

Thermodynamics of Solutions

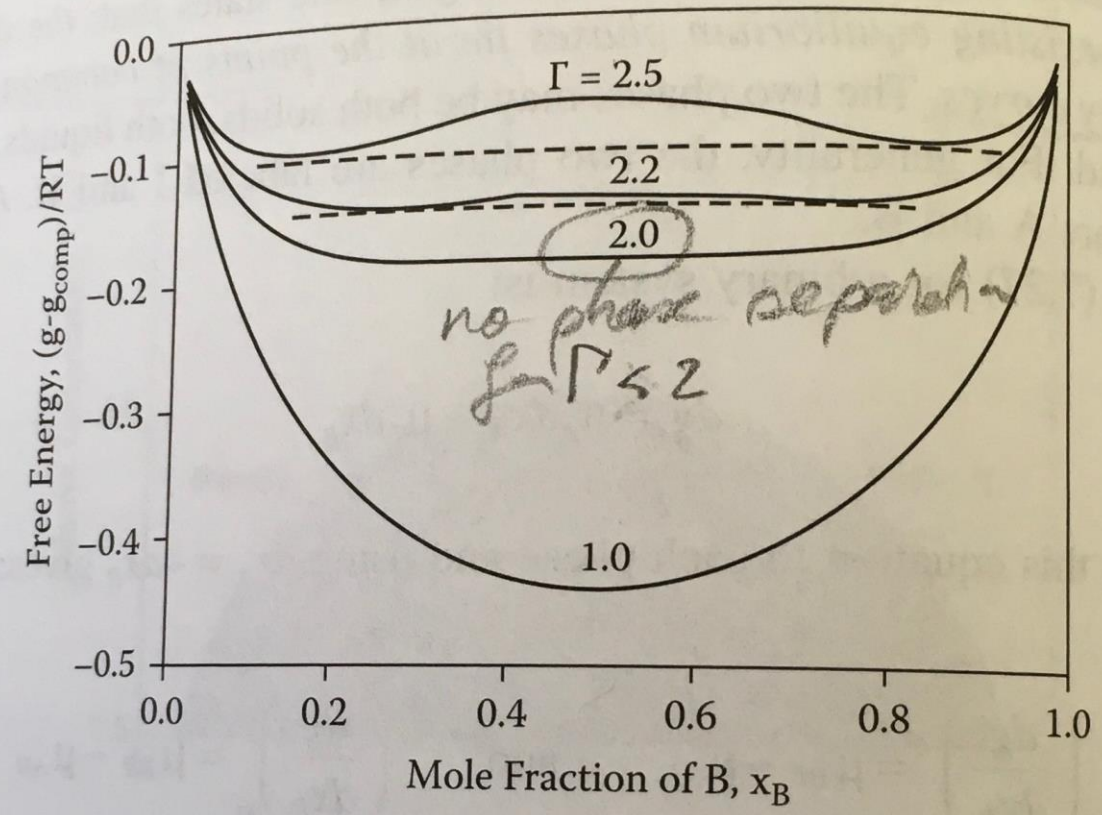


FIGURE 8.5 Graphical solution of the phase diagram for partially-miscible solution formation.

