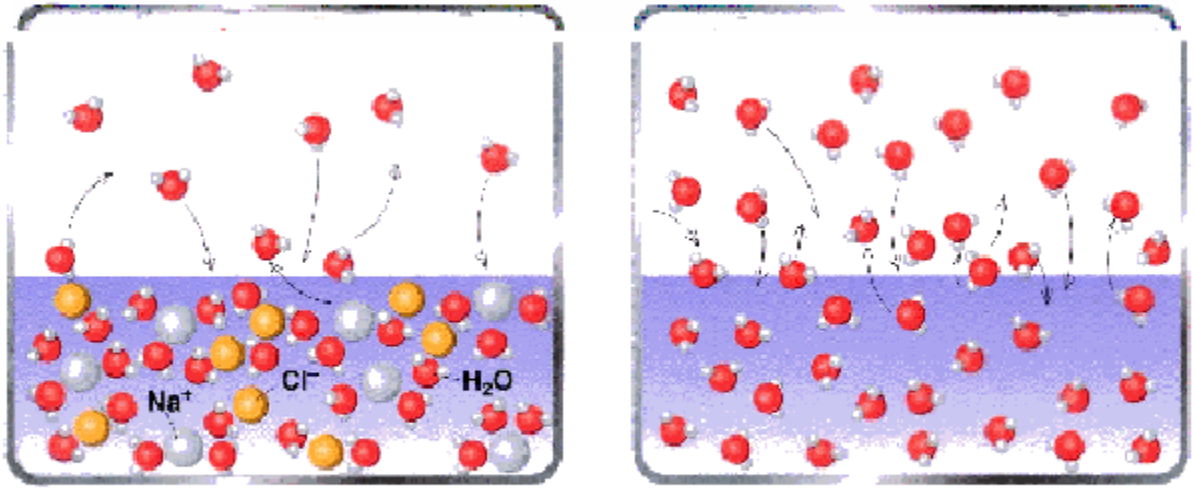
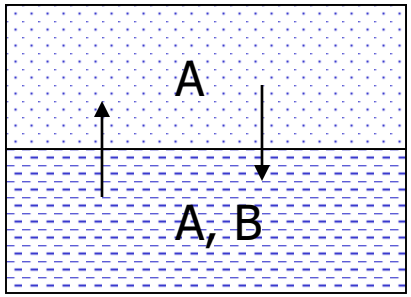
FAZNE RAVNOTEŽE

U DVOKOMPONENTNIM SUSTAVIMA

Npr.: razrijeđena dvokomponentna otopina (NaCl u vodi)

Ograničenje: SAMO OTAPALO ISPARAVA



$d\overline{G}'_{m,A}$ 

$dG''_{m,A}$

Dinamička ravnoteža:

ISPARAVANJE-KONDENZACIJA

$$dG = 0$$

$$d\overline{G}'_{m,A} = dG''_{m,A}$$

$$d\overline{G}'_{m,A} = \overline{V}'_{m,A}dp - \overline{S}'_{m,A}dT + RTd\ln a_A$$

$$dG''_{m,A} = V''_{m,A}dp - S''_{m,A}dT$$

$$\bar{V}'_{m,A}dp - \bar{S}'_{m,A}dT + RTd\ln a_A = V''_{m,A}dp - S''_{m,A}dT$$

? Tlak para

$$T = konst. \qquad dT = 0$$

$$(V''_{m,A} - \bar{V}'_{m,A})dp = RTd\ln a_A$$

Pretpostavke Clausius-a:

$$V_{m,A}{}'' >> \bar{V}_{m,A}{}' \rightarrow \bar{V}_{m,A}{}'$$ možemo zanemariti

$$V_m{}'' \approx \frac{RT}{p}$$ (Pogreška:2-3%)

$$RT\frac{dp}{p} = RTd\ln a_A$$

$$d\ln p = d\ln a_A \qquad /\int$$

$$\int_{p_A^*}^{p_A} d\ln p = \int_{a_A=1}^{a_A} d\ln a_A$$

p*- tlak pare čistog otapala

$$\ln \frac{p_A}{p_A^*} = \ln \frac{a_A}{1}$$

$$\frac{p_A}{p_A^*} = a_A$$

Aktivitet otapala može se odrediti eksperimentalno mjerenjem tlaka para

"korigirana koncentracija"

