



UNIVERSITÄT  
HEIDELBERG  
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SEIT 1386

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# Physikalische Chemie II (PCII) – Thermodynamik

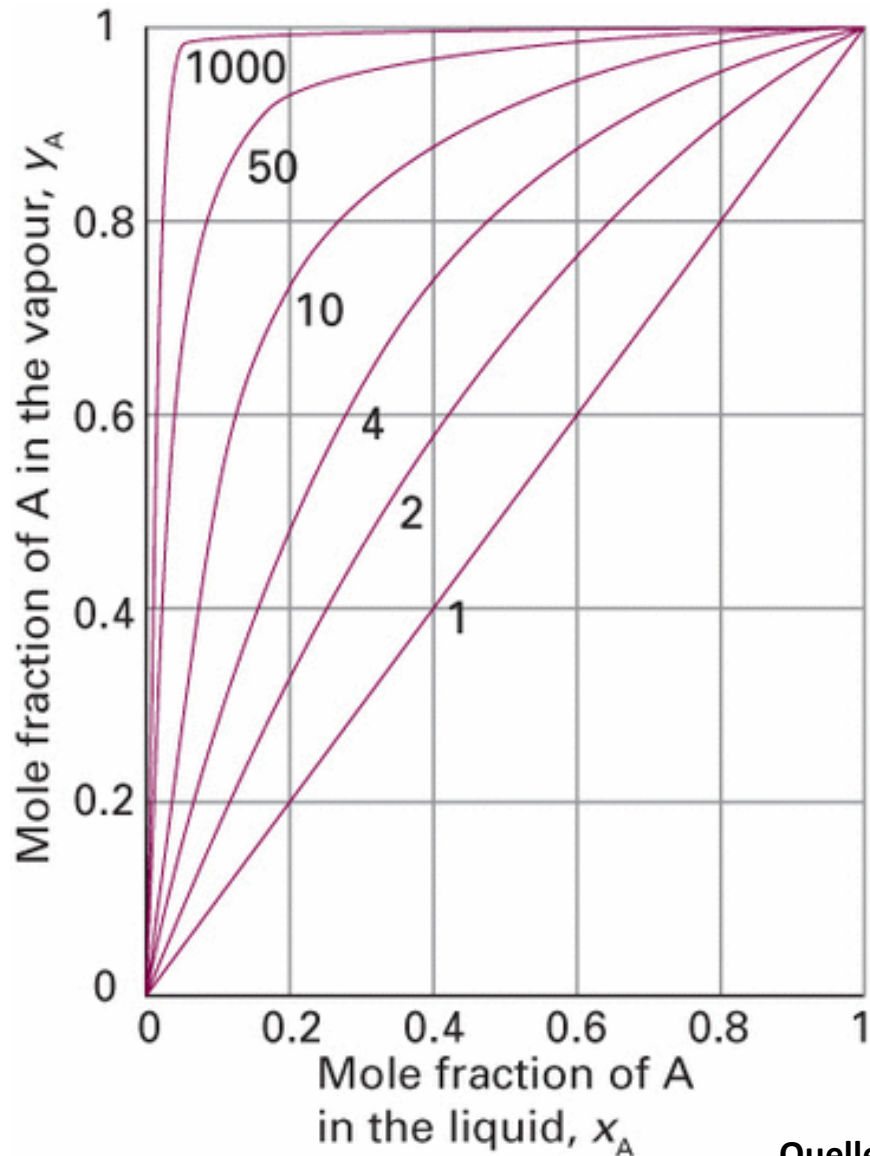
Vorlesung und Übung (LSF#105129 & LSF#101277) - SWS: 4 + 2  
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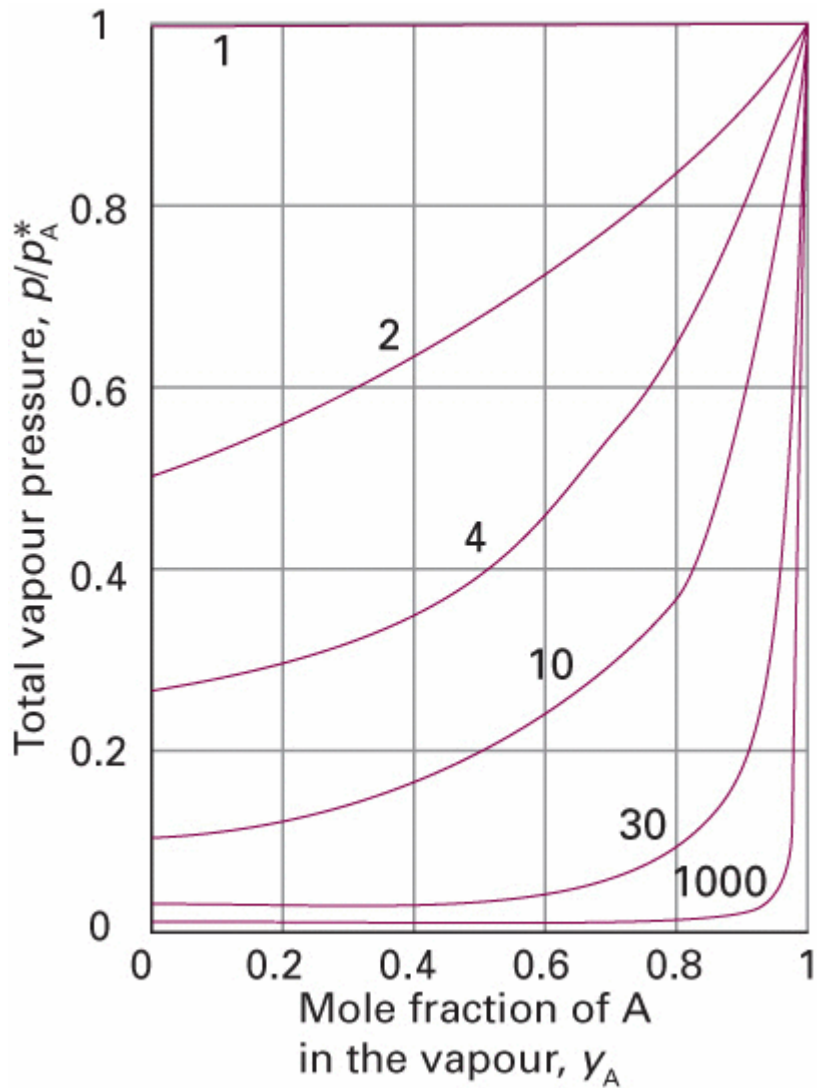