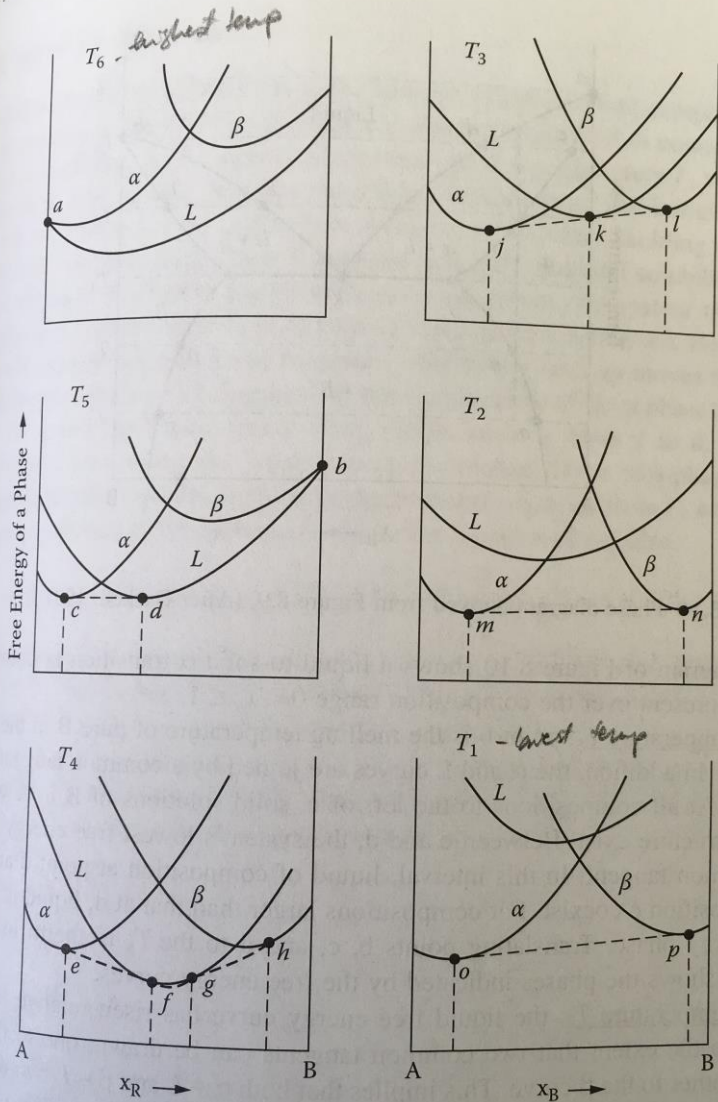


FIGURE 8.9 Free energy-composition curves for an A-B binary system with two solid phases (α and β) and a liquid phase. (From Gaskell, D. R. 1981. *Introduction to Metallurgical Thermodynamics*, 2nd ed. New York: McGraw-Hill. With permission.)

