Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
400 level 1st Semester Examination – June/July 2017
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. Write main structural differences of ceramics compared to glass in terms of atomic arrangement, bonding, etc.

(05 marks)

b. Why ceramics show the following general properties?

(i) Poor thermal and electrical conduction.

(ii) Hard and low ductility.

(iii) High elastic modulus.

(iv) Low density.

(v) High melting point.

(05 marks)

c. What are the two main factors of component ions that determine the crystal structure of a ceramic compound? (02 marks)

d. NaCl has octahedral sites (Coordination no-6) and CsCl has cubic sites (Coordination no-8). Calculate the $\frac{r_{cation}}{r_{anion}}$ value for these two compunds using appropiate crystal geometry.

(08 marks)

2.

a. Write down two good ceramics that have low ionic character. Why are they considered as ceramics although they have low ionic character?

(04 marks)

b. There is a MO type ceramic material having FCC crystal structure. Here, M is a metal having divalent charge and O is oxygen. The density of MO is 3.58 g/cm^3. Assume that the M^{2+} and O^{2-} ions just touch each other along the edges. Consider the ionic radii of M^{2+} and O^{2-} as 0.072 nm and 0.14 nm respectively. Also atomic weights of M and O are 24 g/mol and 16 g/mol respectively.

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(i) Determine the unit cell edge length of above ceramic material.

(04 marks)

(ii) How does this result is compared with the edge length as determined from the ionic radii?

(04 marks)

c. Explain briefly the layered and ring silicates using appropriate minerals.

(05 marks)

d. Give three (03) examples of ceramic materials that can be used as refractory oxides.

(03 marks)

3.

a. Ceramic materials are used as advance ceramics in biomedical applications. Briefly describe the biomedical applications of ceramics using biopassive and bioactive ceramics.

(07 marks)

b. How do we obtain high purity ceramic powders? Briefly describe one method.

(06 marks)

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

(03 marks)

d. Give four different types of mechanical milling used in ceramic powder production. Briefly describe one of them.

(04 marks)

4.

a. The following are some of the main steps followed in the manufacturing process of ceramic based products. Clearly explain each of these steps.

i. Slip

ii. Shrinkage

iii. Shaping

iv. Sintering

(12 marks)

b. Briefly describe the production process of ceramic manufacturing company that you have visited in Sri Lanka.

(8 marks)