Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 level 2nd Semester Examination – Dec./ Jan. 2018
SCT 353-2 Ceramic Science and Technology

Uva Wellassa University

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

1.

i. Briefly describe differences and similarities of atomic arrangement of ceramics compared to glass and metals.

(06 marks)

ii. Why ceramics show poor thermal and electrical conduction, low ductility, and high melting point?

(06 marks)

iii. What are the two characteristic components of ions that determine the crystal structure of a ceramic compound?

(2 marks)

iv. Sphalerite is a ceramic material formed by zinc and sulfur. It crystallizes in the cubic crystal system having tetrahedrally coordination. Calculate the cation-anion radius ratio for this compund using appropiate crystal geometry.

(6 marks)

2.

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

a. Determine edge length of the unit cell.

b. How does this result compare 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-} are 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)

ii. Write chemical formulas for three different silicate structures present in silicate ceramics.

(3 marks)

iii. Using a simple schematic diagram show that how the polymeric forms of silica change with changing the temperature.

(5 marks)

iv. Ceramics play an important role in repairing living tissues and organs. Briefly describe the biomedical applications of ceramics.

(6 marks)

3.

i. High purity ceramic powders can be obtained using sol-gel method. Briefly describe this method.

(6 marks)

ii. How do we obtain ceramic nano particles?

(4 marks)

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

(10 marks)

4.

i. Name four different types of mechanical milling used in ceramic powder production.

(4 marks)

ii. How do we characterize ceramic powders using basic methods?

(4 marks)

iii. We usually use following main steps when we produce ceramic based products. Briefly describe each step using appropriate digrams.

a. Slip
b. Shrinkage
c. Shaping
d. Sintering

(12 marks)