

MAE 2321-001/MSE 3300-001

Homework 6

Due March 4, 2007

On the microstructure drawings, label all important aspects of the drawing, including phases, microconstituents, and C composition of each phase. Show the pertinent locations on phase diagrams. Make copies of the diagrams if needed.

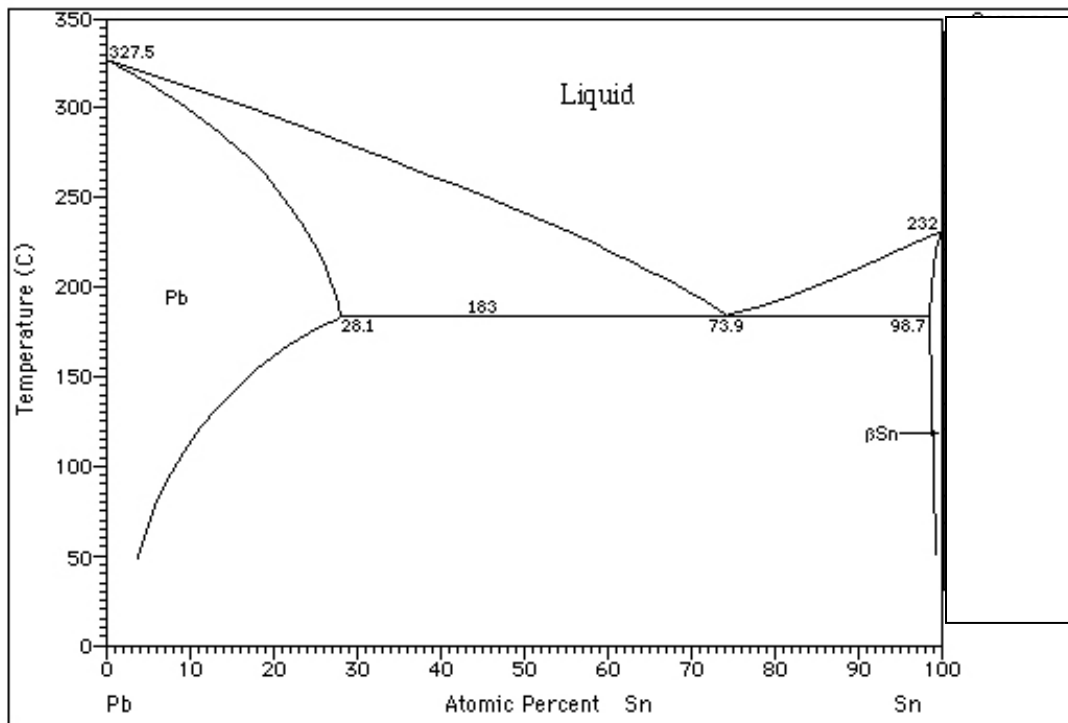
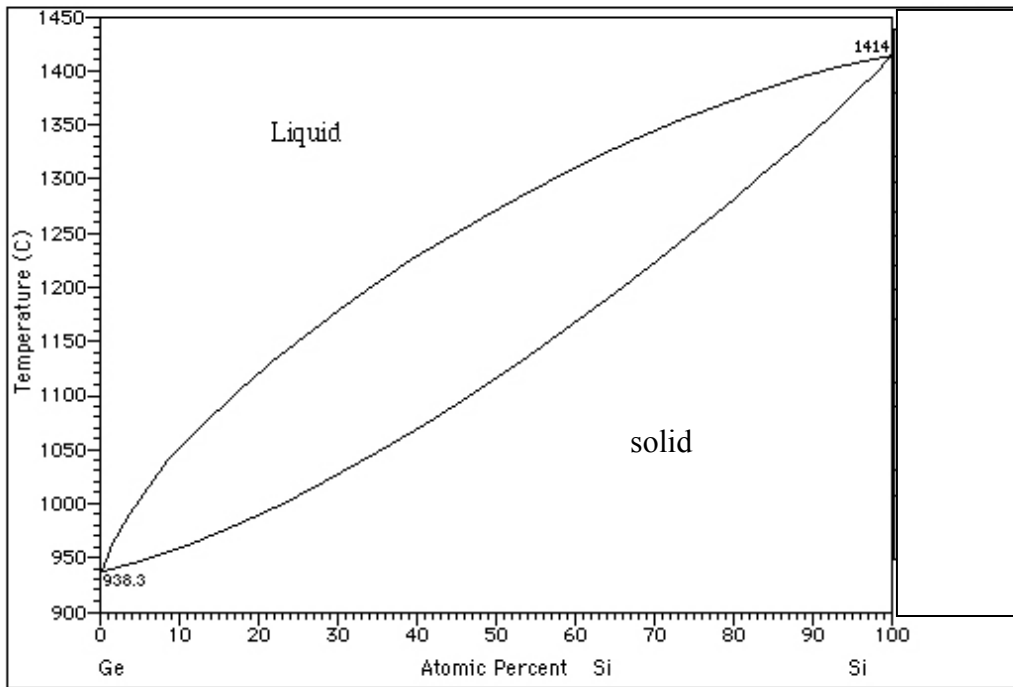
1. Given the Si-Ge phase diagram, answer the following. At a composition of 20% Si and 80% Ge, and beginning at 1500°C,
 - a. At what temperature will the first solid form?
 - b. What is the composition of that solid in mole percent?
 - c. What is the composition in weight percent.
 - d. At what temperature will the last liquid solidify?

2. Continue to use the Si-Ge phase diagram.
 - a. At 80% Si and 20% Ge and 1350 °C, what phase(s) will be present?
 - b. What is(are) the composition(s) of the phase(s) present? (mole%)

3. Given 10 g of a 50 – 50 (by weight) Si-Ge alloy, at 1260°C, how many grams of Si will be in liquid form.

4. Given the Pb-Sn phase diagram answer the following. (All compositions given in mole percent. Give answers in mole percent.) At a composition of 75% Pb and 25% Sn , as the composition slowly cools from 350°C:
 - a. What phases do α and β represent in the diagram?
 - b. At what temperature will the first solid form?
 - c. What is the composition of that solid?
 - d. At what temperature will the last liquid solidify?
 - e. What is the composition of the last liquid prior to solidification?
 - f. Draw the evolution of microstructure (new drawing for each significant change) from 350°C to room temperature if the cooling is done slowly.
 - g. What phase(s) is (are) present if the T is 200°C and the composition is 90% Sn?
 - h. What is (are) the composition(s) of those phase(s)?

5. The two diagrams Si-Ge and Pb-Sn are called binary isomorphous and binary eutectic, respectively.
 - a. For the entire range of compositions in the Pb-Sn diagram at 150°C, briefly describe the possible phases and microstructures. Give the range of compositions for each equilibrium microstructure and draw an example microstructure. Assume cooling was done slowly and equilibrium microstructures exist.
 - b. For the entire range of compositions in the Si-Ge diagram at 900°C, briefly describe the possible phases and microstructures. Give the range of compositions for each equilibrium microstructure and draw an example microstructure.



Book Problems:

10.48, 10.49, 10.56, 10.60

Sketch the microstructures for the following points on the iron-carbon phase diagram.

Assume slow cooling so that equilibrium conditions exist.

Label phases and microconstituents, and indicate C concentration in each phase.

- a. 2% C, 1250°C
- b. 2% C, 1145°C
- c. 2% C, 1000°C
- d. 2% C, 700°C

- e. 2.5% C, 1250°C
- f. 2.5% C, 1145°C
- g. 2.5% C, 800°C
- h. 2.5% C, 700°C

