

1. For an 85 wt% Pb–15 wt% Mg alloy shown in Fig. A, make schematic sketches of the microstructure that would be observed for conditions of very slow cooling at the following temperatures: (1) 600°C, (2) 500°C, (3) 270°C, and (4) 200°C. Label all phases and indicate their approximate compositions. (10%)

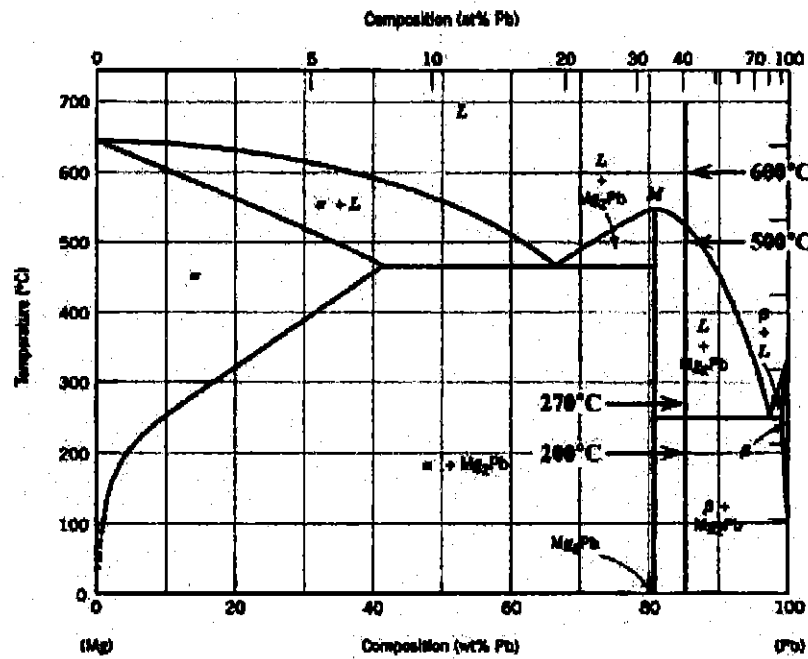


Fig. A Mg-Pb phase diagram

2. Figure B shows the continuous cooling transformation diagram for a 1.13 wt% C iron–carbon alloy. There are five conditions of continuous cooling transformation depicted as curves (a), (b), (c), (d) and (e). Predict the resulting microstructures for each condition represented by each curve. (3% x 5 = 15%)

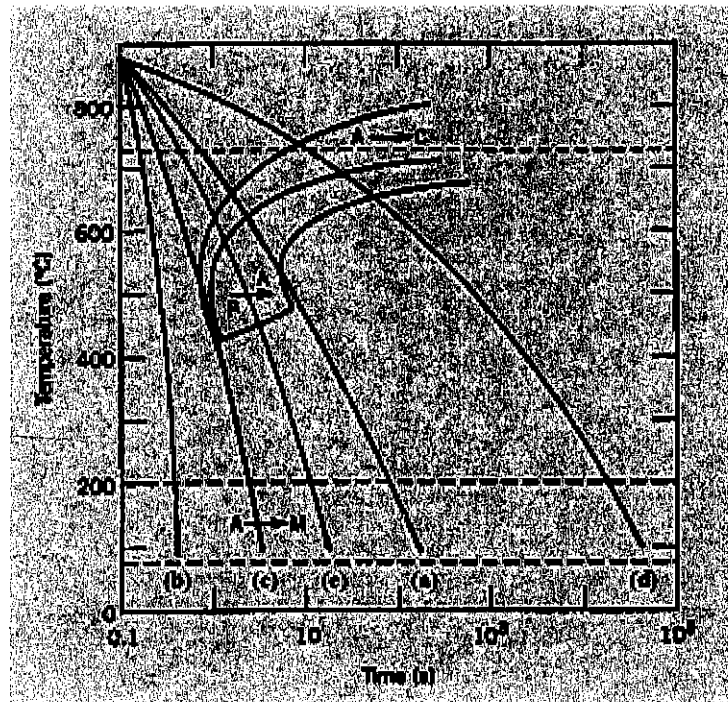


Figure B Continuous cooling transformation diagram for a 1.13 wt% C carbon steel.

國立中央大學104學年度碩士班考試入學試題

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
本科考試可使用計算器，廠牌、功能不拘

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*請在答案卷(卡)內作答

3. Write down Fick's first and second laws of diffusion and explain their physical meaning. What is the driving force for steady-state diffusion? (10%)
4. Applying the concept of Fick's first law to explain the difference between self-diffusion and interdiffusion. (5%)
5. Compare interstitial and vacancy atomic mechanisms for diffusion and mention which one is normally more rapid with your reasons. (10%)
6. 鑽石刀具特別適用於金屬鏡面加工。
 - (a) 試列舉3點理由，說明其為何特別適用於鏡面加工。(6%)
 - (b) 試說明鑽石刀具不適於鐵系列材料切削加工的原因。(6%)
7. 切削熱影響刀具壽命甚鉅，試說明以下幾個問題。
 - (a) 切削熱發生的3個主要熱源。(6%)
 - (b) 熱硬度對刀具磨耗的影響。(7%)
8.
 - (a) Describe the process steps to make micro-channels (trenches) on a silicon wafer using typical semiconductor fabrication techniques. (7%)
 - (b) Can you make the micro-channels that have vertical side walls? Why or why not? (6%)
 - (c) Provide another method to make the micro-channels on a silicon wafer. (6%)
9. Briefly describe three different techniques to coat a thin metal film on a surface. (6%)

參考用