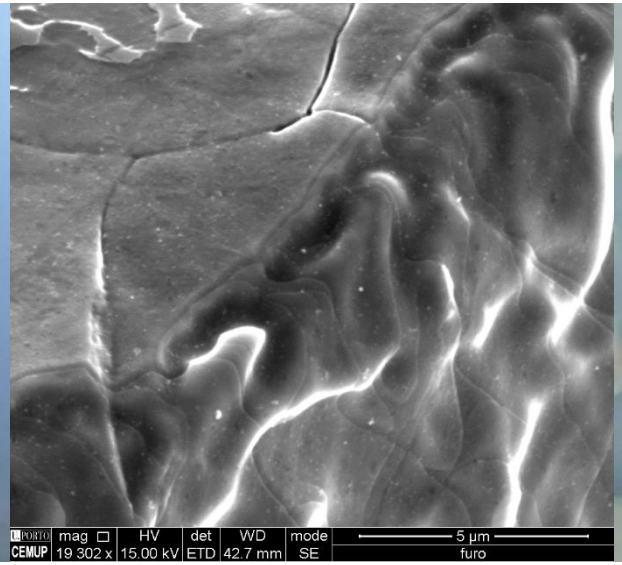
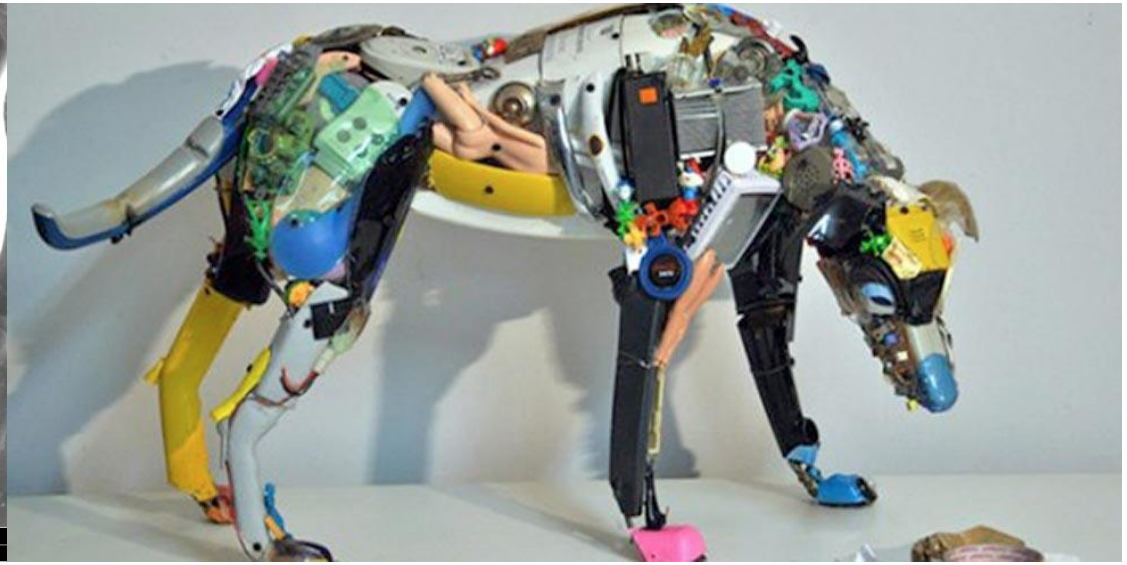
Physical Chemistry

... iremos explorar, refletir, aprender ?..

Area of chemistry concerned with the **application of the techniques and theories of physics** to the study of chemical systems.