"efektivni molni udio"

$$a_A = x_A \cdot \gamma_{a,A}$$

$$x_A = \frac{n_A}{n_A + n_B}$$

$$x_A = 1 - x_B$$

Pretpostavka: IDEALNA OTOPINA

$$\gamma_{a,A} = 1 \qquad a_A = x_A = 1 - x_B$$

$$\frac{p_A}{p_A^*} = 1 - x_B$$

$$x_B = 1 - \frac{p_A}{p_A^*}$$

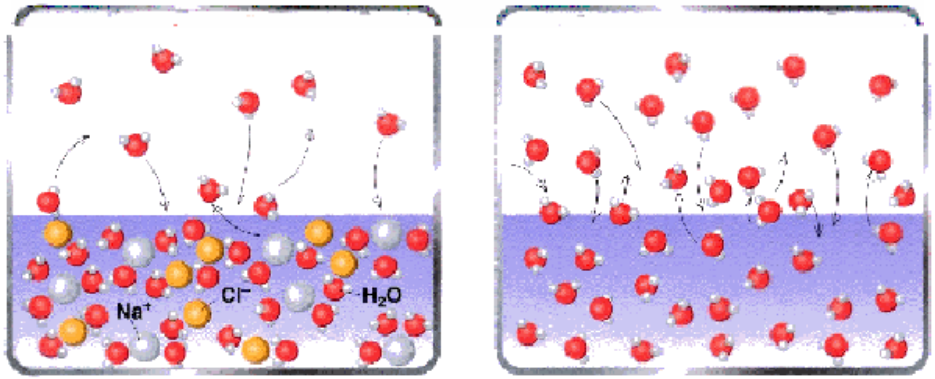
$$x_B = \frac{p_A^* - p_A}{p_A^*}$$

RAOULT-OV ZAKON, 1886.

$$\frac{p_A}{p_A^*} = x_A$$

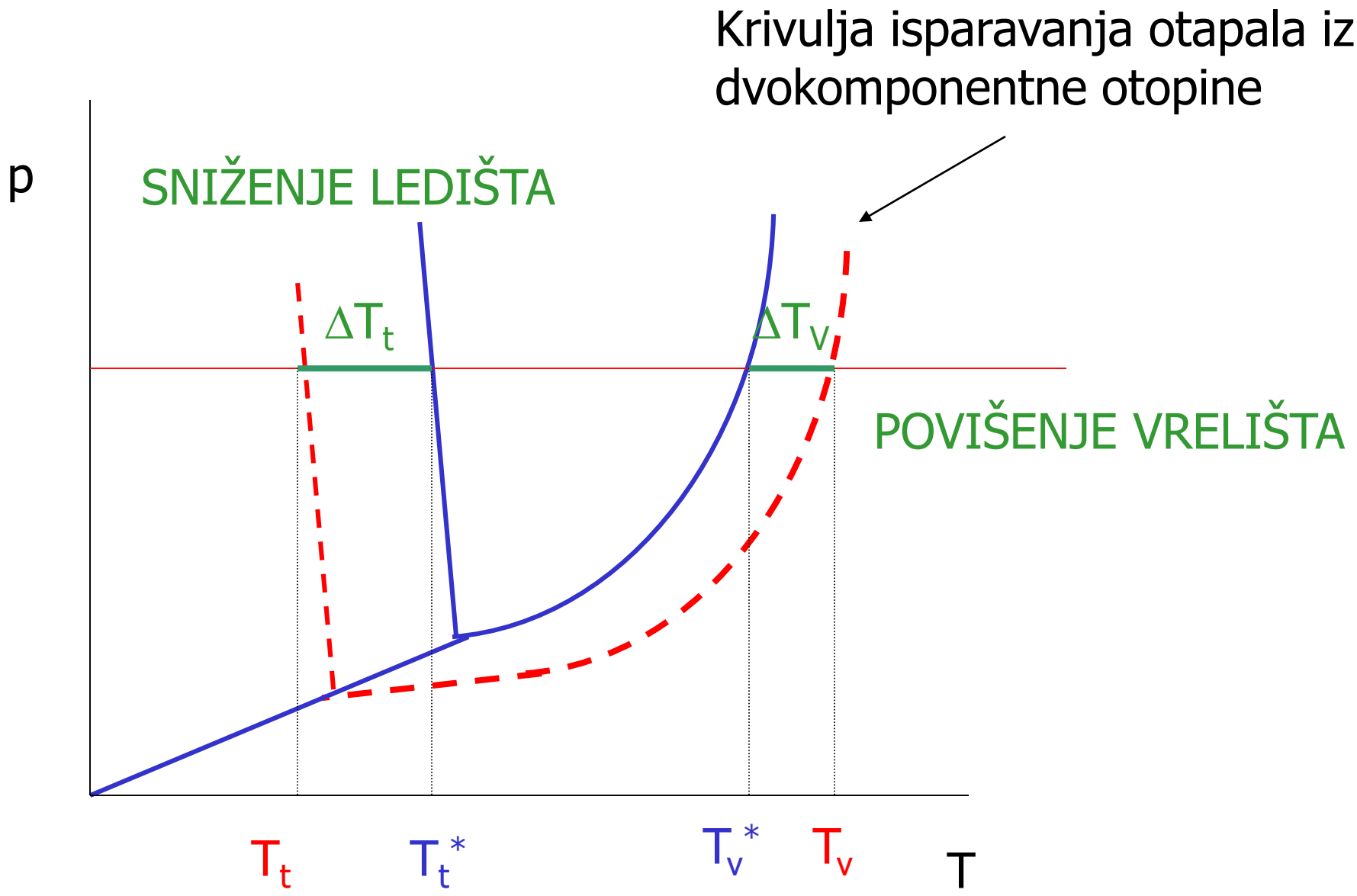
$$p_A = x_A p_A^*$$

$$p_A = x_A p_A^*$$



Tlak para iznad otopine manji je od tlaka para čistog otapala i ovisi o količini (broju čestica) otopljene tvari.

