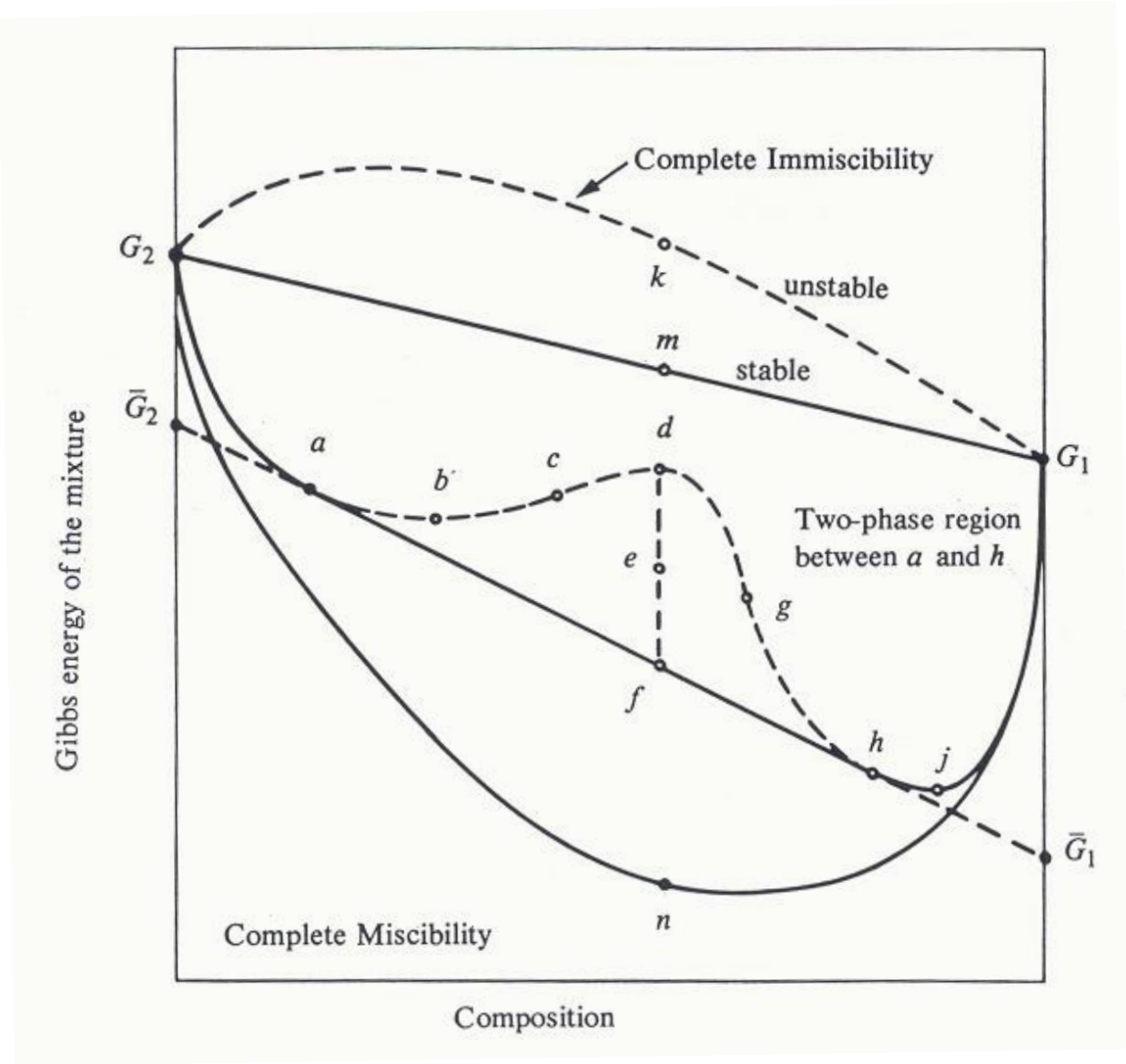
Equilibrio liquido - liquido



Equilibrio liquido - liquido

Condizione per l'esistenza di una zona di instabilità

$$\frac{\partial^2 G}{\partial x_1^2} \leq 0$$

$$\frac{G}{RT} = G^{id} / RT + G^{E} / RT = x_1 \frac{G_1}{RT} + x_2 \frac{G_2}{RT} + x_1 \ln x_1 + x_2 \ln x_2 + \frac{G^E}{RT}$$

Equilibrio liquido - liquido

Condizione per l'esistenza di una zona di instabilità

$$\frac{\partial\ (G/RT)}{\partial x_1} = \frac{G_1}{RT} - \frac{G_2}{RT} + \ln x_1 + x_1 \frac{1}{x_1} - \ln x_2 - x_2 \frac{1}{x_2} + \frac{\partial\left(G^E/RT\right)}{\partial x_1}$$

$$\frac{\partial^2 (G/RT)}{\partial x_1^2} = \frac{1}{x_1} + \frac{1}{x_2} + \frac{\partial^2\left(G^E/RT\right)}{\partial x_1^2}$$

$$\frac{1}{x_1 x_2} + \frac{\partial^2\left(G^E/RT\right)}{\partial x_1^2} \leq 0$$