Partially miscible liquids

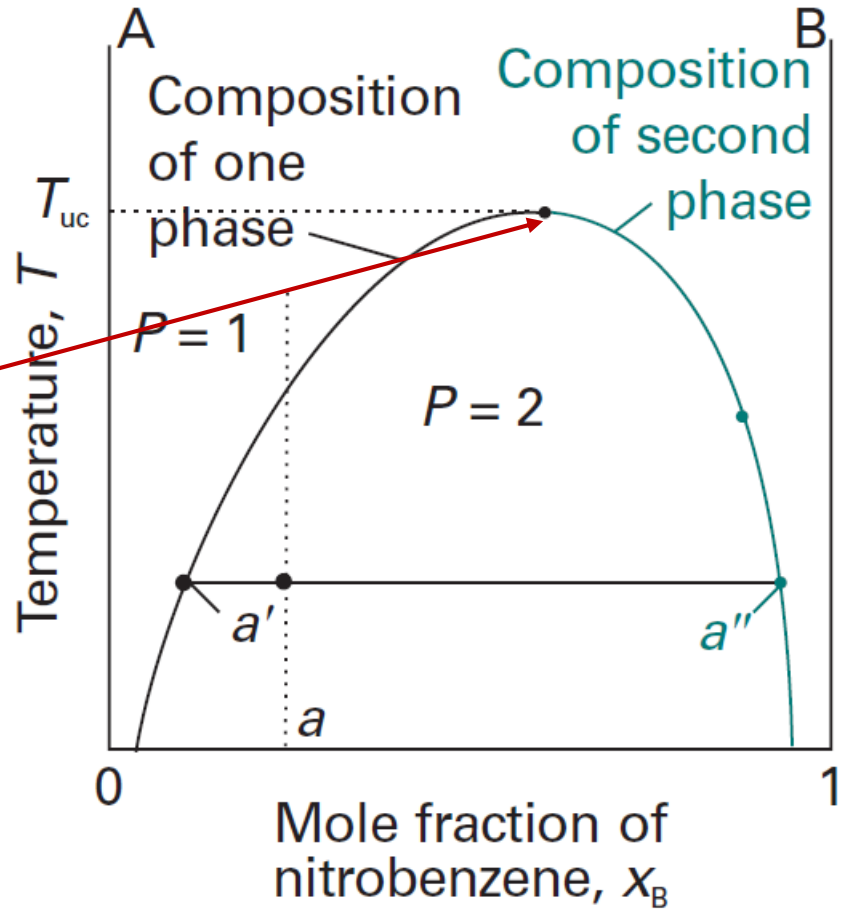
Hexane and **Nitrobenzene**

Upper critical solution **temperature,** T_{uc}

Composition of Phases Are the same !!

miscible

$$\partial \Delta_{mix} G / \partial x = 0$$



Imiscible Liquids

lever rule

Example 6.2 *Interpreting a liquid–liquid phase diagram*

A mixture of 50 g of hexane (0.59 mol C_6H_{14}) and 50 g of nitrobenzene (0.41 mol $C_6H_5NO_2$) was prepared at 290 K. What are the compositions of the phases, and in what proportions do they occur? To what temperature must the sample be heated in order to obtain a single phase?

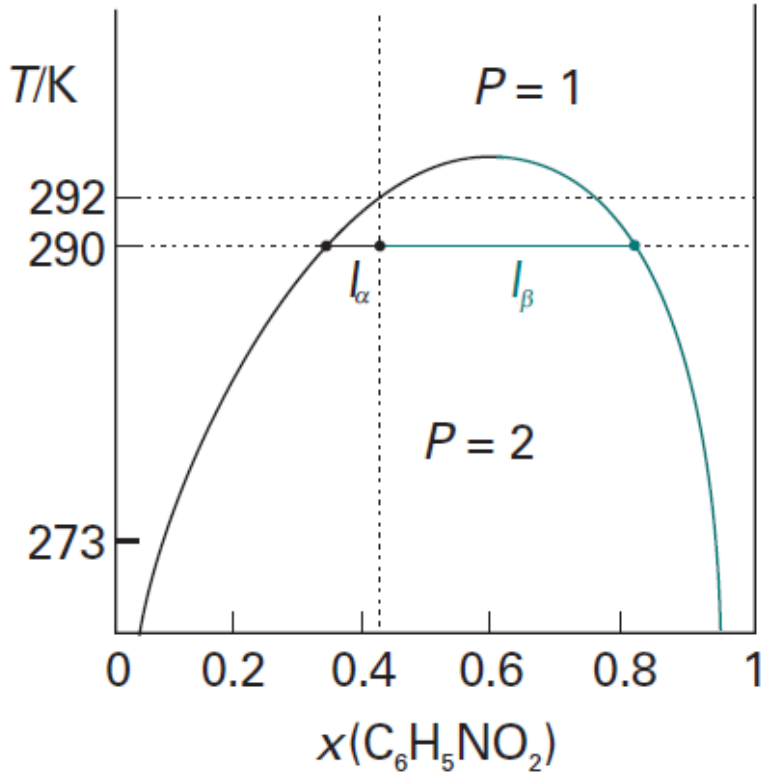


Fig. 6.20 The temperature–composition diagram for hexane and nitrobenzene at 1 atm again, with the points and lengths discussed in the text.