Der Molenbruch der Komponente A im Dampf einer binären idealen Mischung, aufgetragen gegen den Molenbruch von A in der flüssigen Phase. Für verschiedene Werte von  $p_A^0 / p_B^0$  (damit sind die Kurven beschriftet).

Annahme:  
die Flüchtigkeit von A ist größer als die von B.

In allen Fällen ist der Anteil von A im Dampf höher als in der Flüssigkeit.

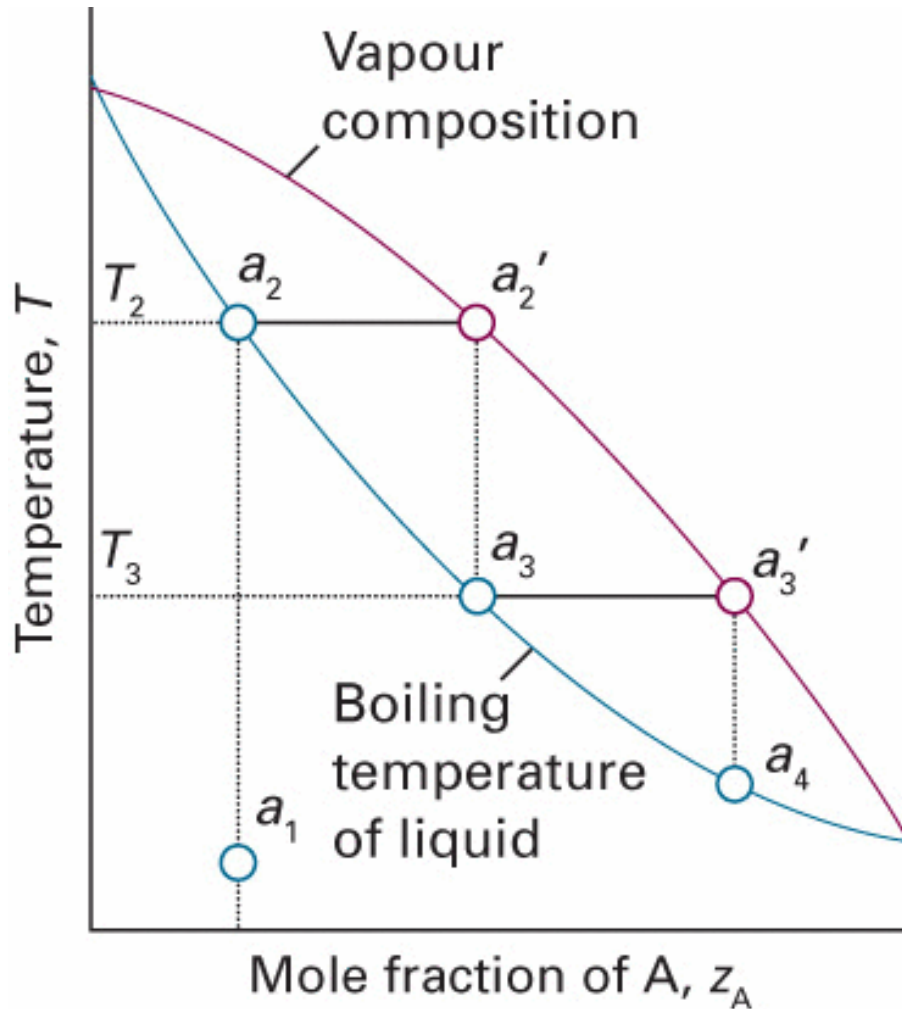
Quelle: P. Atkins, J. de Paula; Physical Chemistry



Der Dampfdruck des gleichen Systems wie in der vorherigen Abb., hier jedoch aufgetragen gegen den Molenbruch von A im Dampf. Für verschiedene Werte von  $p_A^0 / p_B^0$  (damit sind die Kurven beschriftet).

Quelle: P. Atkins, J. de Paula; Physical Chemistry

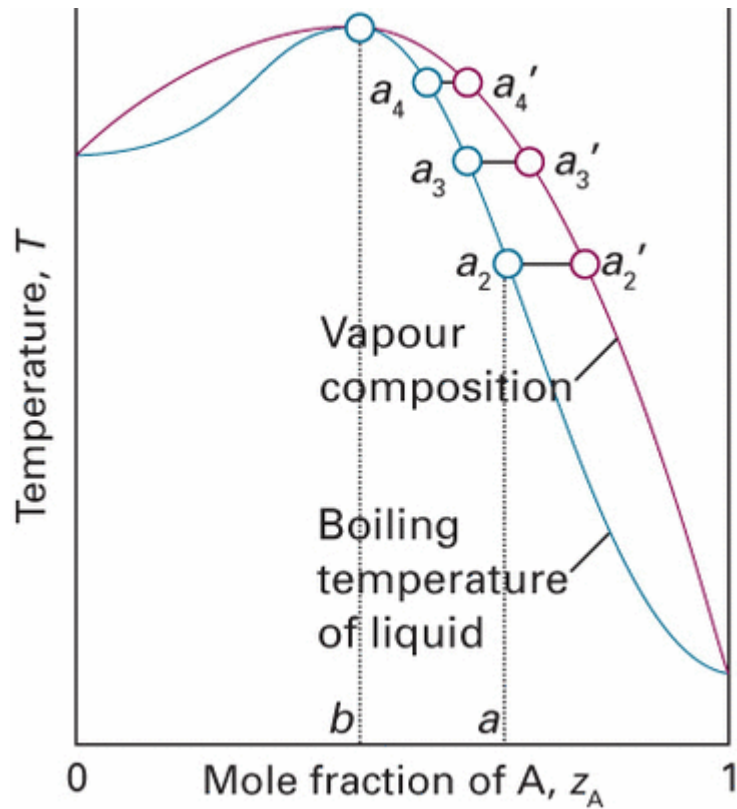
# Siedediagramme



Siedediagramm einer idealen Mischung; Komponente A ist flüchtiger als Komponente B. Wird eine Mischung der Zusammensetzung  $a_1$  mehrmals erhitzt und wieder kondensiert, wird als Kondensat schließlich reines A erhalten.

