編號： 175

國立成功大學 109 學年度碩士班招生考試試題

系　　所：電機工程學系

考試科目：電子材料概論

考試日期：0210，節次：2

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Briefly explain the following items (30%)

(a) Screw dislocation

(b) Bragg's law for x-ray diffraction

(c) Intermetallic compounds

(d) Schottky defect

(e) Burger's vector

(f) Fick's first law for solid-state diffusion

(g) Grain boundary

(h) Vacancy

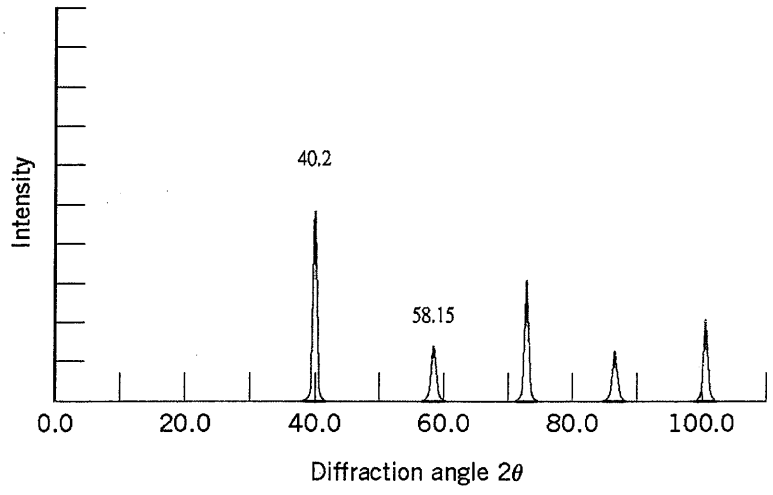
(i) Eutectic reaction

(j) Peritectoid reaction

2. Compare the bonding types and electric conductivity of polymer, ceramic and metal. (10%)

3. Indicate the types of polarization of a dielectric material and explain the related mechanism. (10%)

4. Using a 0.1542 nm Cu-Kα x-ray, we get an x-ray diffraction pattern of metallic tungsten (W). (a) What is the possible crystal structure of this material? Assume that it is either FCC or BCC. (b) Label each diffraction peak referring to its corresponding plane. (c)Determine the interplanar spacing for the first peak from low angle side. (d) Determine the atomic radius. (20%)



5. (a)Calculate the planar atomic density in atoms per square millimeter for the (0001) plane in HCP beryllium, which has lattice constants of a=0.2286 nm and c= 0.3583 nm. (b) Compare the atomic packing factors (the volume fraction of atoms in an unit cell) of the bcc, fcc, and hcp crystal structures. (20%)

6. Draw the band diagram of a (a) Schottky contact of metal and p-type semiconductor and (b) heterojunction of direct Γ band gap system of n-$Al_{0.3}Ga_{0.7}As$ (Eg=1.85 eV) and n-GaAs (1.43 eV), in which the band gap difference is approximately 2/3 in the conduction band and 1/3 in the valence band. (10%)