Phase Diagram

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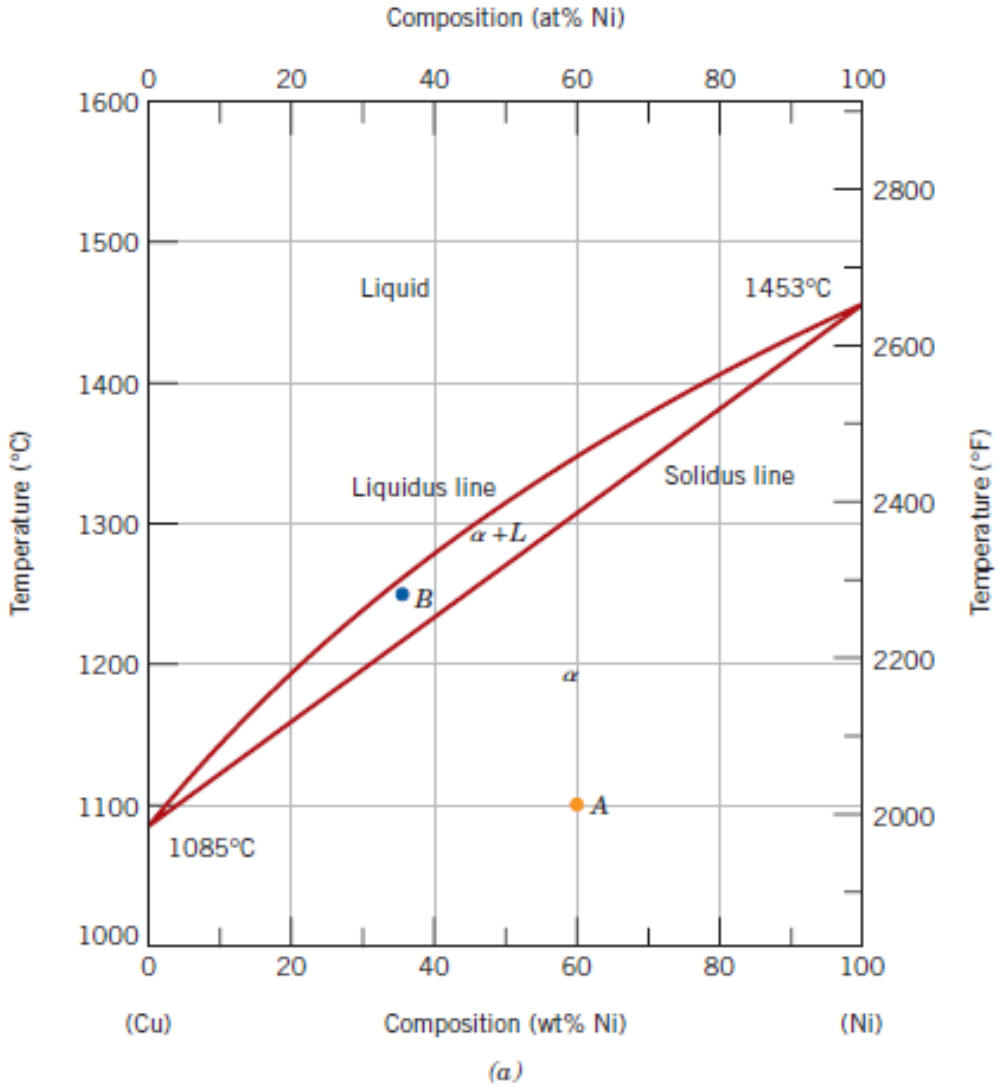
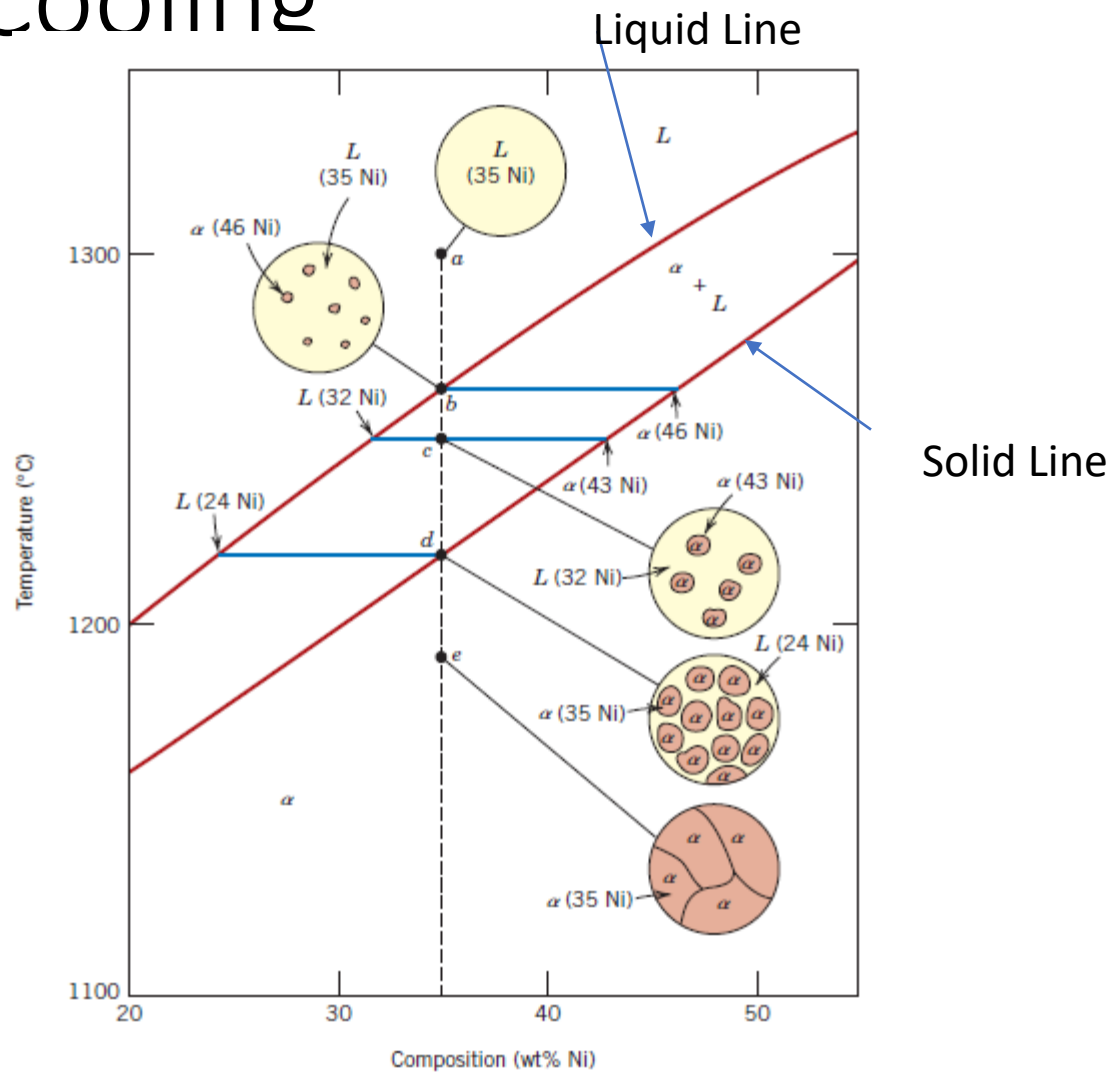
Binary Phase Diagram