Phase diagrams

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Partially miscible liquids

Lower critical solution **temperature,** T_{lc}

Composition of Phases Are the same !!

miscible

$$\partial \Delta_{mix} G / \partial x = 0$$

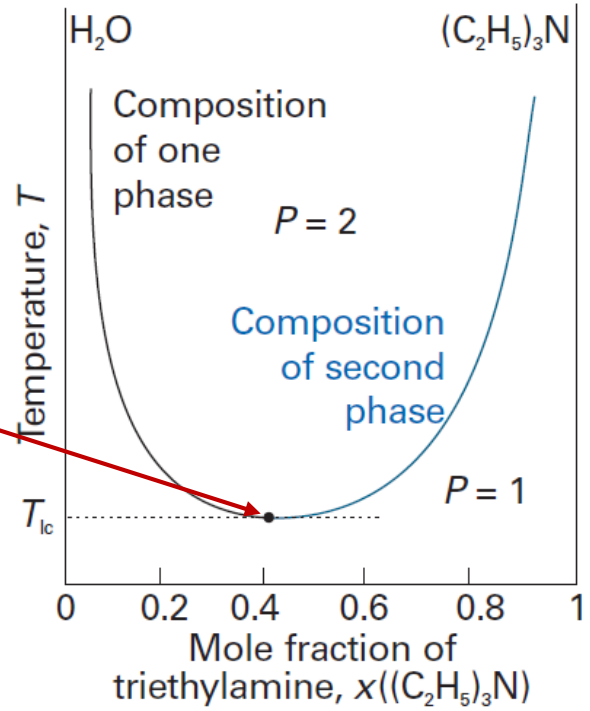
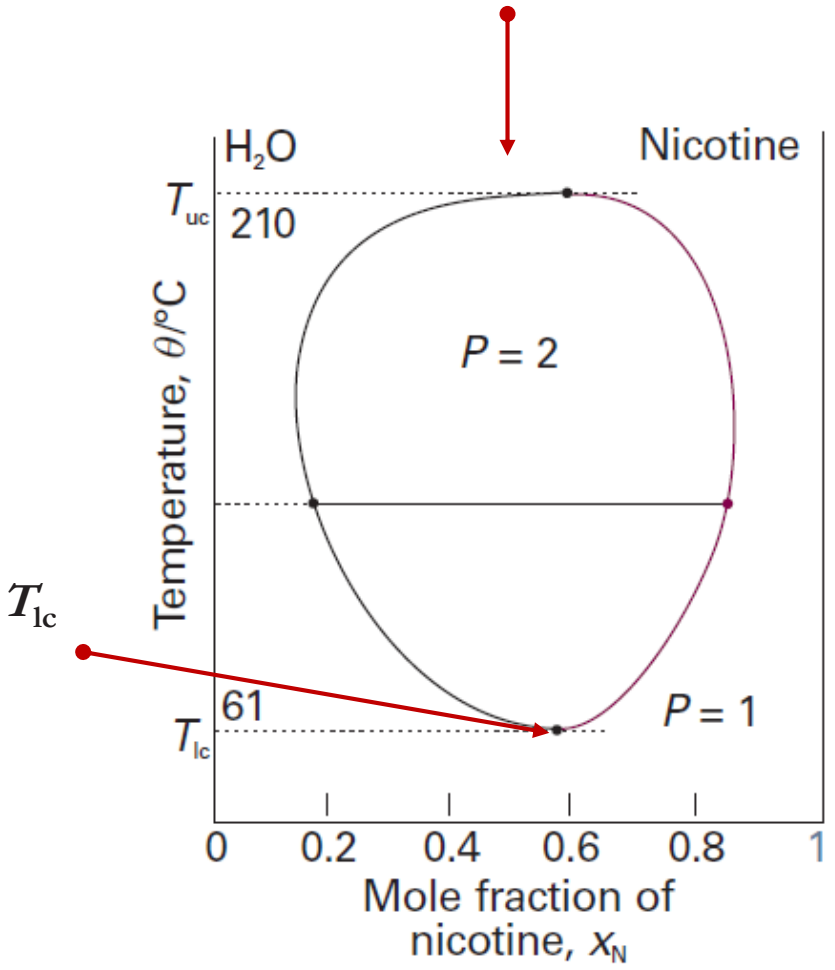


Fig. 6.24 The temperature–composition diagram for water and triethylamine. This system shows a lower critical temperature at 292 K. The labels indicate the interpretation of the boundaries.