1. What does the phase diagram look like?
2. Is there a eutectic? If yes, at what temperature and composition?

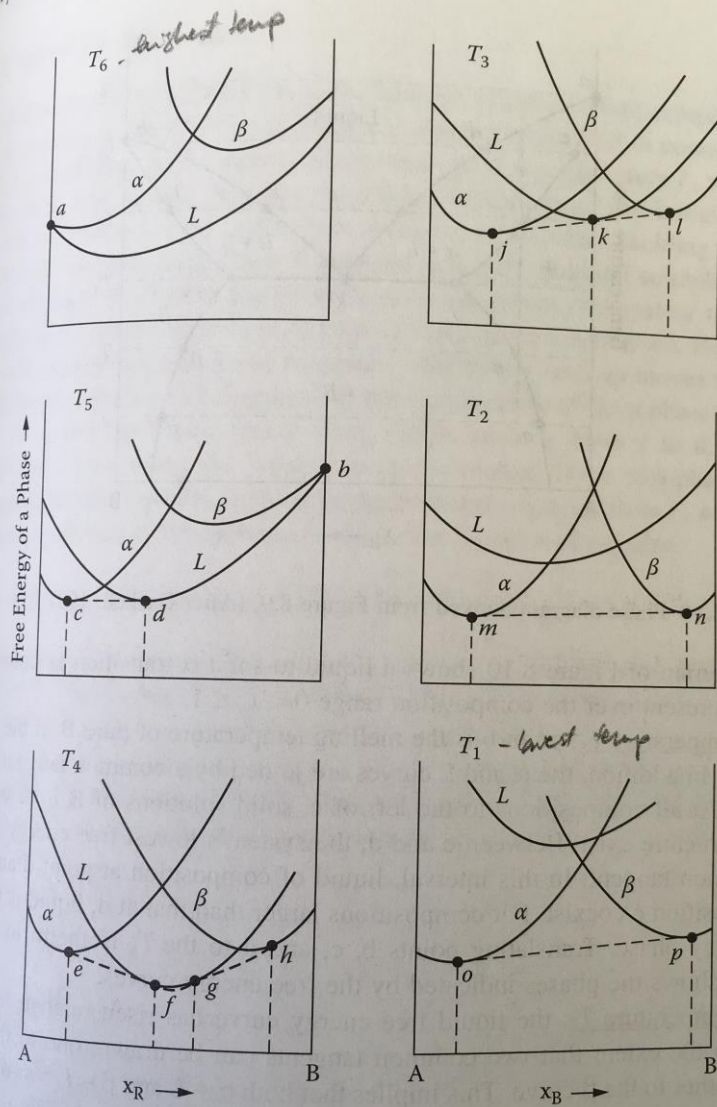


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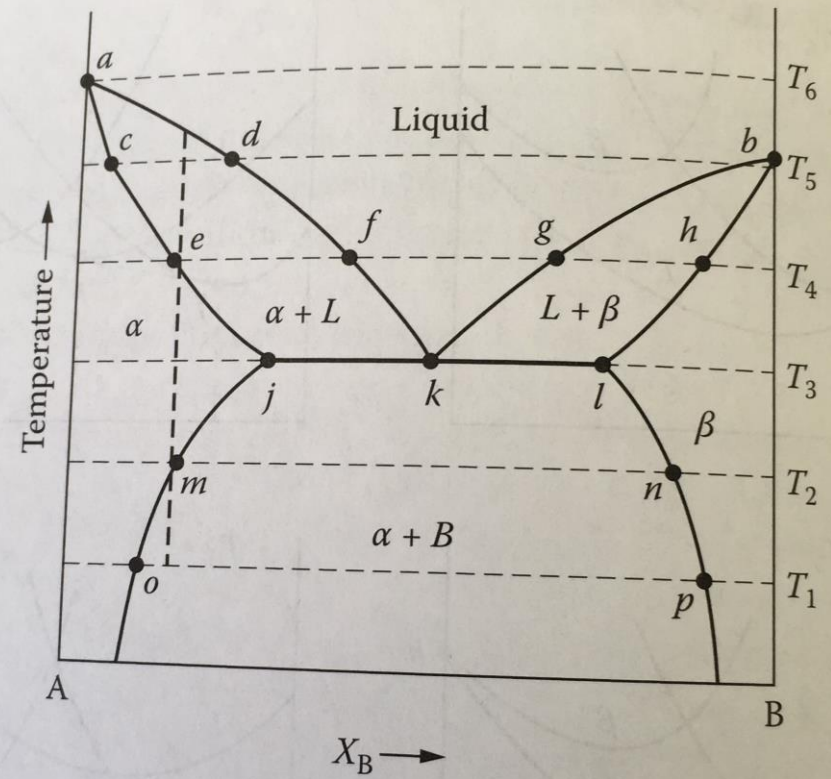


FIGURE 8.10 Phase diagram derived from Figure 8.9. (After Gaskell, 1981.)

