

淡江大學九十學年度碩士班招生考試試題

系別：化學工程學系

科目：材 料 科 學

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本試題共 壹 頁

- (20%)1. a. Sketch, in a cubic cell, a $[210]$ direction and a (210) plane.
b. Describe the cold working (work hardening) of metals.
c. Define eutectic composition, eutectoid and peritectoid of the phase change process.
- (20%)2. a. In term of bonding, explain why silicate materials have relatively low densities.
b. One crystalline form of silica (SiO_2) has a cubic unit cell, and from x-ray diffraction data it is known that the cell edge length is 0.7 nm. If the measured density is 2.328 g/cm^3 , how many Si^{4+} and O^{2-} ions are there per unit cell?
- (20%)3. a. Define plastics, elastomers and fibers.
b. Make a skematic plot showing how the modulus of elasticity of an amorphous polymer depends on the glass transition temperature. Assume that molecular weight is held constant.
c. Briefly explain how each of the following influences the mechanical strength of a semicrystalline polymer and why. ① molecular weight ② degree of crystallinity, and ③ extent of crosslinking
- (20%)4. a. Calculate the elastic modulus perpendicular to continuous, reinforcing fiber in an E-glass (50 vol. %) polyester composite. (the elastic modulus of E-glass and polyester are $70 \times 10^3 \text{ MPa}$ and $7 \times 10^3 \text{ MPa}$, separately)
b. Describe the functions of silane coupling agents used for composites.
c. Describe briefly the organic-inorganic hybrid composites and nanometer composites.
- (20%)5. a. In term of electron band structure, discuss reasons for the difference in electrical conductivity between metals, semiconductors and insulators.
b. Describe briefly the phenomenon of luminescence. What is the distinction between fluorescence and phosphorescence?
c. Describe briefly the principle of the luminescence of light emitting diode(LED).
d. Describe briefly the TFT-LCD.