Upper critical solution **temperature,** T_{uc}



Phase diagrams

Azeotropes

Upper critical solution **temperature,** T_{uc}

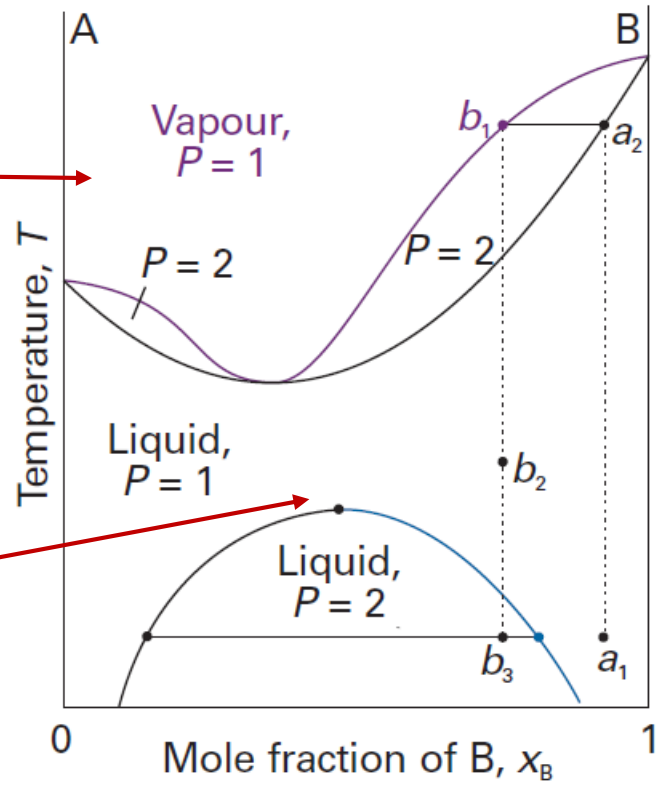


Fig. 6.26 The temperature–composition diagram for a binary system in which the upper critical temperature is less than the boiling point at all compositions. The mixture forms a low-boiling azeotrope.

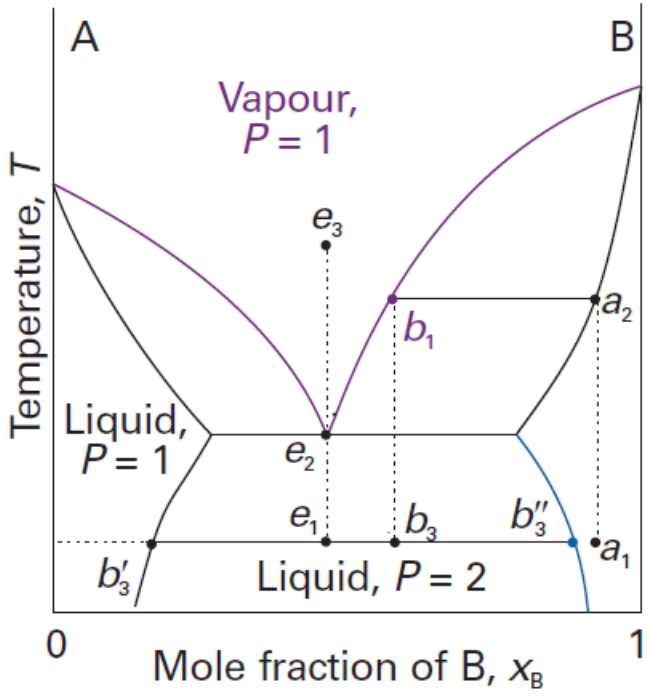
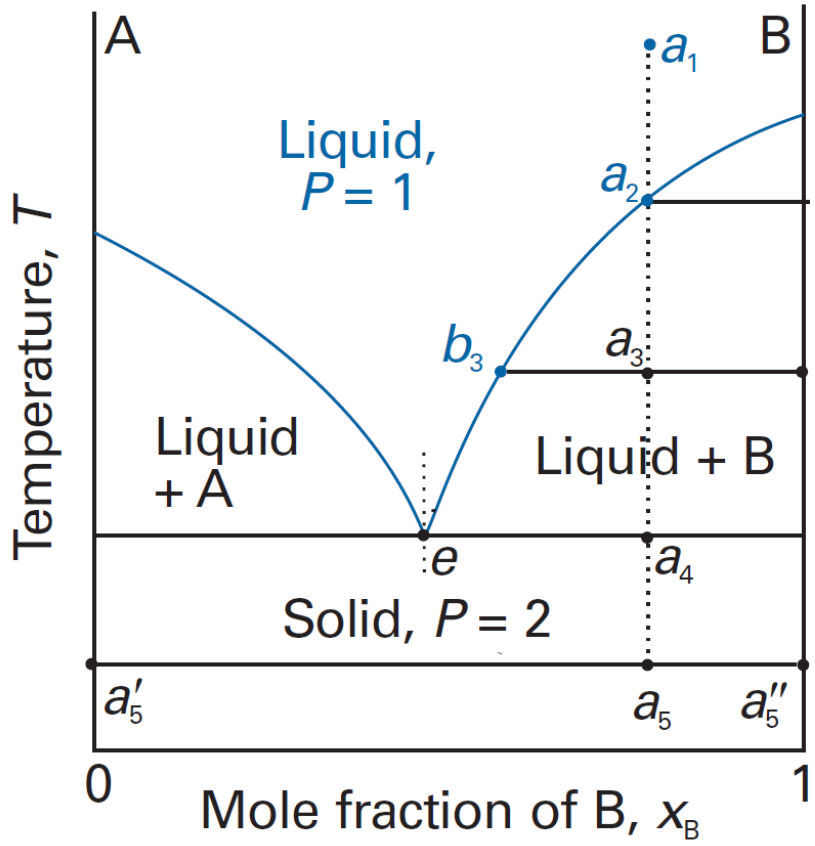
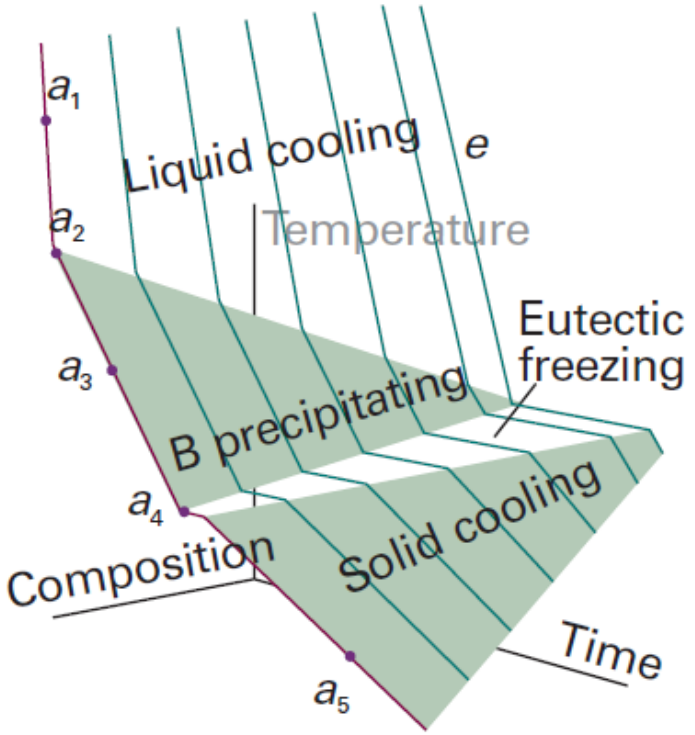