- Constituent- Components in the solution
- Composition-Any ratio of components
- Composition (40 wt.% Ni+60 wt% Cu) for example

Binary Phase Diagram with Equilibrium Cooling



- At 35 wt% Ni-65 wt% Cu, cooling from 1300 C
- Consider Point a, b,c,d,e

Concept Check

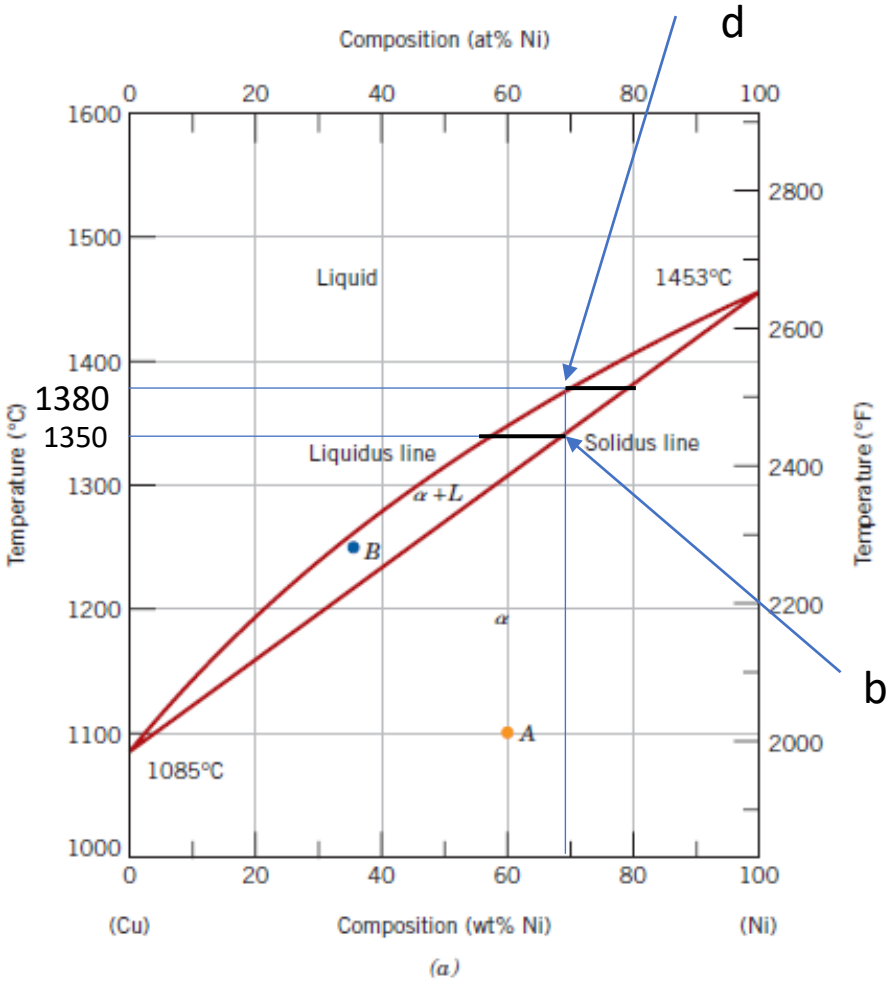
A copper–nickel alloy of composition 70 wt% Ni–30 wt% Cu is slowly heated from a temperature of 1300°C (2370°F).

(a) At what temperature does the first liquid phase form?

(b) What is the composition of this liquid phase?

(c) At what temperature does complete melting of the alloy occur?

(d) What is the composition of the last solid remaining prior to complete melting?



