國立臺南大學 102 學年度 **綠色能源科技學系碩士班** 招生考試 材料科學 試題卷

此科考試可攜帶簡易型計算機

1. What is structure of CsCl(see Figure 1.)?A simple, body centered cubic or face centered cubic?（10 分）

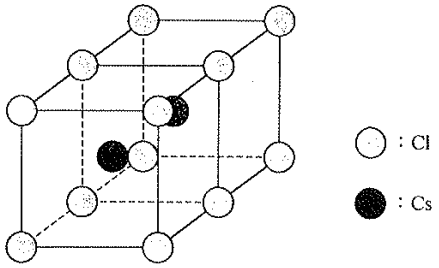

Figure 1.

2. State the relationship between the soacing of partial dislocations and stacking fault energy in FCC (Face-Centered Cubic) crystals.（10 分）

3. Can you explain GaAs is covalent bond or ion bond?（10 分）
(hint:X_{Ga}:1.6,X_{As}:2.0)

4. Can you explain compare characteristic of Metal、Ceramic and Polymer.（10 分）

5. (a)compare metal and polymer crystal state.（5 分）
(b)compare polymer and ceramic amorphous state.（5 分）

6. Niobium has an atomic radius of 0.1430 nm and a density of 8.57 g/cm^3. Determine whether it has an FCC or BCC crystal structure.（10 分）

7. For a BCC single crystal, would you expect the surface energy for a (100) plane to be greater or less than that for a (110) plane? Why?（10 分）

8. A sheet of steel 2.5 mm thick has nitrogen atmospheres on both sides at 900°C and is permitted to achieve a steady-state diffusion condition. The diffusion coefficient for nitrogen in steel at this temperature is 1.2×10^{-10} m^2/s, and the diffusion flux is found to be 1.0×10^{-7} kg/m^2-s. Also, it is known that the concentration of nitrogen in the steel at the high-pressure surface is 2 kg/m^3. How far into the sheet from this high-pressure side will the concentration be 0.5 kg/m^3? Assume a linear concentration profile.（15 分）

9. An aluminum bar 125 mm (5.0 in.) long and having a square cross section 16.5 mm (0.65 in.) on an edge is pulled in tension with a load of 66,700 N (15,000 lb_f), and experiences an elongation of 0.43 mm (1.7×10^{-2} in.). Assuming that the deformation is entirely elastic, calculate the modulus of elasticity of the aluminum.（15 分）