

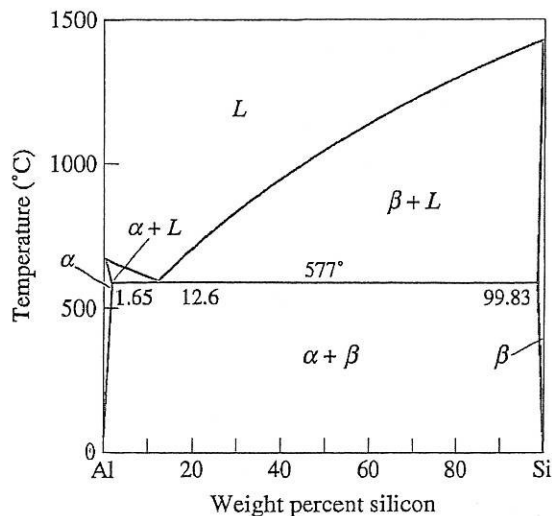
招生學年度	104	招生類別	碩士班
系所班別	材料科學與工程學系碩士班		
科目名稱	材料科學導論		
注意事項	本考科可使用掌上型計算機		

- Beryllium has a hexagonal crystal structure, with $a_0=0.22858$ nm and $c_0=0.35842$ nm. The atomic radius is 0.1143 nm, the density is 1.848 g/cm³, and the atomic weight is 9.01 g/mol.

 - Determine the number of atoms in each unit cell. (5%)
 - Calculate the packing factor in the unit cell. (5%)
- The metal rubidium has a BCC crystal structure. If the angle of diffraction for the (321) set of planes occurs at 27.00° (first-order reflection) when monochromatic x-radiation having a wavelength of 0.071 nm is used,

 - Compute the interplanar spacing for this set of planes. (5%)
 - Compute the atomic radius for the rubidium atom. (5%)
- Briefly explain why fine pearlite is harder and stronger than coarse pearlite, which in turn is harder and stronger than spheroidite. (7%)
 - Briefly explain why the hardness of tempered martensite diminishes with tempering time and with increasing temperature. (8%)
- Consider an Al-4% Si alloy (see the Al-Si phase diagram as below). Determine

 - the amounts and compositions of each phase at 578°C . (5%)
 - the amounts and compositions of each phase at 576°C . (5%)
 - the amounts and compositions of each phase at 25°C . (5%)



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5. (a) Briefly explain the three steps of creep with a creep curve. (5%)
(b) Why recovery and strain hardening are important process during secondary creep stage. (5%)
(c) What are the factors affect the creep characteristics of metals. (5%)
(d) What is an ideal grain structure for creep-resistant alloy and why. (5%)
6. Please explain the following terms: (30%)
- (a) Recrystallization temperature
 - (b) Stacking fault
 - (c) Activation energy
 - (d) Normalizing
 - (e) Coherent precipitates
 - (f) Sensitization