Equilibrio liquido - liquido

Condizione per l'esistenza di una zona di instabilità

Equazione simmetrica

$$\frac{G^E}{RT} = A\ x_1 x_2$$

$$\frac{\partial^2 (G^E / RT)}{\partial x_1^2} = -2A$$

Equazione di Margules

$$\frac{G^E}{RT} = x_1 x_2 \left[A_{21} x_1 + A_{12} x_2 \right]$$

$$\frac{\partial^2 (G^E / RT)}{\partial x_1^2} = 2\left(-2 + 3x_1\right) A_{12} + 2\left(1 - 3x_1\right) A_{21}$$

Equilibrio liquido - liquido

Condizione per l'esistenza di una zona di instabilità

Equazione di Wilson

$$\frac{G^E}{RT} = -x_1 \ln\left(x_1 + x_2\Lambda_{12}\right) - x_2 \ln\left(x_2 + x_1\Lambda_{21}\right)$$

$$\frac{\partial^2 (G^E / RT)}{\partial x_1^2} = \frac{1}{x_1}\left[\frac{1}{\frac{x_1}{\Lambda_{12}} + x_2}\right]^2 + \frac{1}{x_2}\left[\frac{1}{\frac{x_2}{\Lambda_{21}} + x_1}\right]^2$$

Equilibrio liquido - liquido

Condizione per l'esistenza di una zona di instabilità

Equazione N.R.T.L.

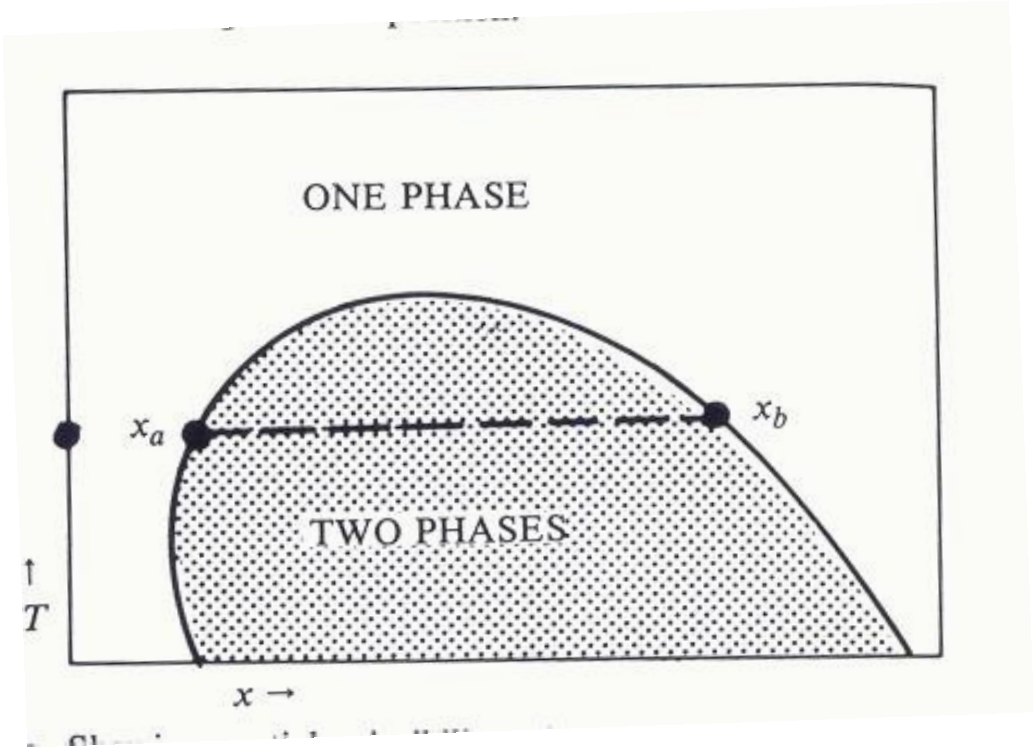
$$\frac{G^E}{RT} = x_1 x_2 \left[\frac{G_{21}\tau_{21}}{x_1 + x_2 G_{21}} + \frac{G_{12}\tau_{12}}{x_2 + x_1 G_{12}} \right]$$

$$\frac{\partial^2 (G^E / RT)}{\partial x_1^2} = -2 \left[\frac{\tau_{21} G_{21}}{x_1 + G_{21} x_2} + \frac{\tau_{12} G_{12}}{x_2 + G_{12} x_1} \right]$$

$$-(1-2x_1) \left[\frac{\tau_{21} G_{21} (1 - G_{21})}{(x_1 + G_{21} x_2)^2} + \frac{\tau_{12} G_{12} (1 + G_{12})}{(x_2 + G_{12} x_1)^2} \right]$$