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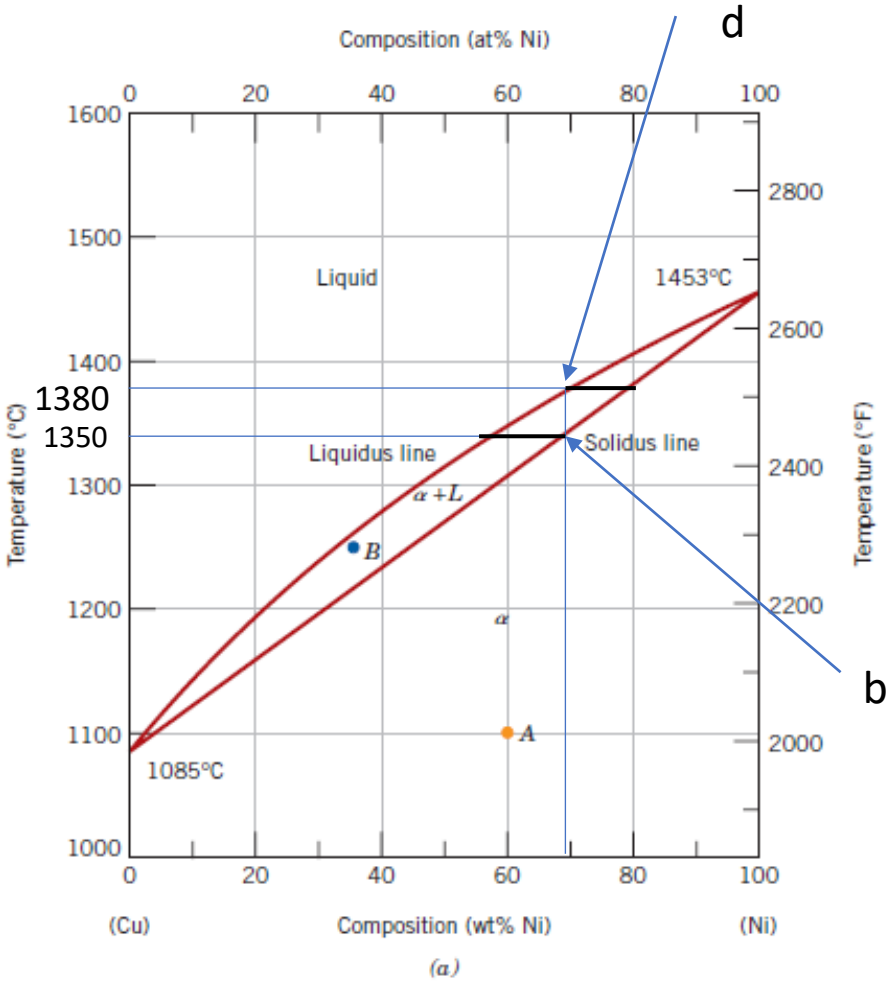
a. 1350 C

