

Answer on question #60751 – Chemistry –Physical Chemistry

Question:

Are colligative properties intensive properties? Physical properties of a solution like melting point and boiling points are intensive properties but are colligative properties, like elevation of b.p and lowering of freezing point too intensive properties?

I have searched the net and found a Pharmacy book that says that they are intensive properties but I wanted to reassure from experts.

Answer:

An intensive property is a physical quantity whose value does not depend on the amount of the substance for which it is measured.

The IUPAC Gold Book defines an extensive property as a physical quantity whose magnitude is additive for subsystems.

Elevation of b.p and lowering of freezing point depend on molality of solute in solution.

Molality (m), also called molal concentration, is a measure of the concentration of a solute in a solution in terms of amount of substance in a specified amount of mass of the solvent.

$$\Delta T_{b.p.} = Km$$

$$\Delta T_{m.p.} = Em$$

E, K – constants.

And the molality is intense properties. If I take 2 kg of solution or 1 kg n(solute)/m(solvent) is constant, because the amount of solvent and solute is decreased (increaced) proportinally. And elevation of b.p and lowering of freezing are proportional intensive properties (E and K are characteric of solvent – intensive properties). As result colligative properties are also intensive properties.