

※ 注意：請於試卷上「非選擇題作答區」標明題號並依序作答。

1. 關於晶體缺陷
 - (1) 試劃刃狀差排的示意圖，並在圖上標示 Burgers 向量、差排線和滑移面。(5%)
 - (2) 試比較置換型固溶體與插入型固溶體的差異。(5%)
2. 關於擴散
 - (1) 試寫出 Fick 第一定律(Fick's first law)的方程式，並說明各參數的物理意義。(5%)
 - (2) 碳原子在 FCC 鐵中的擴散速度和在 BCC 鐵中的擴散速度哪一個快？為什麼？(5%)
3. 有關材料破壞機構
 - (1) 試簡述韌性破壞的機構。(5%)
 - (2) 試簡述脆性破壞的機構。(5%)
4. 圖 1 是 Fe-Fe₃C 的平衡相圖，試寫出 0.6 wt.% 碳鋼在常溫的組織，並計算該組織中共析雪明碳鐵的重量百分比。(10%)

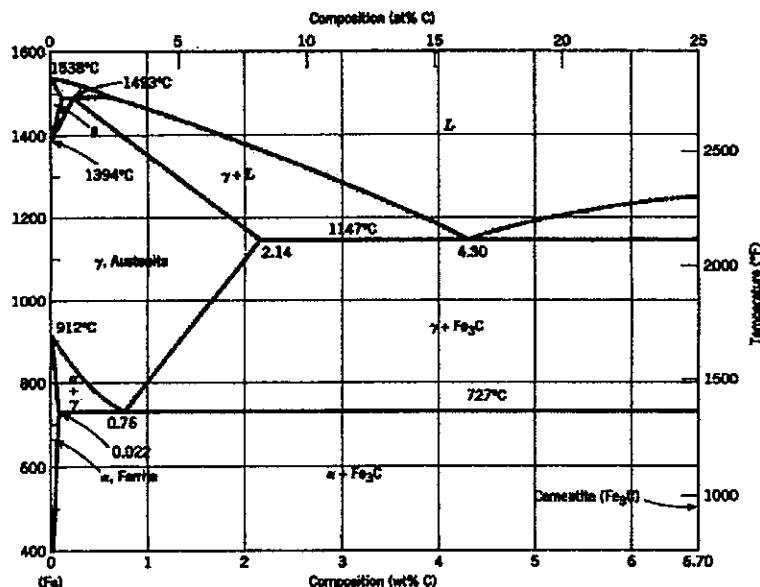


圖 1. Fe-Fe₃C 平衡相圖。

5. Sintering commonly refers to processes involved in the heat treatment of ceramic powder compacts at elevated temperatures to form dense bulks. What are the driving forces (energies) for sintering? Explain them. (10%)
6. Explain the toughening mechanism in partially stabilized zirconia. (10%)
7. (8%) (a) What is the most common semiconductor materials in integrated circuit devices? Please describe the reasons for your answer. (b) What is the most common materials in solar cell industry? Please also describe the reasons for your answer.
8. (12%) What are low dimensional materials? Please give three examples for low dimensional materials. What are the special electrical and optical properties for the low dimensional materials?

見背面

9. Sketch the chemical structure of polyethylene and poly(ethylene terephthalate) (8%)
10. The degree of crystallinity of polyethylene is greater than 90% and the degree of crystallinity of poly(ethylene terephthalate) is about 40% ~ 50%. It is well known that the crystal is very brittle. However, the elongation at break for polyethylene is much larger than it for poly(ethylene terephthalate). Why? (7%)
11. Please, describe the detail structure of crystal lamella of polymer. (5%)

試題隨卷繳回