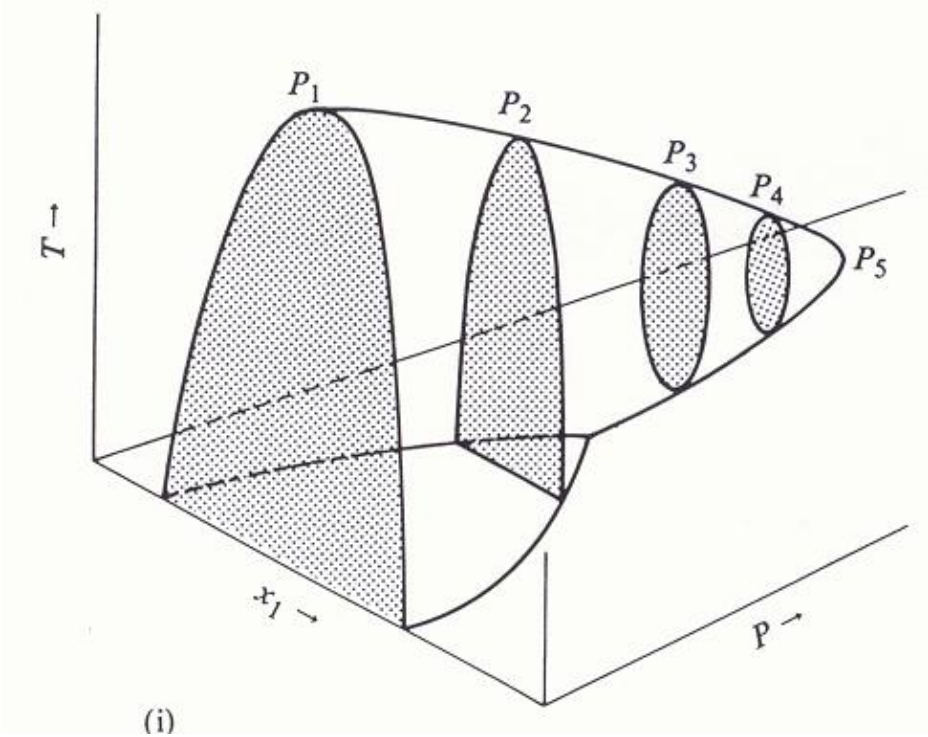
$$+ 2 x_1 x_2 \left[\frac{\tau_{21} G_{21} (1 - G_{21})^2}{(x_1 + G_{21} x_2)^3} + \frac{\tau_{12} G_{12} (1 + G_{12})^2}{(x_2 + G_{12} x_1)^3} \right]$$