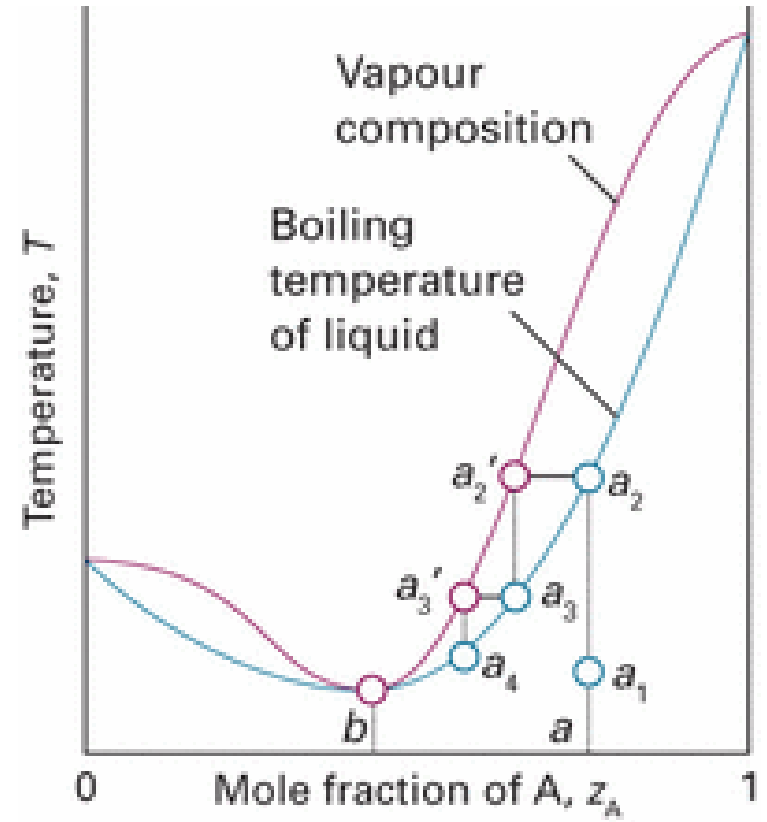
Quelle: P. Atkins, J. de Paula; Physical Chemistry

## Siedediagramme



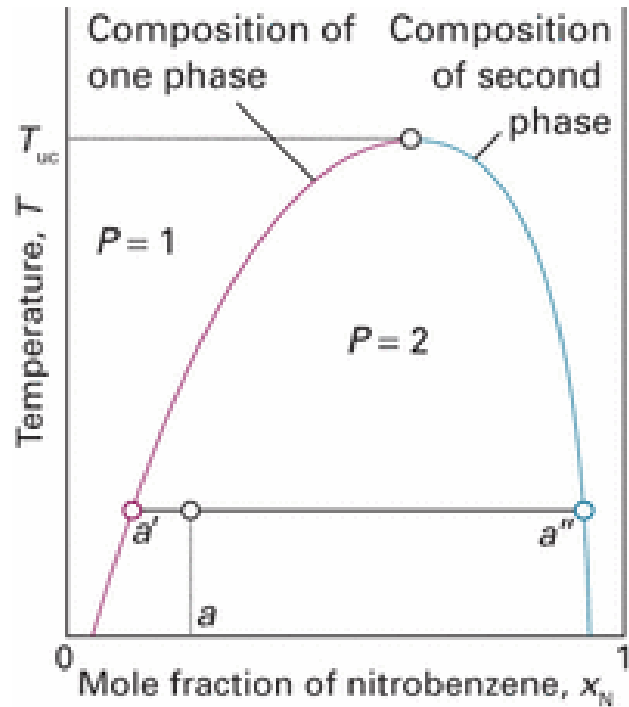
A high-boiling azeotrope. When the liquid of composition  $a$  is distilled, the composition of the remaining liquid changes towards  $b$  but no further.

