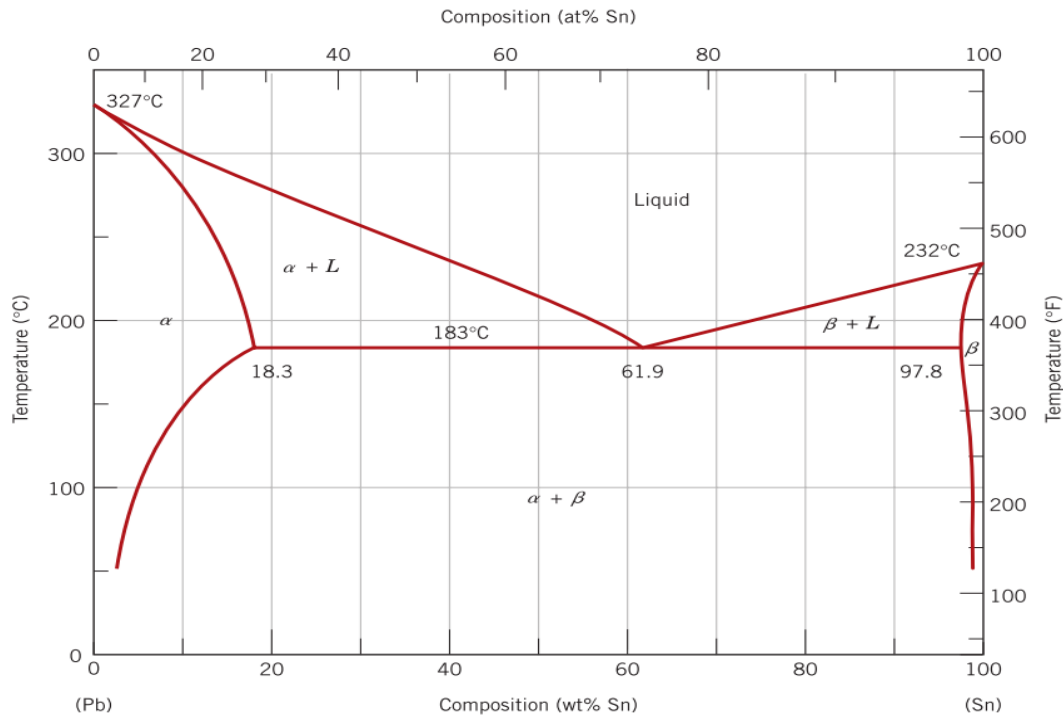


Sample Problems #4 /MECH 221 /FALL 2014

1.(a) Cite the phases that are present and the phase compositions for the following alloy: 4.5 mol Sn and 0.45 mol Pb at 200°C (390°F) (b) Determine the relative amounts (in terms of mass fractions) of the phases for the alloys and temperatures given in part (a).



2. Consider 2.5 kg of austenite containing 0.65 wt% C, cooled to below 727°C (1341°F).

(a) What is the proeutectoid phase? (b) How many kilograms each of total ferrite and cementite form? (c) How many kilograms each of pearlite and the proeutectoid phase form? (d) Schematically sketch and label the resulting microstructure.

3) A three-point bending test was performed on an aluminum oxide specimen having a circular cross section of radius 3.5 mm (0.14 in.); the specimen fractured at a load of 950 N (215 lbf) when the distance between the support points was 50 mm (2.0 in.). Another test is to be performed on a specimen of this same material, but one that has a square cross section of 12 mm (0.47 in.) length on each edge. At what load would you expect this specimen to fracture if the support point separation is 40 mm (1.6 in.)?

4)) The microstructure of an iron-carbon alloy consists of 11 wt% proeutectoid cementite and 89 wt% pearlite. Determine the carbon concentration of this alloy.

5)) On the basis of ionic charge and ionic radii, predict crystal structures for the following materials, justifying your selections:

(a) MnS

(b) KBr