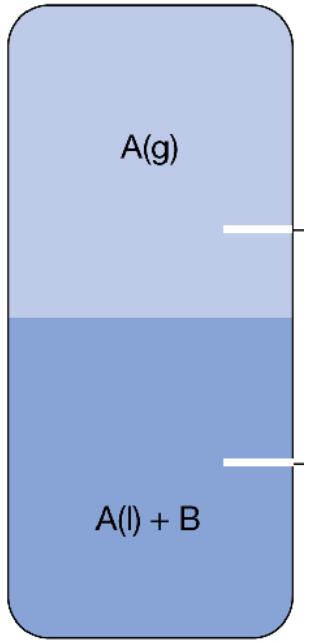
TLAK PARA je KOLIGATIVNO SVOJSTVO


Krivulja isparavanja otapala iz dvokomponentne otopine
p
SNIŽENJE LEDIŠTA
ΔTt
ΔTv
POVIŠENJE VRELIŠTA
Tt
Tt*
Tv*
Tv
T

? Povišenje vrelišta

$$\bar{V}'_{m,A}dp - \bar{S}'_{m,A}dT + RTd\ln a_A = V''_{m,A}dp - S''_{m,A}dT$$

$p = konst.$ $dp = 0$



$$(S''_{m,A} - \bar{S}'_{m,A})dT = -RTd\ln a_A$$

$$\bar{S}'_{m,A} \approx S'_{m,A}$$

$$(S''_{m,A} - \bar{S}'_{m,A}) \approx (S''_{m,A} - S'_{m,A}) = \Delta S_{isp} = \frac{\Delta H_{isp}}{T_V^*}$$

$$\frac{\Delta H_{isp}}{T_V^*} dT = -RTd \ln a_A$$

$$a_A \approx x_A = 1 - x_B$$

$$d \ln a_A = d \ln(1 - x_B) \approx -dx_B$$

$$\ln(1 - x_B) \approx -x_B - \frac{x_B^2}{2} - \frac{x_B^3}{3} \ldots \approx -x_B$$

$$\frac{\Delta H_{isp}}{T_V^*} dT = RT dx_B$$

$$dT = \frac{RT \cdot T_V^*}{\Delta H_{isp}} dx_B$$

$$T \approx T_V^*$$

$$dT = \frac{RT_V^{*2}}{\Delta H_{isp}} dx_B \qquad / \int$$

$$dT = \frac{RT_V^{*2}}{\Delta H_{isp}} dx_B \qquad / \int$$

$$\int_{T_V^*}^{T_V} dT = \frac{RT_V^{*2}}{\Delta H_{isp}} \int_{x_B=0}^{x_B} dx_B$$

$$T_V - T_V^* = \Delta T_V = \frac{RT_V^{*2}}{\Delta H_{isp}} x_B$$

$$x_B = \frac{n_B}{n_A + n_B} \cong \frac{n_B}{n_A} = \frac{n_B}{\frac{m_A}{M_A}} = \frac{n_B M_A}{m_A} = b \cdot M_A$$

molalitet

$$\Delta T_V = \frac{R T_V^{*2} M_A}{\Delta H_{isp}} \cdot b = K' \cdot b$$

KOLIGATIVNO SVOJSTVO

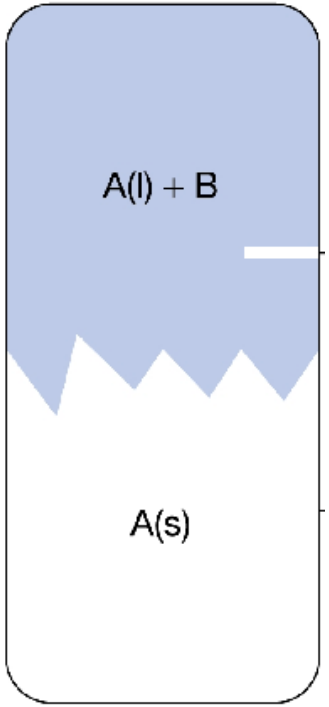
EBULIOSKOPSKA KONSTANTA

KONSTANTA POVIŠENJA VRELIŠTA

Sniženje ledišta

$$T_t^* - T_t = \Delta T_t = \frac{RT_t^{*2} M_A}{\Delta H_{talj}} \cdot b = K^{//} \cdot b$$

KRIOSKOPSKA KONSTANTA



KOLIGATIVNO SVOJSTVO

	$K^{/} / kgKmol^{-1}$	$K^{//} / kgKmol^{-1}$
Voda	0,51	1,86
Etanol	1,20	
Metanol	0,83	
Benzen	2,53	5,12
Fenol	3,04	7,27
CH_3Cl	3,85	
Kamfor		40