Quelle: P. Atkins, J. de Paula; Physical Chemistry

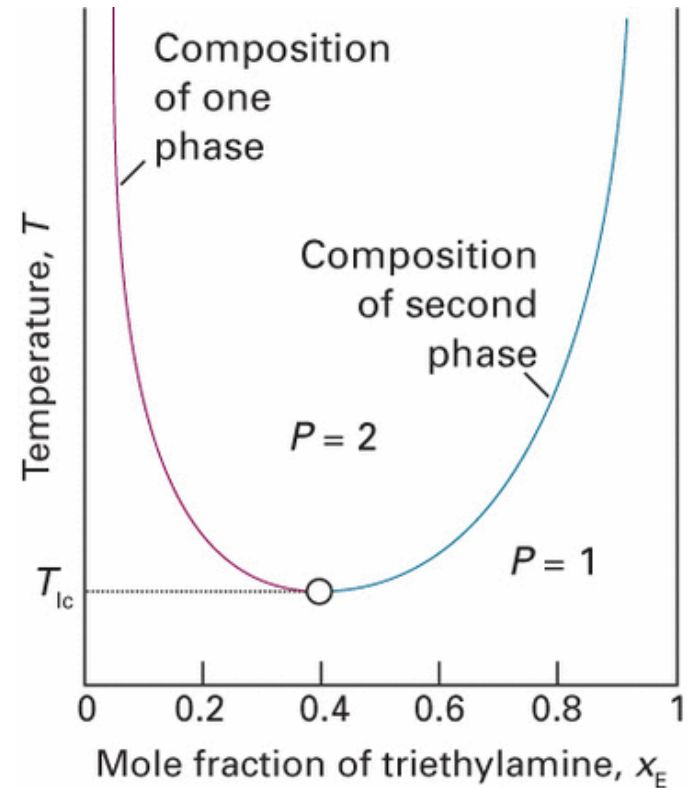


A low-boiling azeotrope. When the mixture at  $a$  is fractionally distilled, the vapour in equilibrium in the fractionating column moves towards  $b$  and then remains unchanged.

# Flüssig/Flüssig-Phasendiagramme



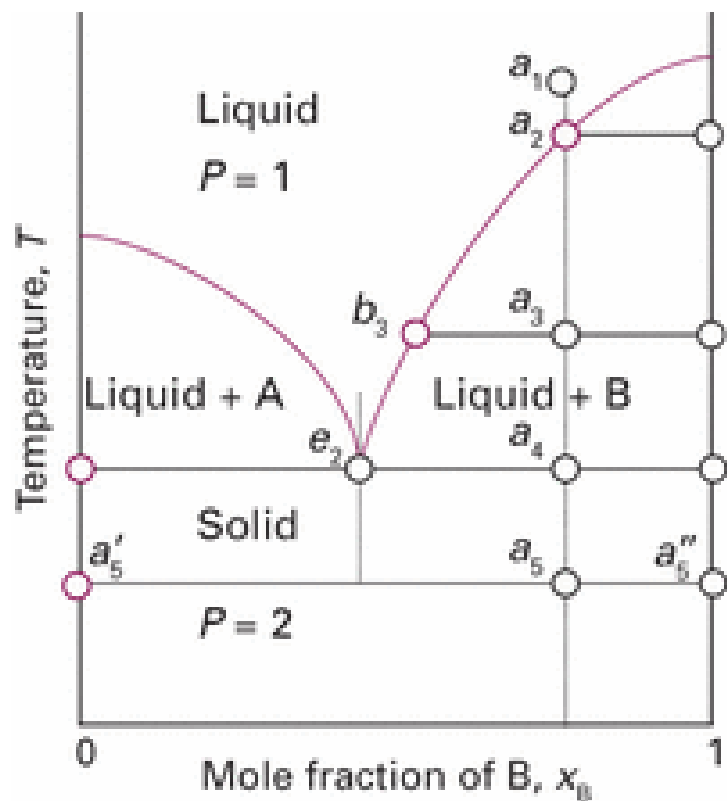
The temperature–composition diagram for hexane and nitrobenzene at 1 atm. The region below the curve corresponds to the compositions and temperatures at which the liquids are partially miscible. The upper critical temperature,  $T_{UC}$ , is the temperature above which the two liquids are miscible in all proportions.



