

In-Class Exercise
Phase Diagrams: Lever Rule
SOLUTIONS

Work on these problems together using the Al-Ni phase diagram given below.

1.) Label an example of a solvus, solidus, and liquidus lines.

Solvus: divides to solid regions (representing the point where solid solubility is exceeded and you begin to have a second solid phase)

Solidus: divides regions of solid and solid + liquid (representing the point where the liquid is finished solidifying/ solid begins melting)

Liquidus: divides regions of liquid and solid+liquid (representing the point where the liquid begins solidifying/solid is done melting)

2.) List the phases present at points A, B, and C.

A: is on the liquidus: liquid and AlNi are present

B: is in a one phase region: solid AlNi is present

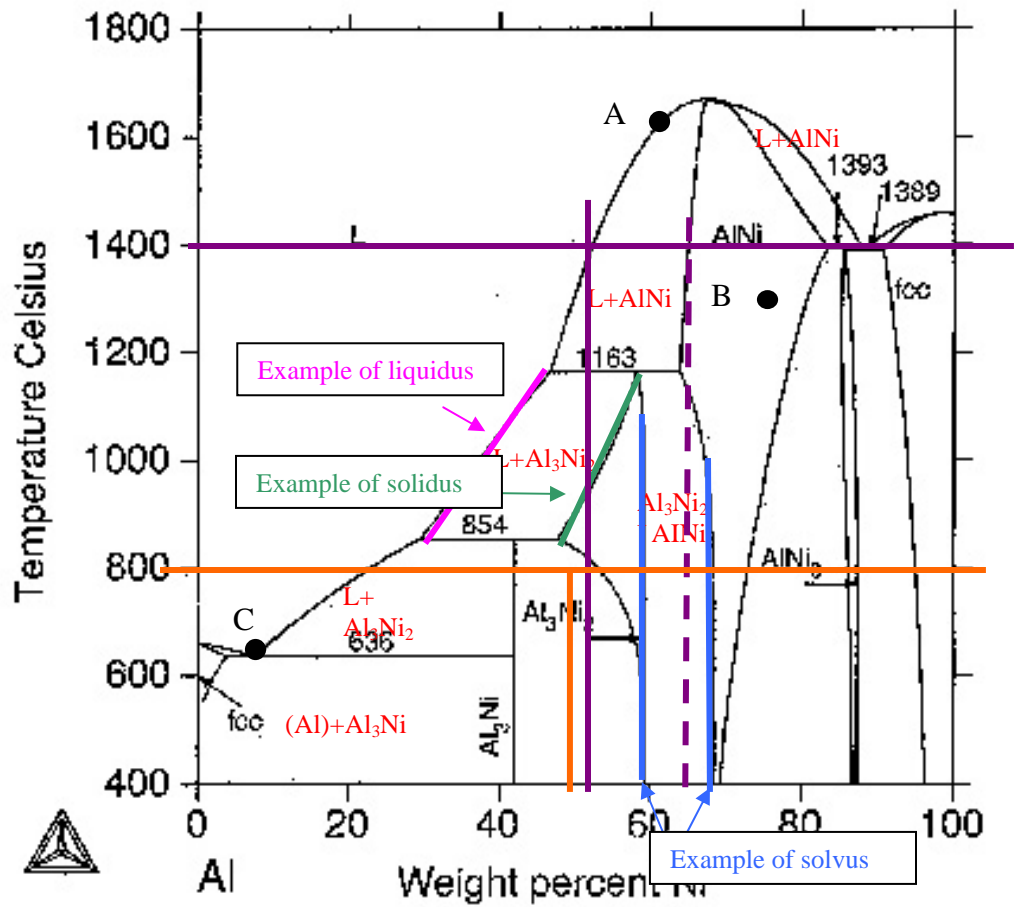
C: is a eutectic point: liquid, (Al) and Al₃Ni are present

3.) If you have liquid that is 50 wt % Ni and AlNi present, what temperature are you at and what is the composition of the AlNi?

To solve this problem, you need to draw a line at 50 wt% Ni, then find where that intersects the liquidus in the two phase (l+AlNi) region. Use a tie line to figure out the composition of AlNi in that region (65 wt% Ni) and the temperature (1400°C). See the purple lines on the phase diagram below.

4.) A liquid was slow cooled to 800°C resulted in 0.3 Al₃Ni and 0.7 Al₃Ni₂. What must the wt% Ni of the liquid been?

~50 wt% Ni, You can do this by estimating with the lever rule- so that the segment of line opposite the Al₃Ni section is about 30% of the whole line. See the set of orange lines on the phase diagram.



Al-Ni Crystal Structure Data

Phase	Pearson Symbol	Struktur Bericht	Prototype	Model
fcc	cF4	A1	Cu	RK
Al ₃ Ni	cP16	D0 ₁₁	CFe ₃	CE
Al ₃ Ni ₂	hP5	D5 ₁₃	Al ₃ Ni ₂	CE
AlNi	cP2	B2	CaCl	CE
AlNi ₃	cP4	I1 ₂	AuCu ₃	CE

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