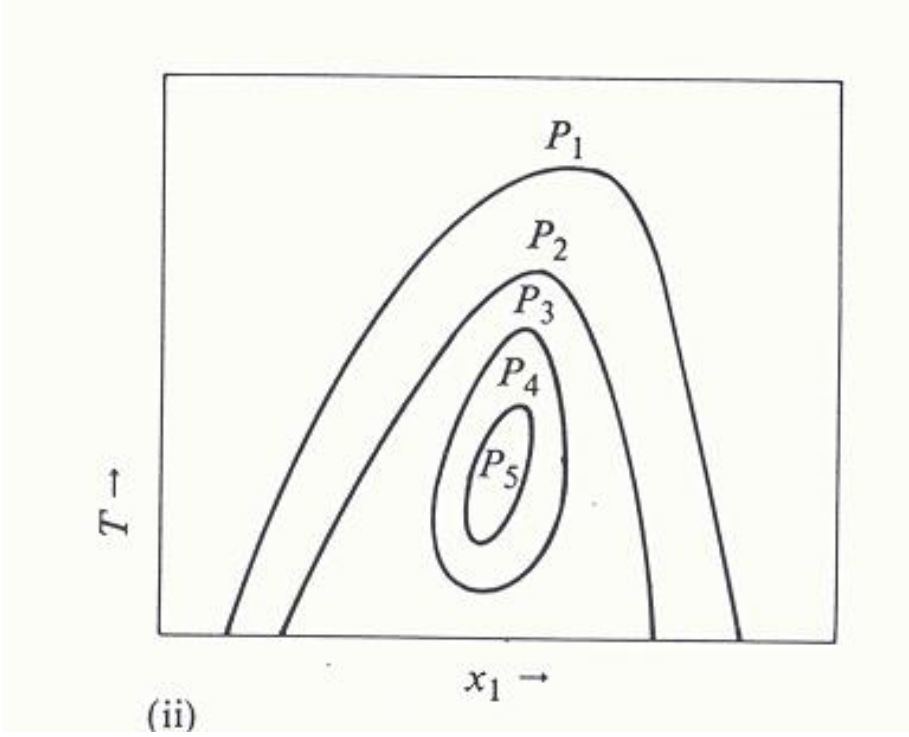
Equilibrio liquido - liquido



Lacuna di miscibilità con UCST

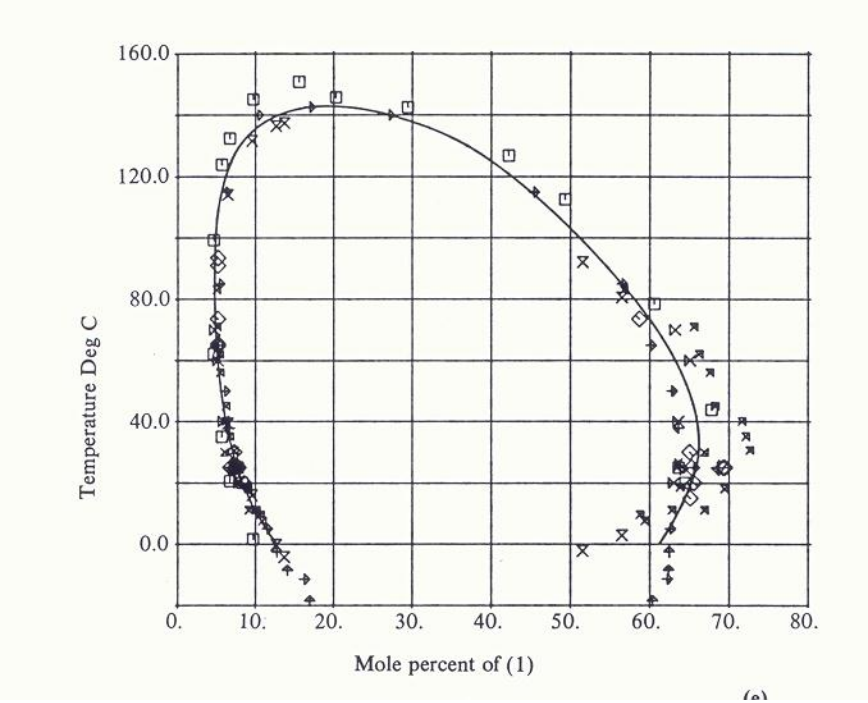
Equilibrio liquido - liquido





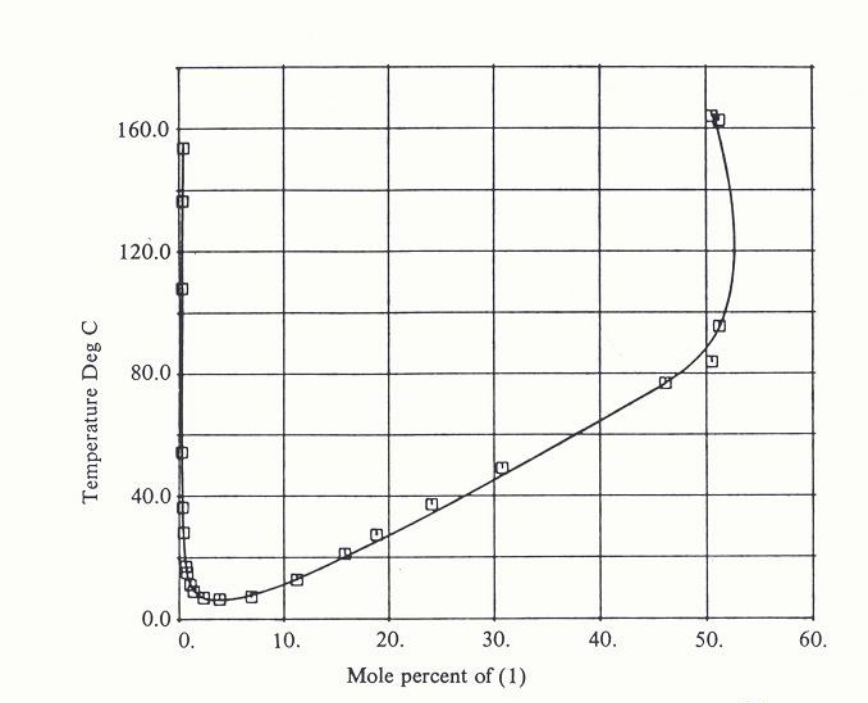
Equilibrio liquido - liquido

UCST



Sistema 2-butanone + acqua

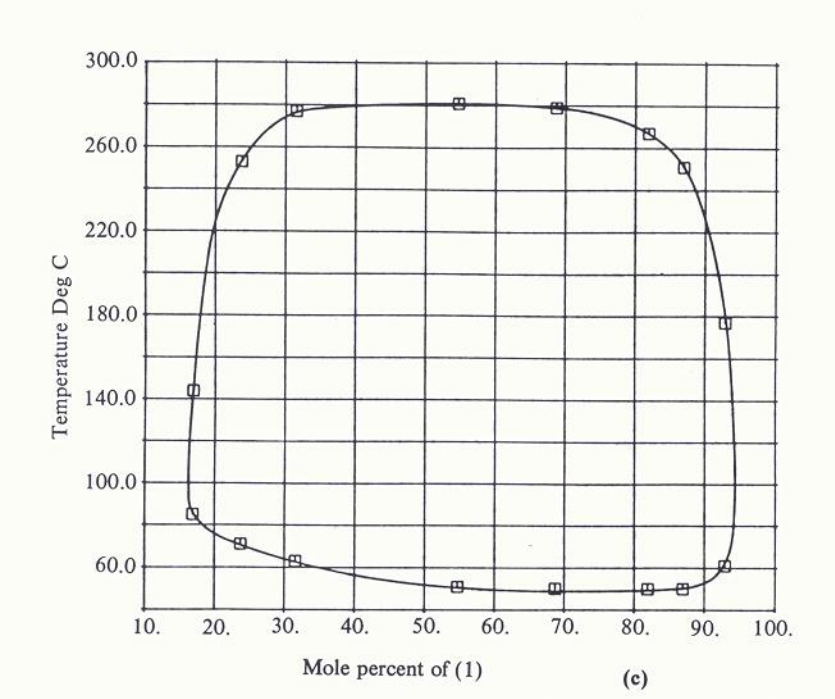
LCST



3-etil,4-metil piridina + acqua

Equilibrio liquido - liquido

LCST e UCST

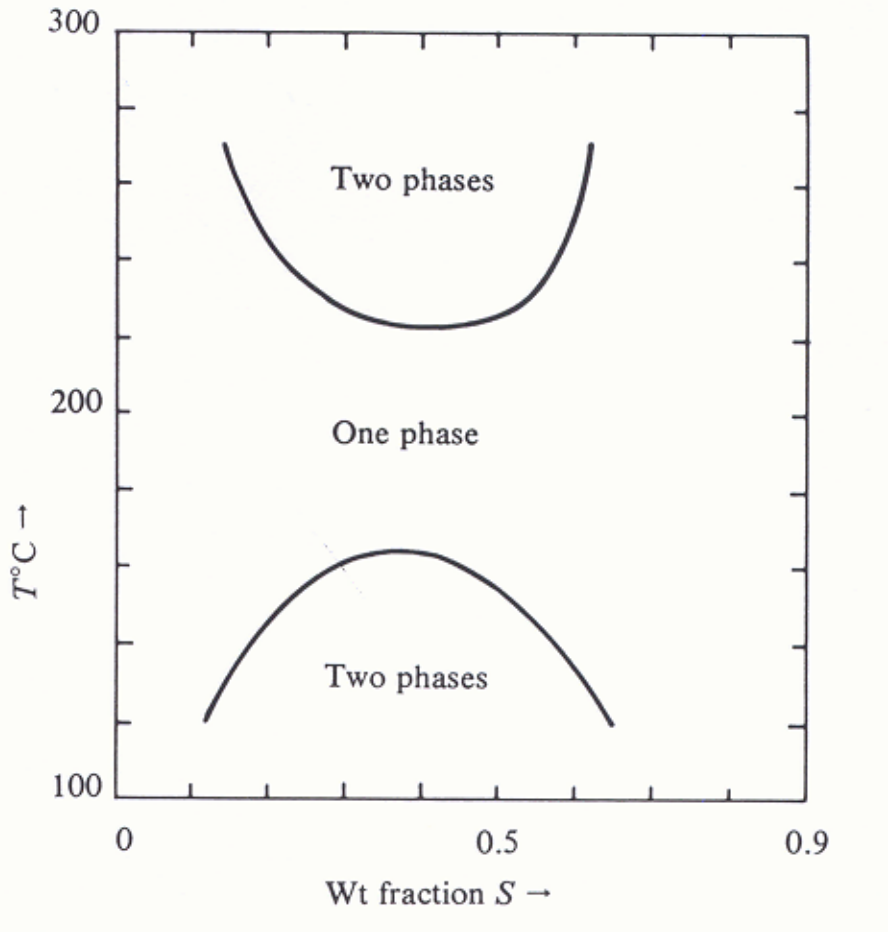


UCST > LCST

Glicerina – benzil etil ammina