Fig. 6.27 The temperature–composition diagram for a binary system in which boiling occurs before the two liquids are fully miscible.

Phase diagrams

Liquid–solid phase diagrams





Phase diagrams

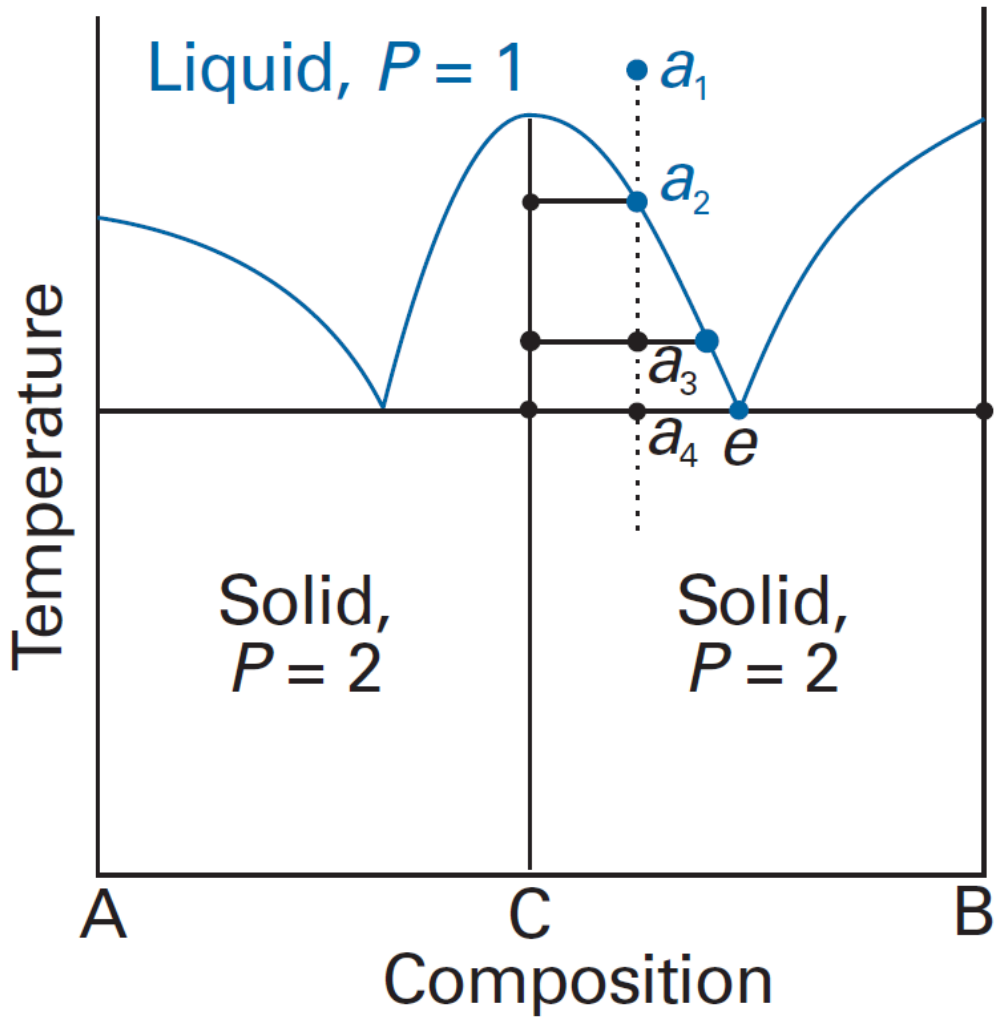
$Ga + As \rightarrow GaAs.$

