國立臺北科技大學 105 學年度碩士班招生考試

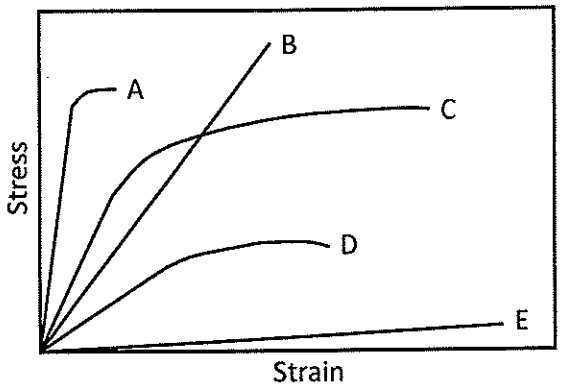
系所組別：3302 材料科學與工程研究所

第三節　物理冶金　試題（選考）

注意事項：

1. 本試題共 11 題，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Refer to the stress-strain diagram, please compare the five materials in
   (a) strength (2%)
   (b) ductility (2%)
   (c) toughness (2%)
   [ex. A>B=C=D>E]

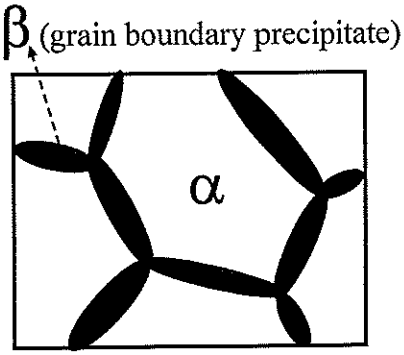


2. Please explain the shape memory effect by the martensite transformation. (5%)

3. What are the interactions between the dislocation and solute in the solid solution? (10%)

4. What factors affect the recrystallization rate? (10%)

5. You have a metal with large grain size and precipitate in the grain boundary, the microstructure is showed in the right. You are requested to improve its strength. Please show two kinds of methods. (10%)



6. (a) During the solidification, the growth rate of plane (100) is faster than (111), why? (5%)
   (b) however, the solidification is progressed along the direction of plane (111), please explain it. (5%)

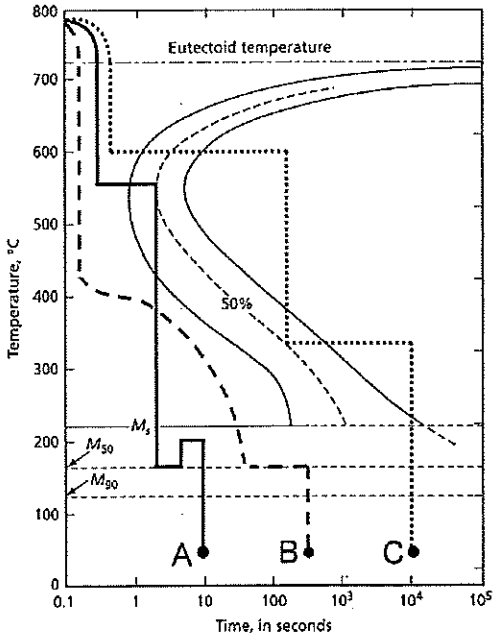
7. Please describe what are the formation mechanisms of
   (a) dendrite grain (5%)
   (b) coring structure (5%)

8. What are and how to get these diffusivity
   (a) D*: self-diffusivity (3%)
   (b) $\tilde{D}$: inter-diffusion coefficient (3%)
   (c) D_a D_b: intrinsic diffusivity (4%)

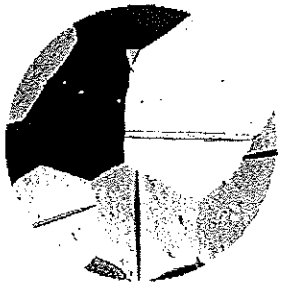
9. Base on the relation between dislocation and atmosphere, please explain why the sharp yield point occurred in the stress-strain curve? (10%)

10. How to prove that the dislocation exist in the crystal structure? (10%)

11. Please draw and indicate the microstructure in the end of each cooling path (A, B, C) in the TTT curve. (9%)



Example:



10% α phase

90% β phase