所別：機械工程學系碩士班 乙組(製造與材料)(一般生)　科目：材料導論與機械製造　共 2 頁 第 1 頁

本科考試可使用計算器，廠牌、功能不拘　＊請在試卷答案卷（卡）內作答

1. Figure 1 is the tin-gold phase diagram, for which only single-phase regions are labeled. Specify temperature-composition points at which all three phases reaction (eutectic, peritectic etc...) and congruent phase transformations occur. Also, for each, write the reaction upon cooling. (12%)

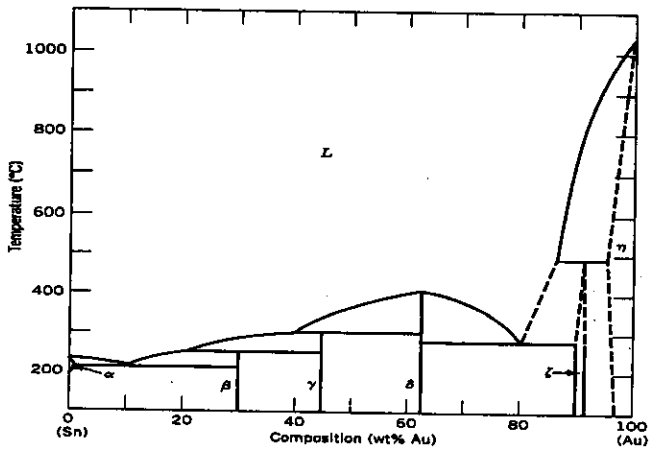

Fig.1　Sn-Au binary phase diagram

2. For the 40 wt.% Sn- 60 wt.% Pb alloy, phase diagram shown in Fig.2, calculate the relative amount of each phase present in terms of mass fraction at 150°C. (3%)

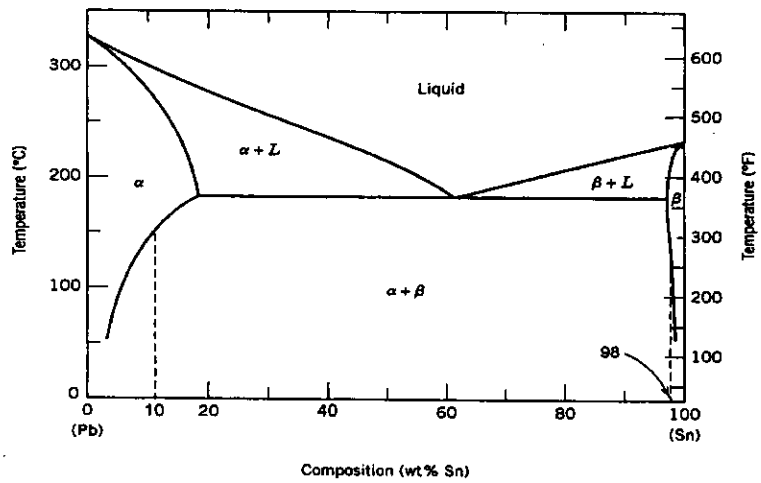

Fig.2　Pb-Sn binary phase diagram

參考用

注意：背面有試題

所別：機械工程學系碩士班 乙組(製造與材料)(一般生)　科目：材料導論與機械製造　共 2 頁 第 2 頁

本科考試可使用計算器，廠牌、功能不拘　＊請在試卷答案卷（卡）內作答

3. Figure 3 shows the continuous cooling transformation diagram for a 0.35wt%C iron-carbon alloy, with continuous cooling path that will produce proeutectoid ferrite, martensite, fine pearlite and coarse pearlite. Please show the composition of each path. (10%)

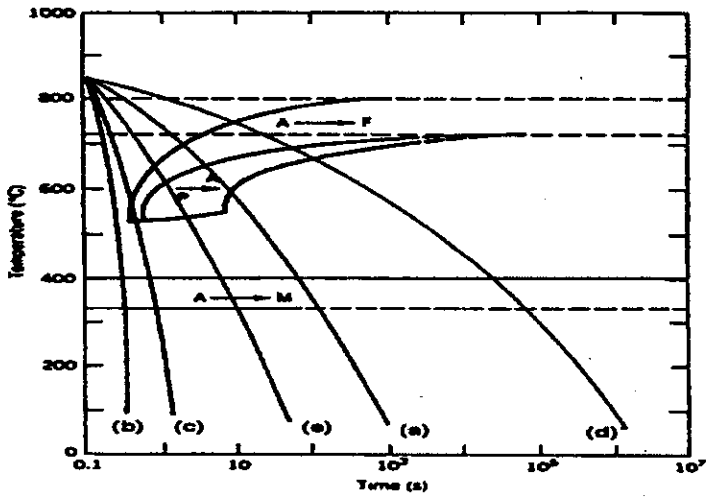

Figure 3　Continuous cooling transformation diagram for a Fe-0.35wt%C alloy

4. Describe these two defects (a) Frenkel defect (b) Schottky defect in a typical crystal structure. (5%)

5. Cite similarities and differences between precipitation hardening and dispersion strengthening. (5%)

6. How to increase the conductivity of pure silicon for semiconductor application? (5%)

7. Why porosity decreases the thermal conductivity of ceramic and polymeric materials? (5%)

8. How the degree of crystallinity affects the thermal conductivity of polymeric materials and why. (5%)

9. 鏟花是提高機械精度的重要切削加工法之一，試就下列問題簡要論述之。
   (a) 請簡要描述鏟花加工的方法 (5%)
   (b) 請簡要解說鏟花可以大幅提高機械精度的原因 (10%)

10. 試從刀具壽命曲線比較說明高速度鋼刀具與陶瓷刀具的優缺點。 (10%)

11. Photolithography process can be used to produce microscale patterns on a flat surface.
   (a) Please list three important factors that affect the resolution of the etched patterns. (6%)
   (b) Please list three important considerations on the selecting of the etching mask material. (6%)

12. Chemical vapor deposition (CVD) and physical vapor deposition (PVD) are used to deposit thin films on objects' surfaces.
   (a) Please give short descriptions of these two deposition methods. (5%)
   (b) What is the difference between PVD and CVD? (3%)
   (c) Give two applications of PVD or CVD. Please specify the deposition materials and their functions. (5%)