Liquid–solid phase diagrams

The pure compound C melts **congruently,** composition of the liquid is the same as solid!

C .... AB

$X_A = 0.5$



Phase diagrams

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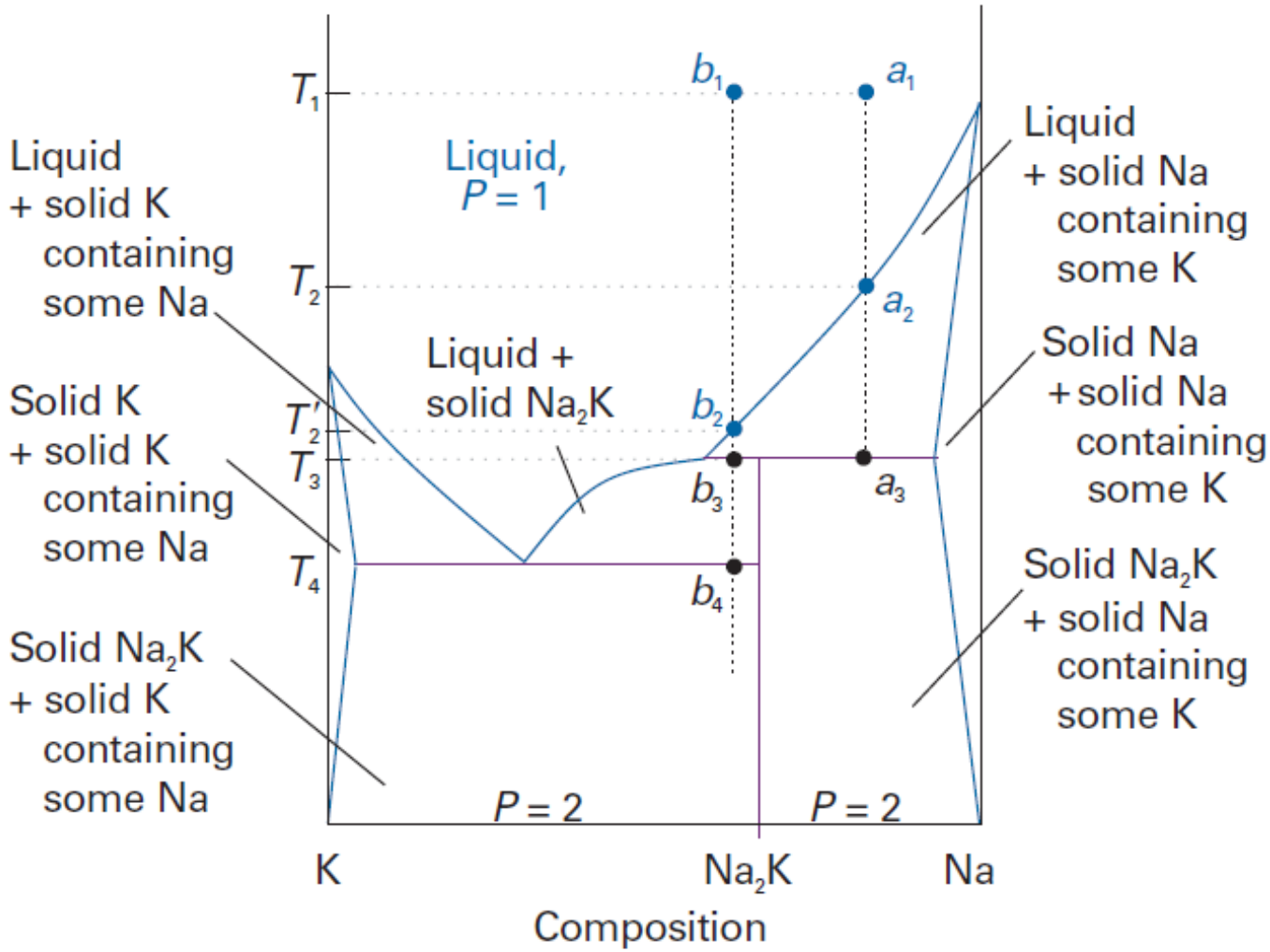
Ga + As → GaAs.

