

# Consequences of chemical potential changes in mixtures: Colligative properties

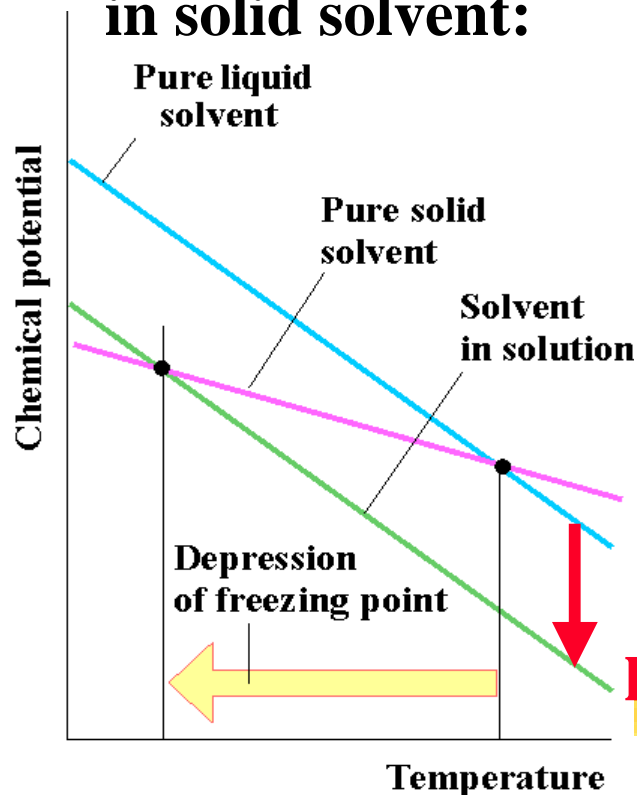
Freezing point depression:

$$\Delta T_f = K_f b_B$$

cryoscopic constant

molality

Solute is insoluble in solid solvent:



Chemical Potential lowered by solute

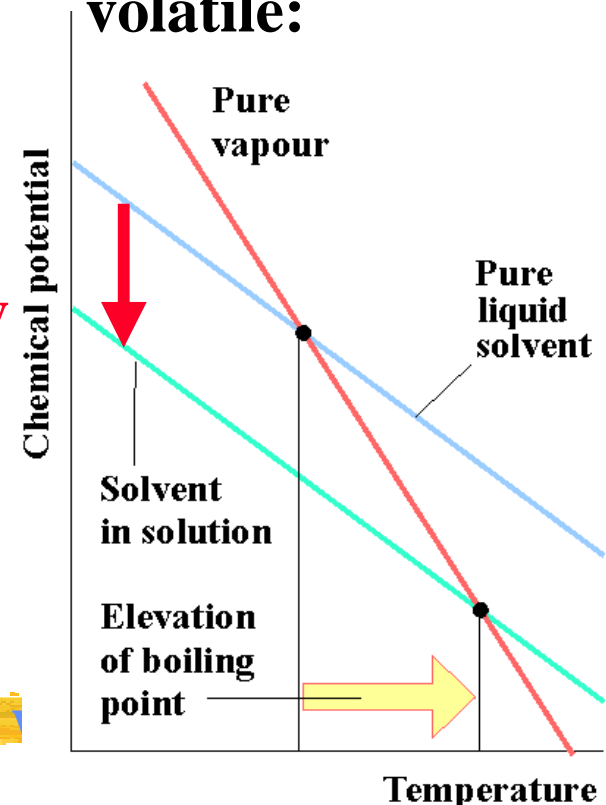
Boiling point elevation:

$$\Delta T_B = K_B b_B$$

ebullioscopic constant

Solute is not volatile:

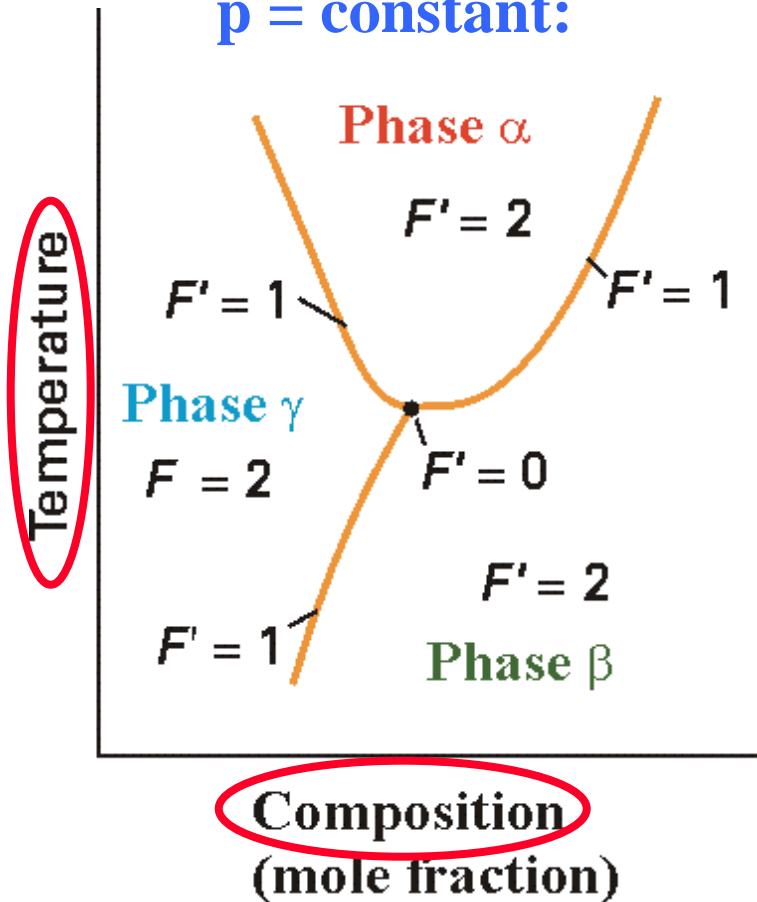
Chemical Potential lowered by solute



# Phase diagrams of binary mixtures

**Phase rule:  $F = C - P + 2$**   
 for binary mixtures = 2

**p = constant:**



**Temperature-composition diagram for binary mixture of volatile liquids**

