into ions. Given that colligative properties are contingent solely on the number of solute particles, the dissociation of solute molecules into ions increases the particle count, consequently impacting colligative properties.

For instance, when 1 mole of NaCl dissolves in 1 kg of water and fully dissociates, the resulting solution contains 1 mole of Cl^- ions and 1 mole of Na^+ ions, totaling 2 moles of ions. However, in calculating the molar mass using colligative properties, only 1 mol of NaCl is considered present in the solution.

Certain substances exhibit association in the aqueous state, resulting in fewer ions or molecules in the solution compared to the actual number of molecules. Consequently, for substances that dissociate, the observed molar mass is lower than the actual mass, while for substances that associate, the real mass is lower than the observed molar mass.

The abnormality in molecular mass can be explained as follows:

- The dissociation of solute molecules into multiple ions increases the number of particles, subsequently elevating colligative properties.
- As the molar mass is inversely proportional to colligative properties, its value tends to be lower than anticipated.
- Conversely, when solute particles associate, the total particle count decreases, resulting in a reduction of colligative properties. In such cases, the observed molar mass values are higher than expected.