Liquid–solid phase diagrams

The pure compound C melts in**congruently**, composition of the liquid is not the same as solid!

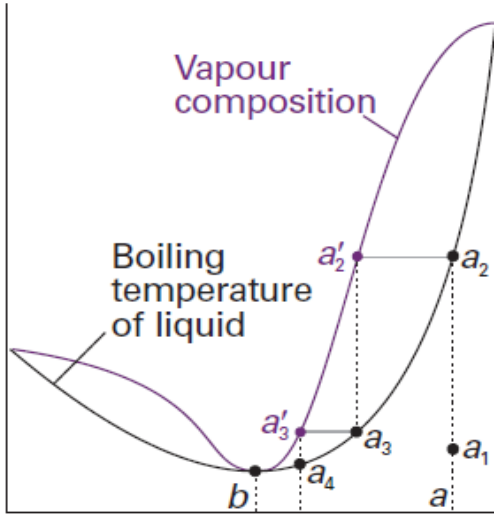
C .... A_2B

$X_A = 0.66(6)$

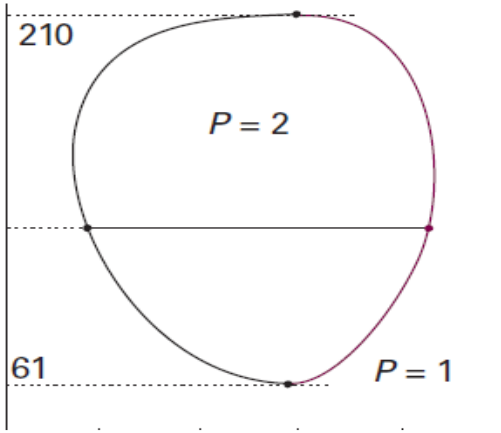


Phase diagrams

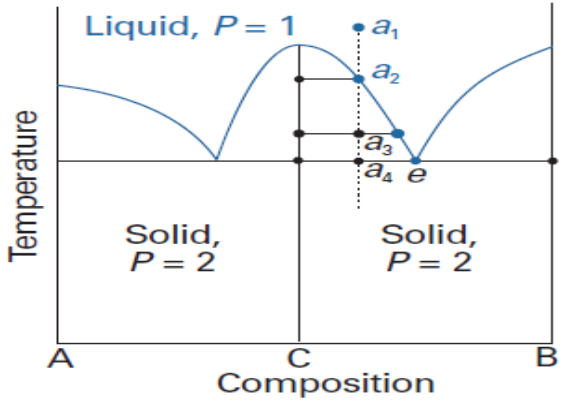
Liquid–vapor phase diagrams



Liquid–liquid phase diagrams



Liquid–solid phase diagrams

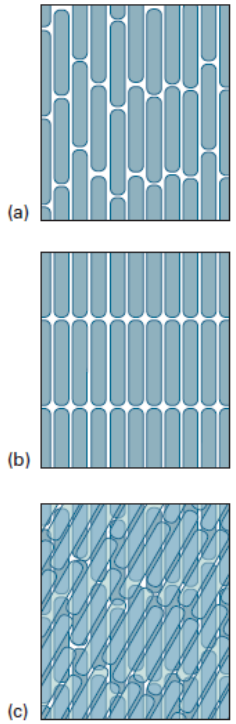


Phase diagrams

(a) **nematic** phase

(b) **Smectic** phase

(c) **cholesteric** phase