b. WL= 55 wt% Ni, 45 wt% Cu

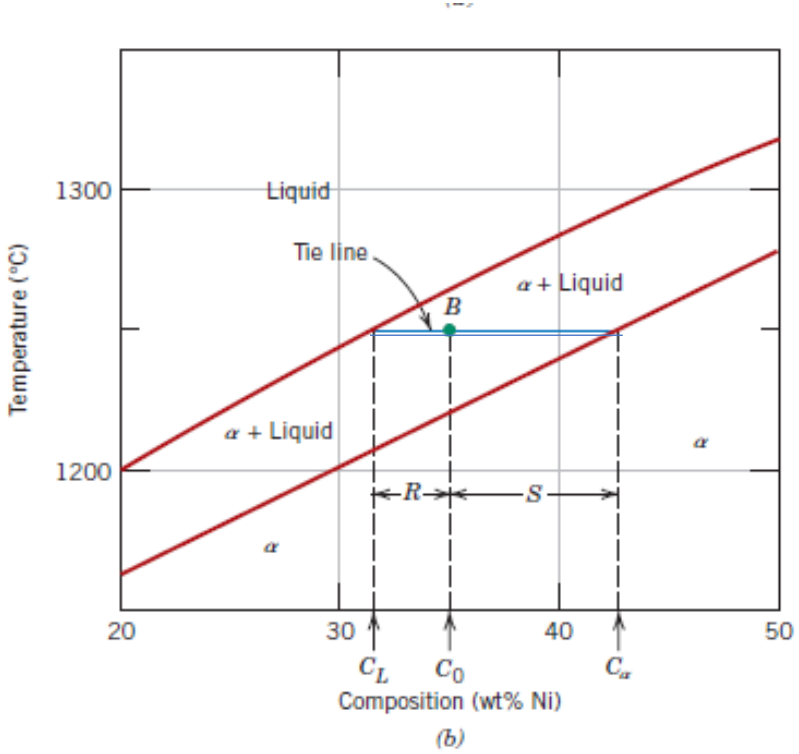
c. 1380 C

d. Ws= 80 wt% Ni, 20 wt% Cu



Determination of Phase Amount

- Lever Rule



$$W_L = \frac{S}{R+S}$$

Ws=R/(R+S)

W_L=1-Ws

$$W_L = \frac{C_\alpha - C_0}{C_\alpha - C_L}$$

- Consider at 1250 C (Point B) where Alpha+ Liquid Phases present
- Determine W_L and W_{alpha} at Point B
- Composition need to determine in terms of only one constituent