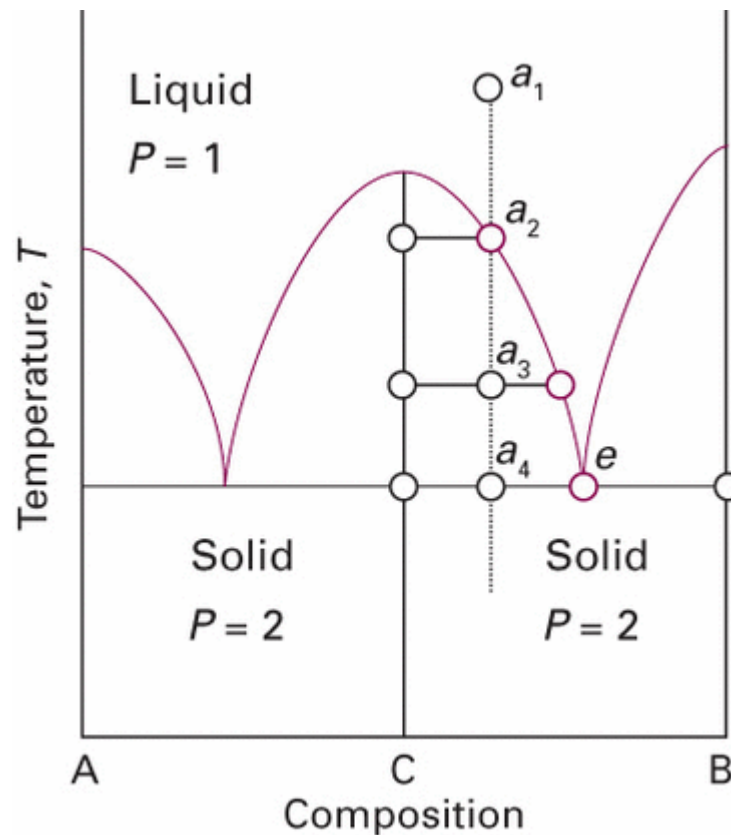
The temperature–composition diagram for water and triethylamine. This system shows a lower critical temperature at 292 K. The labels indicate the interpretation of the boundaries.