Equilibrio liquido - liquido

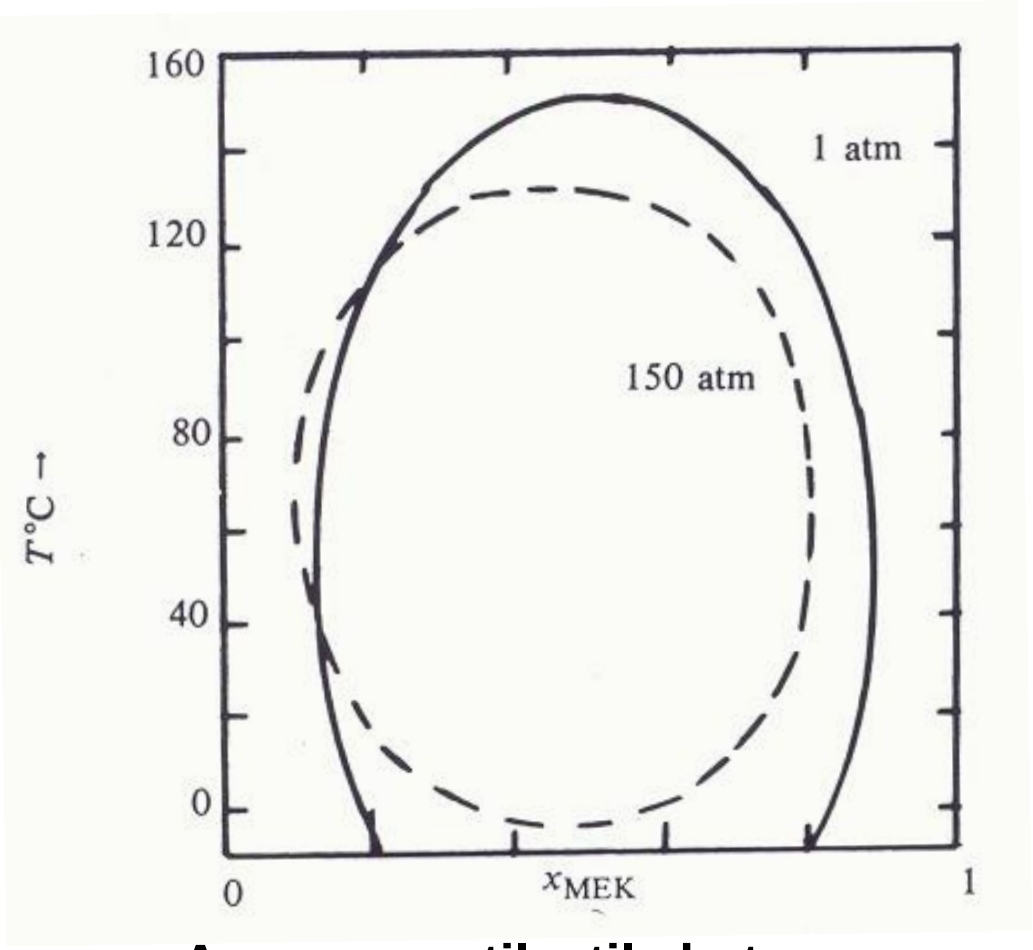
LCST e UCST



UCST < LCST

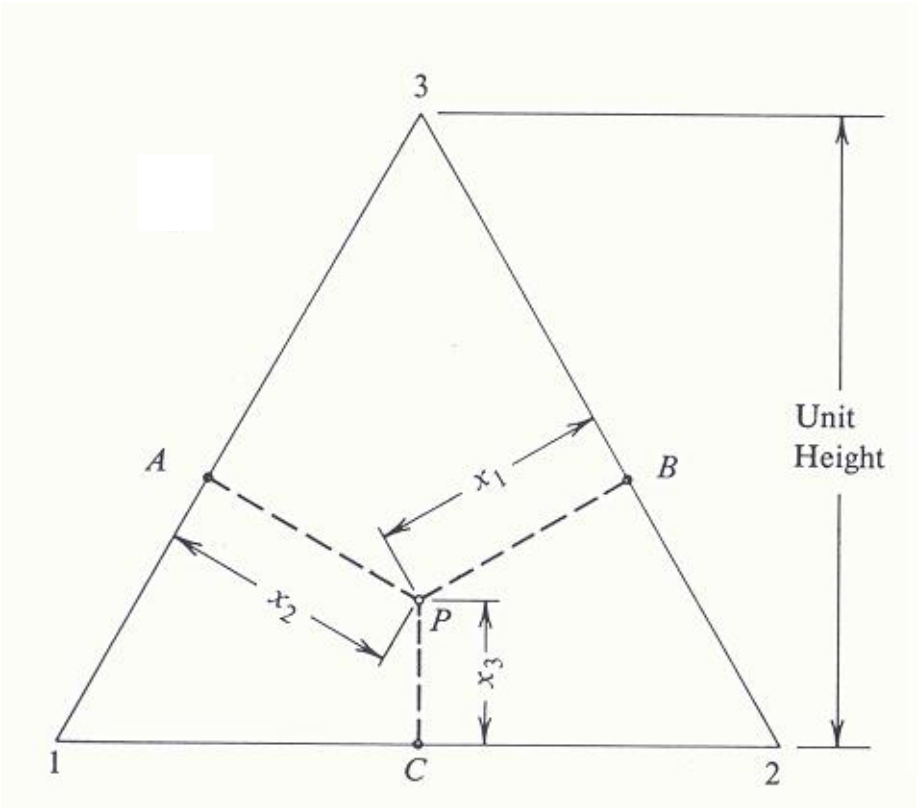
Zolfo + benzene

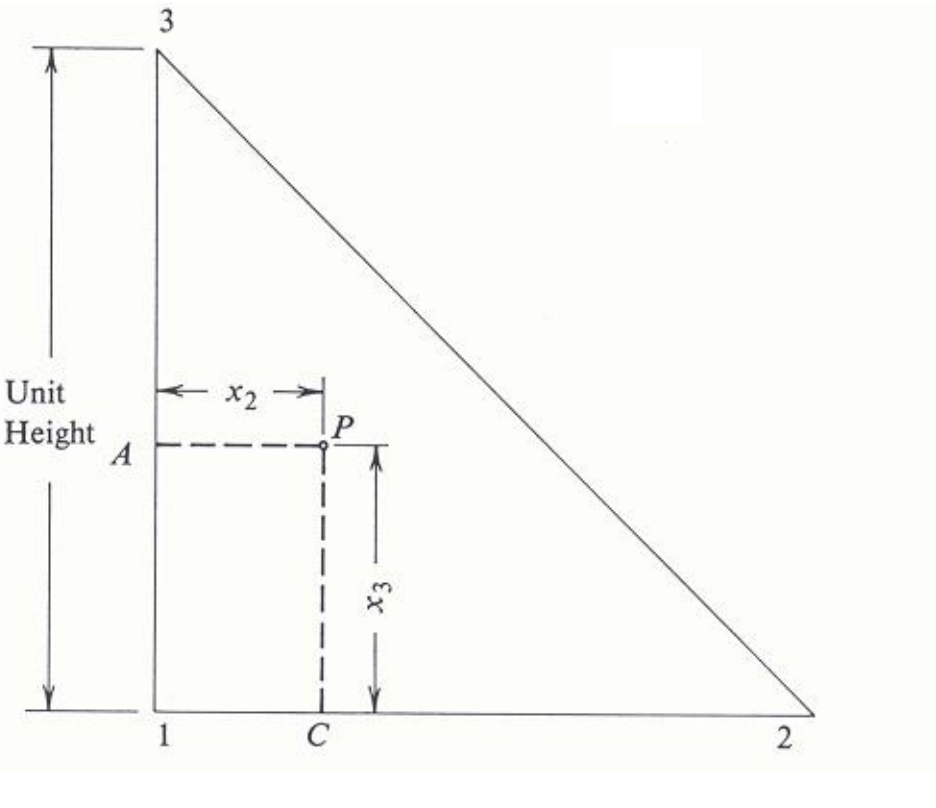
Equilibrio liquido - liquido



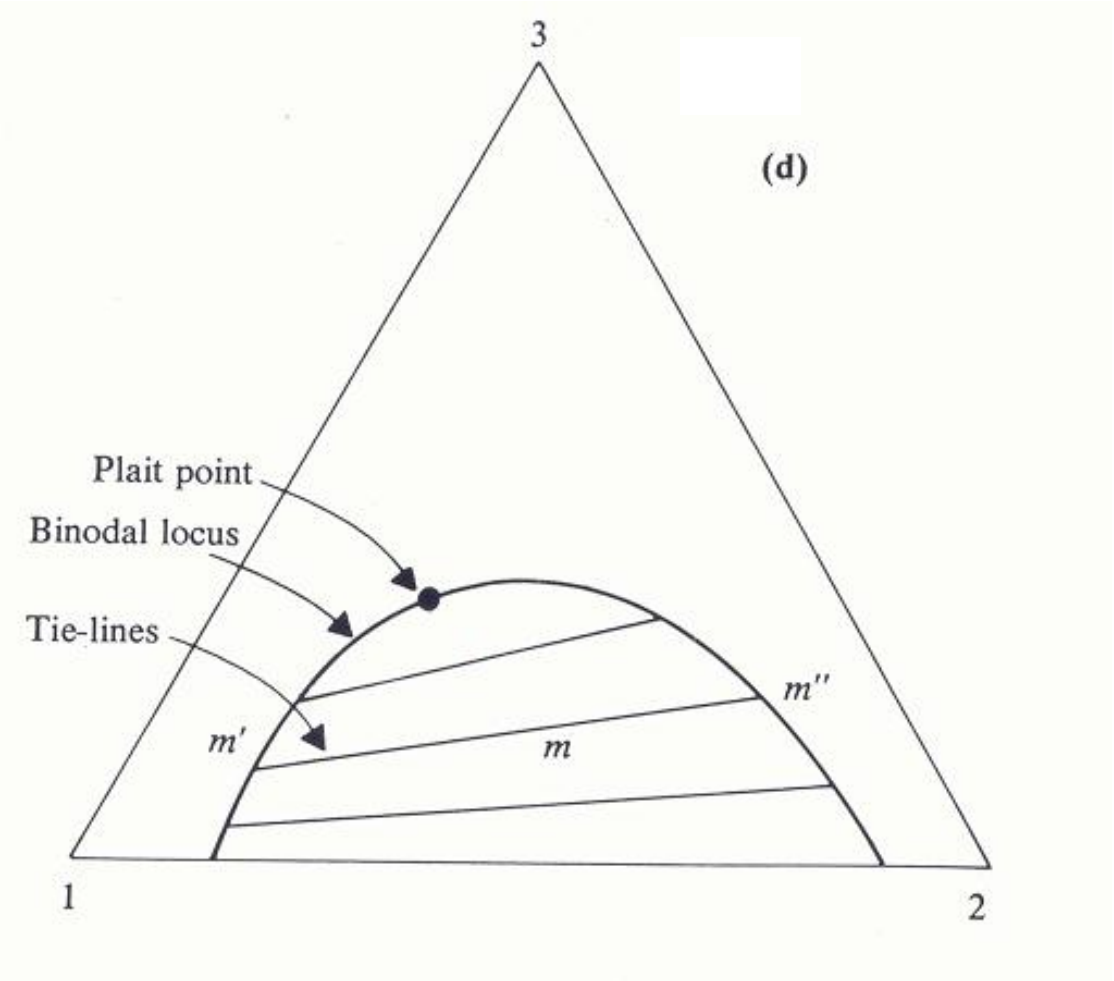
Acqua + metil, etil chetone

Equilibrio liquido – liquido – Sistemi ternari

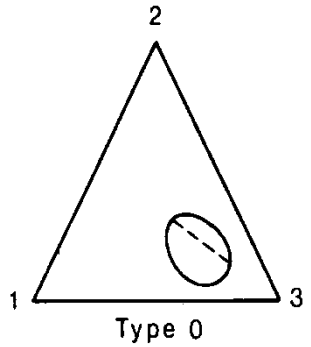




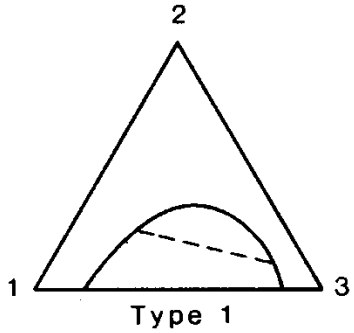
Equilibrio liquido – liquido – Sistemi ternari



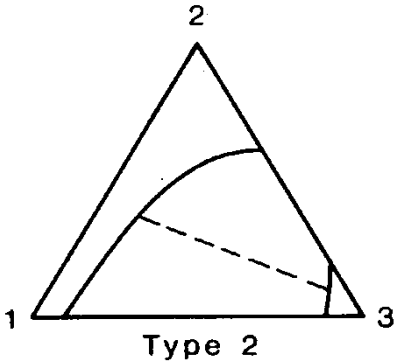