Alpha Phase is solid Pahse

At Point B, Ni wt.%, C_0=35 wt.%

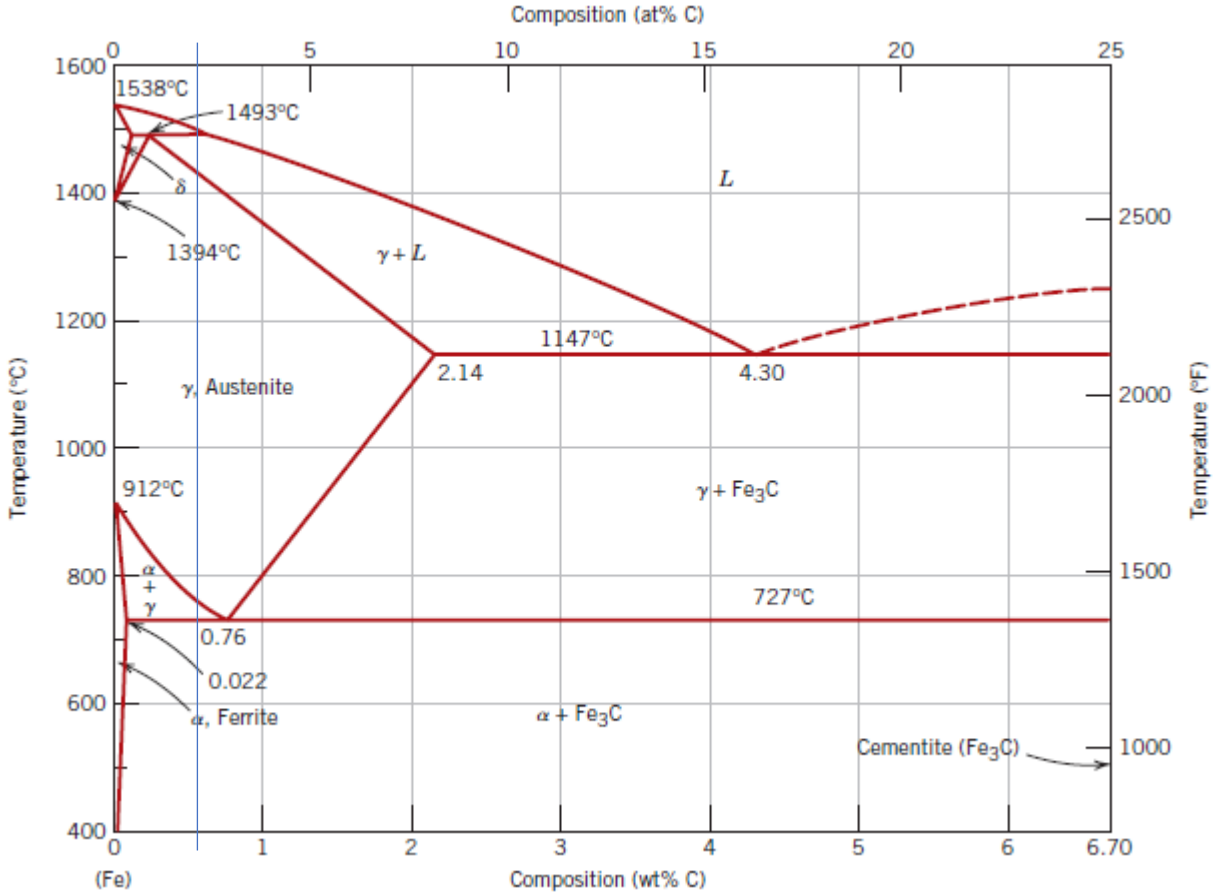
C_L=32 wt.%

C_{alpha}=43%

H.W. →Determine Solid and Liquid Phases at 1225 C

$$W_L = \frac{42.5 - 35}{42.5 - 31.5} =$$ 0.68 or 68 wt.% Liquid,
so reminder 32 wt% Solid alpha phase

Iron-Carbon System



- Polymorphic Transformation–
- Consider Pure Iron
  - Ferrite- A stable iron phase, Alpha Iron.
  - At 912 C-- Ferrite to Austenite, FCC gamma iron
  - At 1394 – Austenite to Delta Ferrite, BCC

HW→Now if you consider Carbon in it. For example, Determine Phase Changes at 0.5 wt% C
As you heat up from Room to 1600 C.
See what happens

Homework

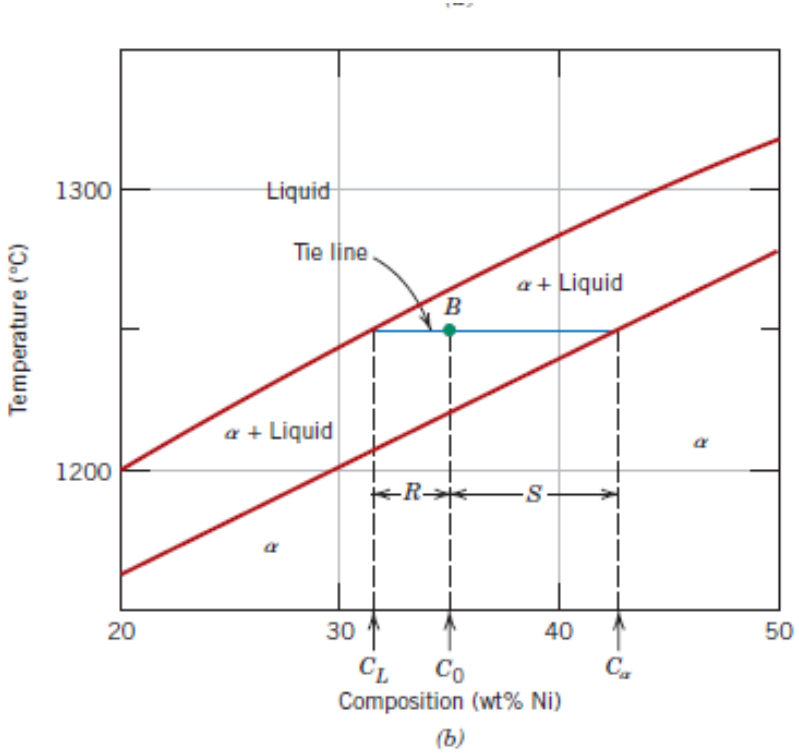


Fig-Partial Cu-Ni Phase Diagram

- Q1. In the Copper-Nickel Phase Diagram, Determine Solid and Liquid Phase Amount of composition B at 1225 C.
- Q2. From Iron-Carbon Phase Diagram, Determine Phase Changes at 0.5 wt% C As you heat up from Room to 1600 C.