Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
400 level 1st Semester Examination – July/ August 2016
SCT 441-2 Ceramic Technology

Uva Wellassa University

Instructions to candidates
Duration: 02 hours
Number of questions: 04
Mark allocation: 80
Answer all questions

1.

a. Solid state materials can mainly be found as metals, ceramics, polymers, and composites. Write main structural differences of ceramics compared to other mentioned materials. (4 marks)

b. Write three general properties of ceramics. Briefly explain why they show these properties. (6 marks)

c. Why relative sizes of ions and charge neutrality is so important when you determine the crystal structures of ceramics? (4 marks)

d. Sphalerite is a ceramic formed by zinc and sulfur. It crystallizes in the cubic crystal system having tetrahedrally coordinated zinc and sulfur. Calculate the $\frac{r_{cation}}{r_{anion}}$ for this compound using appropiate crystal geometry. (6 marks)

2.

a. In general, ceramic compounds show high ionic character. However, Silicon Carbide (SiC) is a very good ceramic having significant covalent bonding. Explain why SiC is considered as a ceramic material. (3 marks)

b. Magnesium oxide (MgO) is a ceramic material and has FCC crystal structure. The density of MgO is 3.58 g/cm^3.

(i) Determine the unit cell edge length.

(ii) Compare this result with the edge length as determined from the ionic radii.
(Assume that the Mg^{2+} and O^{2-} ions just touch each other along the edges. Consider ionic radii of Mg^{2+} and O^{2-} as 0.072 nm and 0.14 nm respectively. Atomic weights of Mg and O are 24 g/mol and 16 g/mol respectively). (6 marks)

(52)

(16)

c. Explain briefly silicates and their structures based on SiO_4. (8 marks)

d. Give three (03) characteristic features of Refractory Oxides. (3 marks)

3.

a. Briefly discuss clinical applications of bio-ceramics. (7 marks)

b. High purity ceramic powders can be obtained using sol-gel method. Briefly describe this method. (6 marks)

c. What are the main raw materials we use in ceramic production in Sri Lanka? (3 marks)

d. Write down major problems that are related to raw materials we use in ceramic industry. (4 marks)

4.

a. Give four different types of mechanical milling used in ceramic powder production. Briefly describe one of them. (6 marks)

b. Following steps are the main steps we use in ceramic manufacturing process. Briefly describe each step. (14 marks)

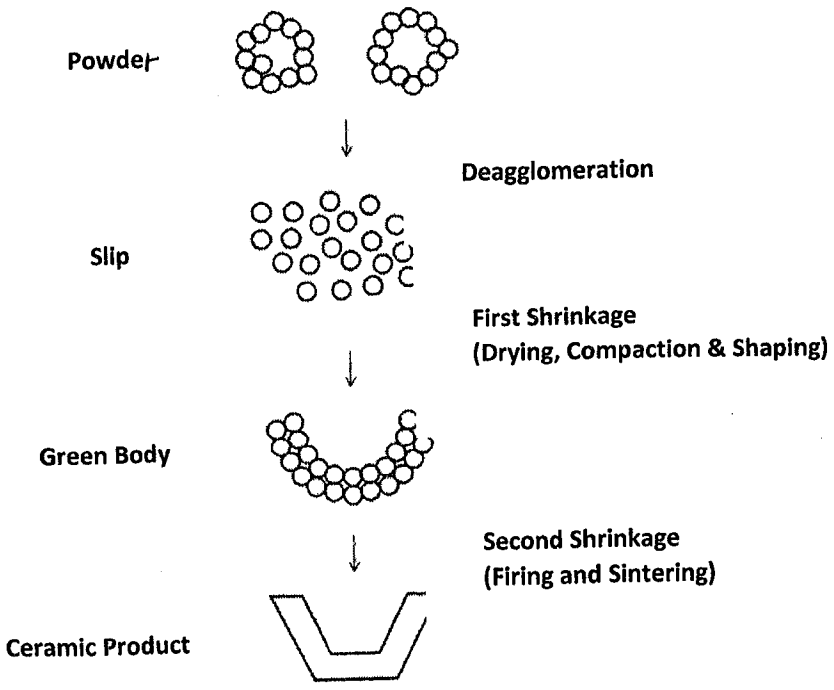

Figure 01