Quelle: P. Atkins, J. de Paula; Physical Chemistry

# Flüssig/Fest-Phasendiagramme



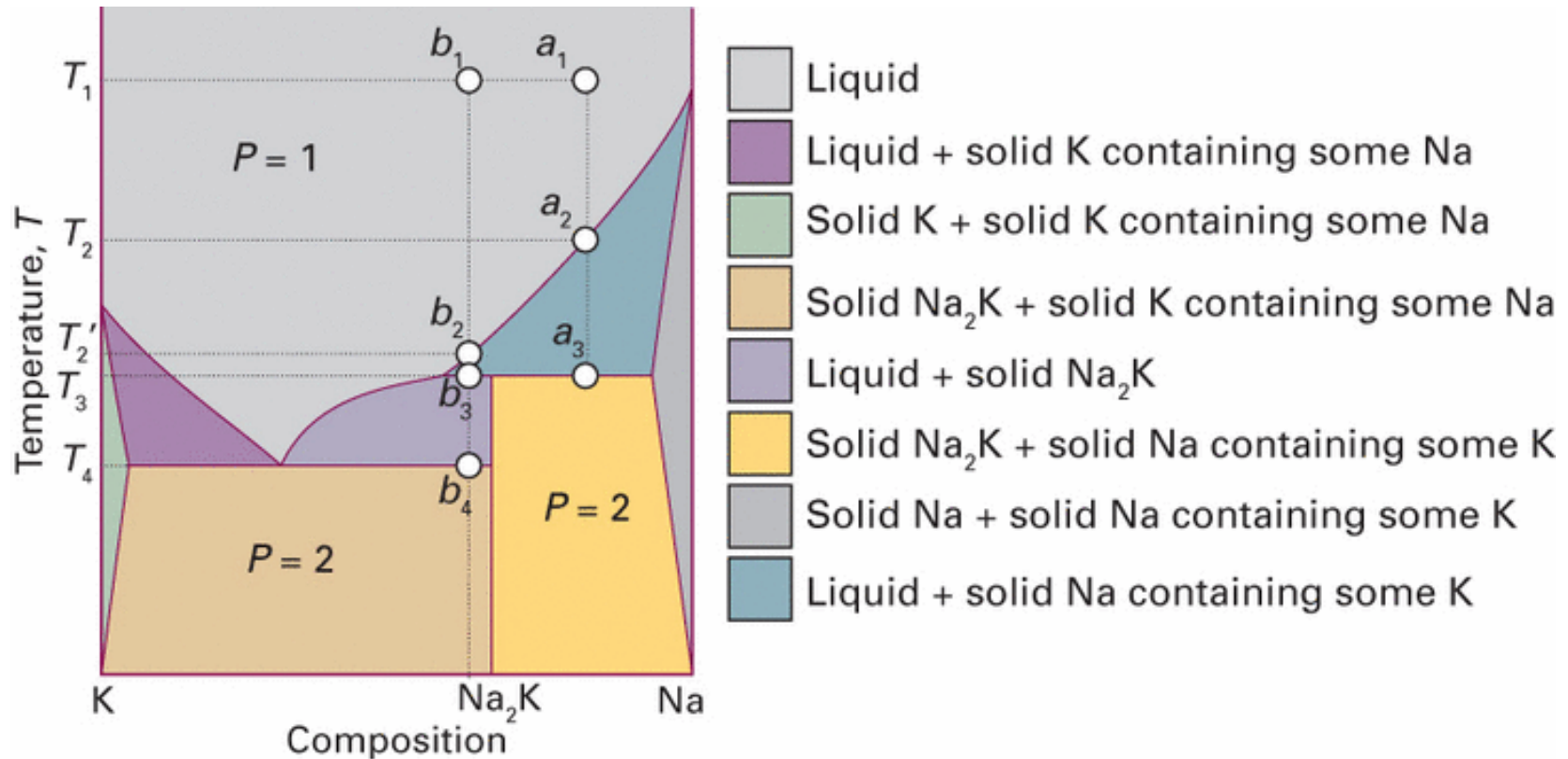
The temperature–composition phase diagram for two almost immiscible solids and their completely miscible liquids



The phase diagram for a system in which A and B react to form a compound  $C = AB$