Equilibrio liquido – liquido – Sistemi ternari



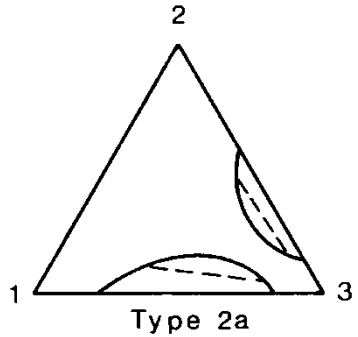
Type 0



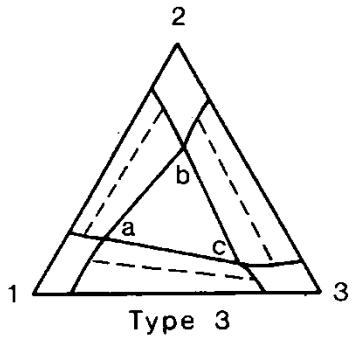
Type 1



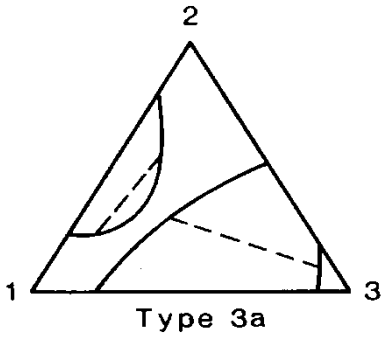
Type 2



Type 2a



Type 3



Type 3a

Equilibrio liquido - liquido

Table 7.3. Sample Page from Sorensen & Arlt, DECHEMA Liquid-Liquid Equilibrium Data Collection, vol 5, part 2 (1980).

(1) C7H8 TOLUENE

(2) C3H6O 2-PROPANONE

(3) H2O WATER

HACKL A., SOLAR W., ZIEBLAND G.
EUR.FED.CHEM.ENG.,RECOMM.SYST.LIQ.EXTR.STUD.,EDITOR:T.MISEK