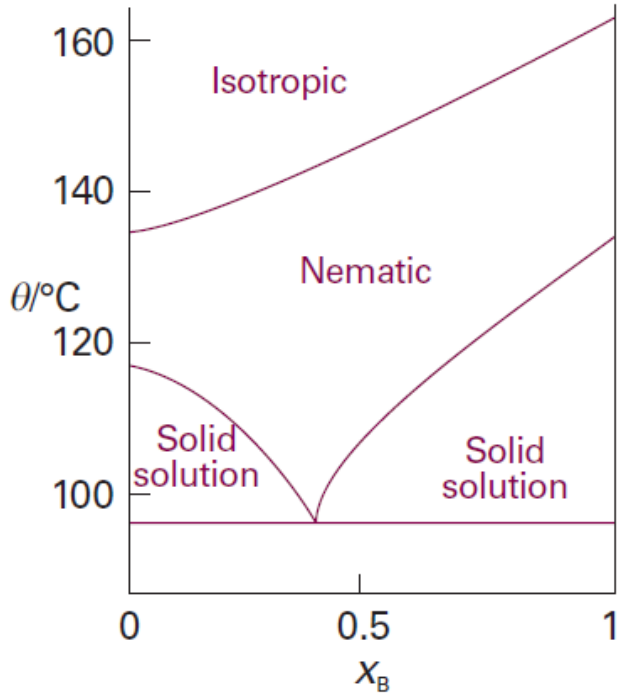


Fig. 6.34 The phase diagram at 1 atm for a binary system of two liquid crystalline materials, 4,4′-dimethoxyazoxybenzene (A) and 4,4′-diethoxyazoxybenzene (B).

Phase diagrams

Zone refining

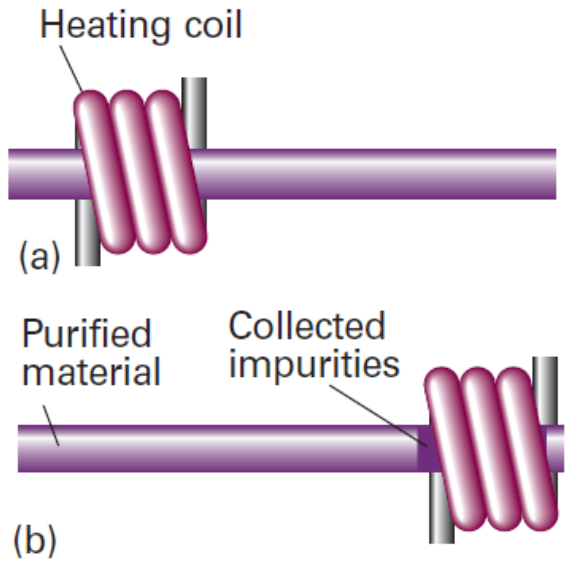


Fig. 6.35 The procedure for zone refining.

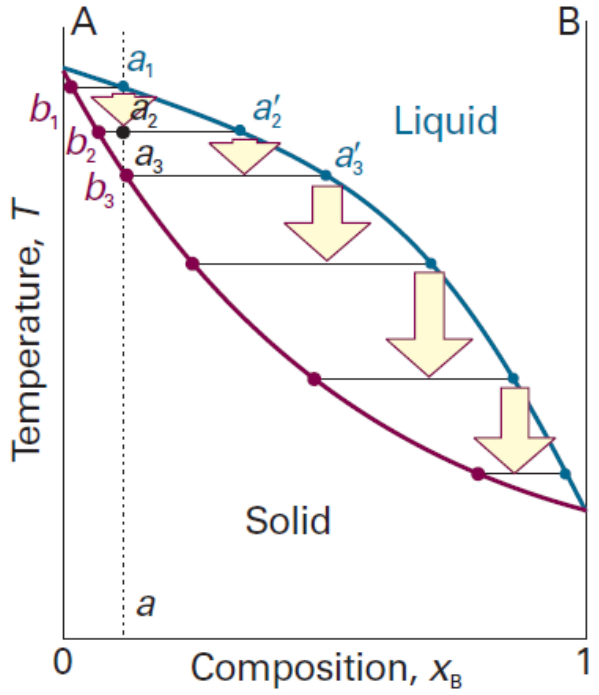


Fig. 6.36 A binary temperature–composition diagram can be used to discuss zone refining, as explained in the text.

More complex …. Phase diagrams