Quelle: P. Atkins, J. de Paula; Physical Chemistry

# Flüssig/Fest-Phasendiagramme

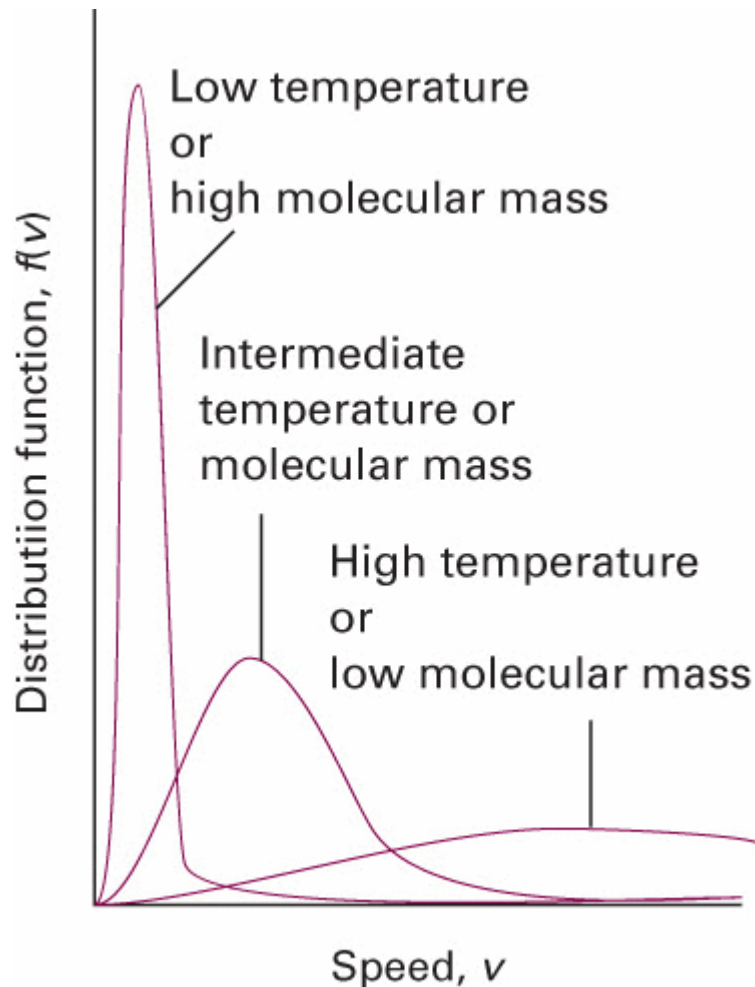


The phase diagram for an actual system (sodium and potassium).

Quelle: P. Atkins, J. de Paula; Physical Chemistry



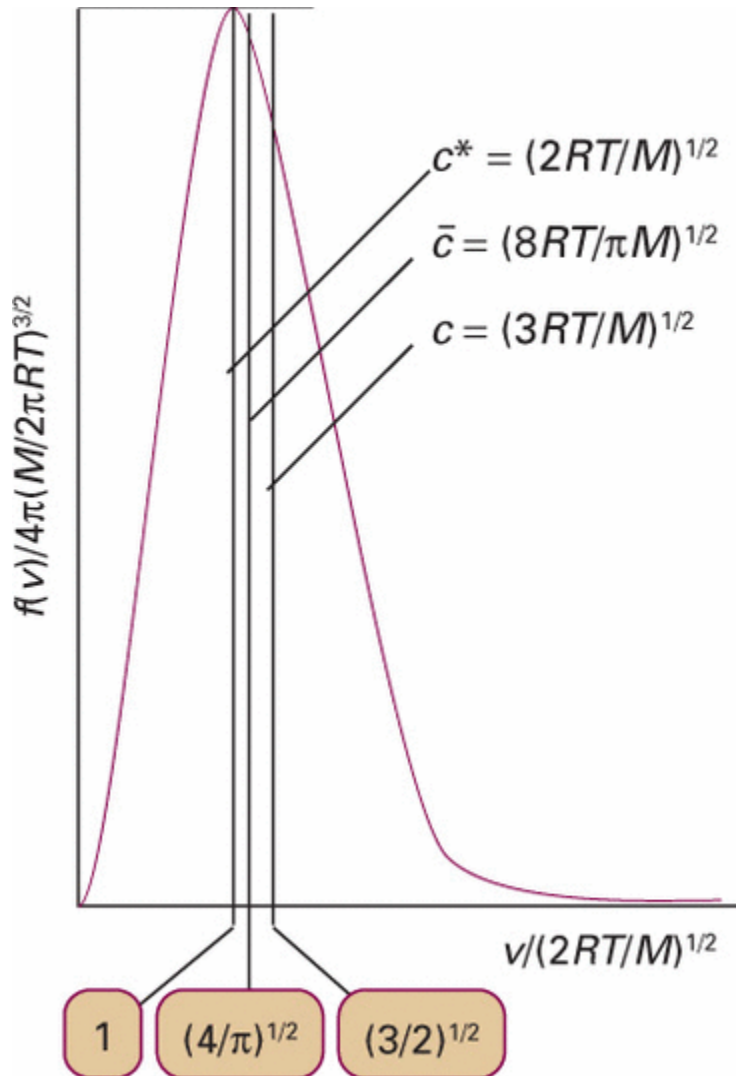
# Maxwell-Boltzmann-Geschwindigkeitsverteilung



The distribution of molecular speeds with temperature and molar mass. Note that the most probable speed (corresponding to the peak of the distribution) increases with temperature and with decreasing molar mass, and simultaneously the distribution becomes broader.

Quelle: P. Atkins, J. de Paula; Physical Chemistry

# Maxwell-Boltzmann-Geschwindigkeitsverteilung



A summary of the conclusions that can be deduced from the Maxwell distribution for molecules of molar mass  $M$  at a temperature  $T$ :  
 $c^*$  is the most probable speed,  
 $\bar{c}$  is the mean speed, and  
 $c$  is the root mean square speed.

Quelle: P. Atkins, J. de Paula; Physical Chemistry