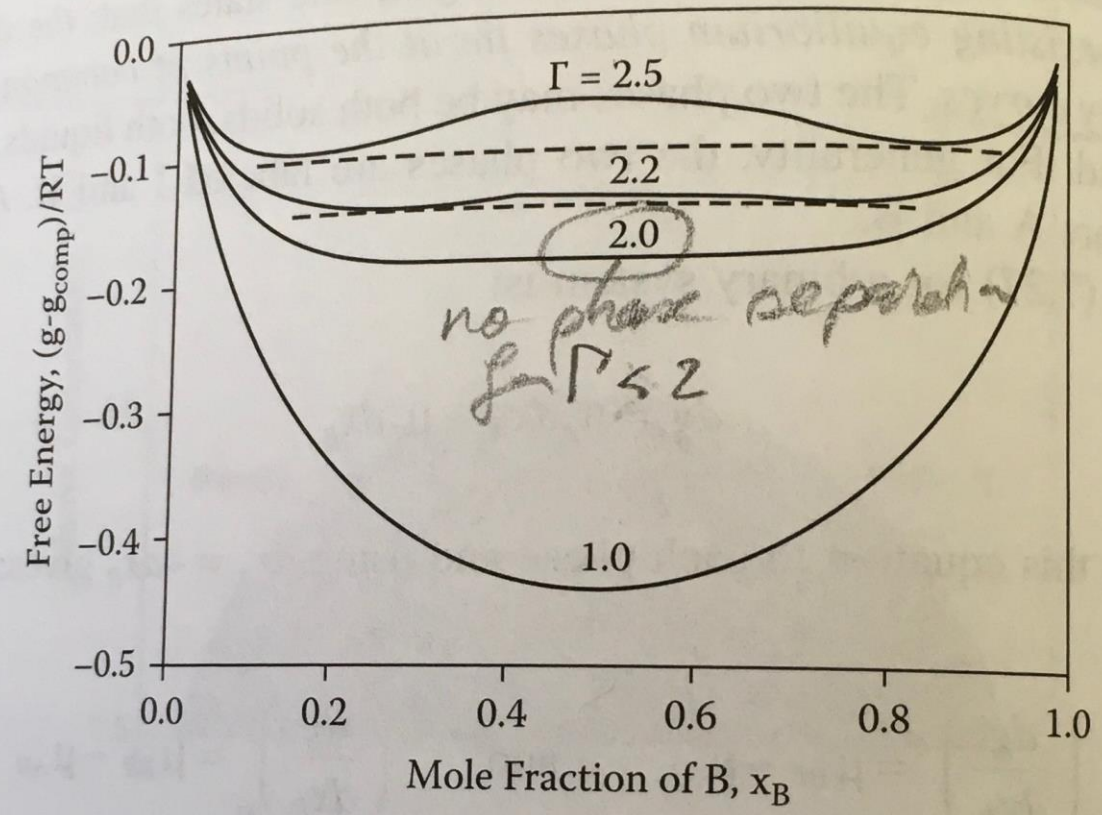


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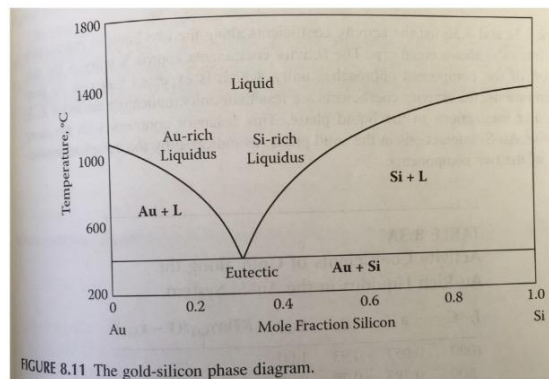


FIGURE 8.11 The gold-silicon phase diagram.

TABLE 8.3A
Activity Coefficients of Gold along the Au-Rich Liquidus in the Au-Si System

$T, ^\circ\text{C}$	a	$x_{\text{Au,L}}$	$\gamma_{\text{Au,L}}$	$RT \ln \gamma_{\text{Au,L}} / (1 - x_{\text{Au,L}})^2$
1000	0.057	0.93	1.00	—
800	0.283	0.78	0.97	-700
600	0.611	0.73	0.74	-3600
370 ^a	1.242	0.69	0.42	-5800

^a Eutectic temperature.

TABLE 8.3B
Activity Coefficients of Silicon Along the Si-Rich Liquidus in the Au-Si System

$T, ^\circ\text{C}$	b	$x_{\text{Si,L}}$	$\gamma_{\text{Si,L}}$	$RT \ln \gamma_{\text{Si,L}} / (1 - x_{\text{Si,L}})^2$
1300	0.241	0.83	0.95	-2800
1200	0.505	0.70	0.86	-2500
1000	1.156	0.54	0.58	-3300
800	2.051	0.44	0.30	-4100
600	3.355	0.37	0.094	-5200
370 ^a	5.859	0.31	0.009	-6300

^a Eutectic temperature.