

Code No: 07A71801

R07**Set No. 2**

IV B.Tech I Semester Examinations, MAY 2011
CERAMIC SCIENCE AND TECHNOLOGY
Metallurgy And Material Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Describe the composition base classification of ceramic materials?
(b) Write short notes on silicate ceramics? [8+8]
2. Describe the powder preparation of ZrO_2 by hydrothermal preparation. [16]
3. Write short notes on :
 - (a) Isomorphism
 - (b) Polymorphism
 - (c) Polytypism. [6+5+5]
4. (a) Discuss briefly about Hot Isostatic Pressing (HIP) variables.
(b) What are the advantages of Hot Isostatic pressing (HIP) over Hot Pressing (HP)? [8+8]
5. (a) With a neat sketch explain the metastable phases that occur in the SiO_2 system?
(b) Describe the dynamic methods of determining phase-equilibrium diagrams? [8+8]
6. What is Sintering? Discuss the different stages in sintering in detail. [16]
7. Explain the melting behavior of cordierite, steatite porcelain and low-loss steatite compositions with a neat sketch? [16]
8. Briefly discuss the processing of monolithic ceramics and glasses by sol-gel processing. [16]

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R07**Set No. 4**

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Time: 3 hours

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Answer any FIVE Questions
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1. Give the properties and applications of :
 - (a) Magnesite refractories
 - (b) Forsterite ceramics. [8+8]
2. (a) Define the terms phase and isotherm ?
 (b) Draw a neat sketch of BaO-TiO₂ binary system and label all points? [4+12]
3. Write short notes on:
 - (a) Hot Pressing dies
 - (b) Pressure-time relationship during Hot Pressing (HP).
 - (c) Die washers, liners in Hot Pressing (HP). [5+6+5]
4. (a) What are some of the attractive and limiting properties of Sialon (One of the structural ceramics)?
 (b) What features of ceramic materials make them attractive for cutting tools? [8+8]
5. Explain how SiC is produced by sol-gel process. [16]
6. Write short notes on:
 - (a) Pore structure
 - (b) Compaction effects on sintering. [8+8]
7. Describe the following models of glass structure:
 - (a) Crystallite model
 - (b) Random network model. [8+8]
8. Describe the hydrothermal method of preparation of powders of oxides and hydroxides. [16]

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R07**Set No. 1**

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1. (a) With the help of a schematic diagram explain injection molding.
 (b) Discuss about the binder system in injection molding.
 (c) Discuss about the variables in injection molding. [6+5+5]
2. (a) What is incongruent melting? Explain with examples.
 (b) Draw a neat sketch of $Al_2O_3SiO_2$ phase-equilibrium diagram? Label all the phases and invariant temperatures? [8+8]
3. (a) What is a sol and gel? What are the sol-gel processes?
 (b) Give a flow chart for sol-gel process.
 (c) What are the advantages of sol-gel process. [6+5+5]
4. (a) What are the properties and applications of fine ceramics?
 (b) Give the Brongniarts classification of ceramic ware? [8+8]
5. Give the chemical formulae, properties and applications of:
 - (a) Sapphirine
 - (b) Corundum
 - (c) Forsterite
 - (d) Kaoline. [4X4=16]
6. (a) With a neat sketch show the liquid-liquid immiscibility region in the soda lime - silica system?
 (b) With neat sketches explain the effect of Oxygen-Silicon ratio on silicate network structures? [8+8]
7. Describe the production of Si_3N_4 and SiC by laser heating of gases. [16]
8. (a) What are the advantages of Hot Pressing (HP)? For what type of powder materials is this method preferred?
 (b) What are the additional factors required in design and construction of dies, punches etc for Hot Pressing (HP)?
 (c) Compare Hot Pressing (HP) and cold die compaction. [8+8]

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R07**Set No. 3**

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Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Give the important features of crystallization curve of a ternary system?
(b) Give the important applications of cordierite ceramics? [8+8]
2. Discuss about the following:
(a) Colloidal gels.
(b) Polymeric gels. [8+8]
3. (a) Give the general principles of classifying ceramic ware?
(b) What are fine ceramics? Give their applications? [8+8]
4. Explain how Si_3N_4 is produced by sol-gel process. [16]
5. With neat sketches explain the miscibility gaps in the following oxide systems:
(a) $Na_2O - SiO_2$
(b) $TiO_2 - SiO_2$
6. (a) Discuss about the Hot Isostatic pressing (HIP) equipment.
(b) What are the Hot Isostatic Pressing (HIP) applications? [8+8]
7. Discuss about the dimensional changes and micro structural changes during sintering. [16]
8. "Factors affecting the fabrication and use of several refractory products can be related to $Al_2O_3-SiO_2$ equilibrium diagram". Justify? [16]