(1978)

TEMPERATURE = 10.0 DEG C TYPE OF SYSTEM = 1

EXPERIMENTAL TIE LINES IN MOLE PCT (GRAPH.INTERPOL.)

LEFT PHASE			RIGHT PHASE		
(1)	(2)	(3)	(1)	(2)	(3)
99.587	0.158	0.255	0.010	0.056	99.934
98.110	1.637	0.254	0.010	0.537	99.453
96.558	2.938	0.504	0.010	0.918	99.072
95.497	4.001	0.502	0.010	1.227	98.763
94.612	4.887	0.500	0.010	1.434	98.506
91.710	7.796	0.495	0.010	2.324	97.666
88.300	10.969	0.732	0.021	3.270	96.709
83.486	15.558	0.956	0.022	4.599	95.380
80.002	18.820	1.178	0.033	5.516	94.451
76.752	21.854	1.393	0.034	6.432	93.534
72.635	25.768	1.597	0.046	7.470	92.484
66.126	31.880	1.994	0.059	9.158	90.783

SPECIFIC MODEL PARAMETERS IN KELVIN

	UNIQUAC		NRTL(ALPHA=.2)	
I J	AIJ	AJI	AIJ	AJI
1 2	115.14	29.585	211.69	14.071
1 3	814.64	334.88	1057.6	1643.2
2 3	317.21	-22.287	366.44	250.69

R1 = 3.9228 R2 = 2.5735 R3 = 0.9200
Q1 = 2.968 Q2 = 2.336 Q3 = 1.400

MEAN DEV. BETWEEN CALC. AND EXP. CONC. IN MOLE PCT

UNIQUAC (SPECIFIC PARAMETERS)	0.05
NRTL (SPECIFIC PARAMETERS)	0.09