Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 level 2nd Semester Examination – January 2019
SCT 353-2 Ceramic Science and Technology

Uva Wellassa University

Instructions to candidates
Duration: 02 hours
Number of questions: 04
Mark allocation: 120
Answer all questions

1.

a. Ceramics are hard, brittle and show poor thermal and electrical conductivity. Why?

(6 marks)

b. Ceramic based materials are classified as traditional and advance. Write three exmples for each case.

(6 marks)

c. The radius ratio between cation and anion of constituent atoms in ceramics is found as a key factor to determine the crystal structures of ceramics. Write those ratio values for tetrahedral, octahedral and cubic systems providing one example for each case.

(6 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 radius ratio between cation and anion of for this compund using appropiate crystal geometry.

(8 marks)

e. In general, ceramic compounds show high ionic character. However, Aluminium nitride (AlN) shows significant covalent bonding and considerd as a very good ceramic. Explain why AlN has considerd as a ceramic material?

(4 marks)

2.

a. A AX type ceramic material has FCC crystal structure. Here, A is a divalent cation and X is oxygen. The density of AX is 3.58 g/cm^3. The ionic radii of A and X are 0.072 nm and 0.14 nm, respectively. The atomic weights of A is 24 g/mol and X is 16 g/mol. Assume that the ions of A and X just touch each other along the edges.

(i) Determine the unit cell edge length.

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

(10 marks)

b. ABX_3 type crystalline materials are ceramics and show Perovskites structure. Here, A and B are two cations of very different sizes and X is an anion that bonds to both. Give three (03) examples of different minerals for those structures. What are the main applications of them?

(6 marks)

c. Give a brief introduction about layered silicates.

(6 marks)

d. Write four (04) clinical applications of bioceramics giving appropriate examples.

(8 marks)

3.

a. Ceramic powders are produced using mechanical methods, chemical methods and vapor phase reactions. What are the advantages and disadvantages of those methods?

(12 marks)

b. The large surface area of ceramic powders is essential to make the high quality ceramic products. Why?

(4 marks)

c. Write down five (05) modern ceramic shaping methods. Which method gives the thin sheets?

(7 marks)

d. The final step of ceramic production is sintering. Briefly describe this step.

(7 marks)

4.

a. What are the main raw materials we use in ceramic industries in Sri Lanka?

(5 marks)

b. What are your suggestions on value addition to Sri Lankan minerals?

(10 marks)

c. Describe the main steps of production process of ceramic manufacturing company that you have visited in Sri Lanka.

(15 marks)