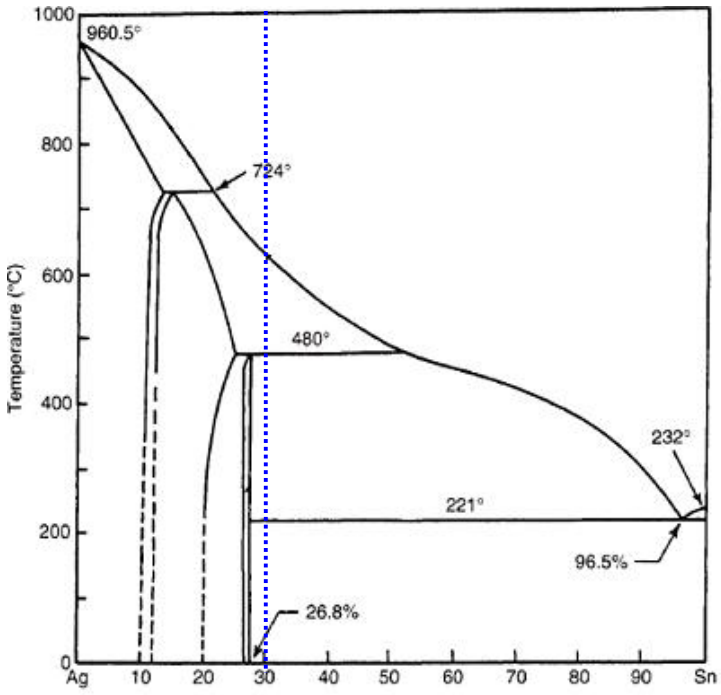
Aerospace Materials I. Extraordinary exam 29/06/2012

Name……

1) (1.5p) The lattice constant for BCC tantalum at 20°C is 0.33026 nm and its density is 16.6 g/cm3. Calculate a value for its relative atomic mass (in g/mol units). (N_A=6.023x1023 atoms/mol).

2) (2p) Calculate the planar atomic density in atoms per square millimeter for the crystal plane (100) in FCC gold, which has a lattice constant of 0.40788 nm.

3) (2.5 p)In the next figure is represented the phase diagram of the Ag-Sn system (wt. %):



a) Write the invariant reactions, including: name, temperature, percentage of involved phases.
b) For the alloy Ag-30% de Sn, indicate the present phases, composition and percentage of phases at 400ºC and 0 ºC. For 0 ºC indicate the micro-constituents and it percentage.
c) In the metalographic analysis of the alloy Ag-15%Sn can be seen, at room temperature, two different phases. Is it possible?, if the answer is positive, which phases are present? Why this microstructure has been obtained?.

d) In the alloy Ag-10%Sn cooled from the liquid state, quantify the amount of Ag ansd Sn in the border and in the core of each grain (due to the micro segregation).

4) (2 p) a) Calculate the tensile Young modulus of a unidirectional composite made by eopxi resin reinforced with carbón fiber. The composite has 64% in volume of reinforcing fibers and is in isostrain mode. If the ultimate tensile strength of the carbon fibers is 0,31×106 psi and for the epoxi resin is 9.20×103 psi, b) calculate the ultimate tensile strength of the composite.c) ¿Which fraction of the load is supported by the fibers?. (Efibers=54×106 psi and Eepoxi=0.53×106 psi)

5) (0.5p) Explain how the defects (point defects, disclocations,…) can affect the electrical conductivity in metals. Why?

6) (0.5p) Explain the Meissner effect

7) (0.5p) Which structural aspects of ceramics materials produce in these materials high hardness and brittleness.

8) (0.5p) How affect the Temperature and the strain rate the young modulus in most of thermoplastic polimers? Expalin it using an stress-strain curve.