

B.E. Met & Mat Engg 6th Semester Final Examination, 2013

Materials Characterization

(MT 602)

Time 3hrs

Full Marks 70

Answer any FIVE questions

- Q1. (a) Explain how kinetic information can be obtained from the DTA_TGA plot.
(b) What are the limitations of DTA in quantitative analysis? State measures to overcome the limitations. (8+6)
- Q2. (a) What is an Auger electron? With the help of a suitable diagram explain how Auger electron emission from a surface is detected and is used to analyze the composition of the surface.
(b) State the advantages and limitations of AES as a surface analytical tool. (8+6)
- Q3.(a) Explain why XRD profile of a material broadens with the decrease in grain size.
(b) Highlighting the limitations of the Scherer relationship describes the procedure for computing the grain size and micro strain with the aid of single line profile analysis. (6+8)
- Q4. (a) All transition metals in their bulk form are not magnetic. Give reasons.
(b) State the information that can be obtained from a magnetic hysteresis loop pattern.
(c) Write briefly on the following. (i) Bohr magneton, (ii) Curie temperature, (iii) Magnetic domains. (4+4+6)
- Q5. (a) State and explain the factors that cause variations in the resistivity of metals.
(b) State Mattheissen rule and explain its importance from the viewpoint of characterizing metals and alloys. (6+8)
- Q6. (a) Differentiate between a dark field and bright field image in TEM.
(b) Briefly describe how metallic samples are prepared for TEM investigations.
(c) What is staining? Why it is done in some samples for TEM studies? Name some commonly used staining agents. (4+5+5)
- Q7. (a) Using suitable diagram explain the working principle of an atomic force microscope.
(b) State and compare the advantages and limitations of the AFM images recorded under different operating modes. (6+8)
- Q8. Write briefly on *any two* of the following
(a) Energy dispersive spectroscopy
(b) Near field Scanning optical microscopy
(c) Scanning tunneling microscope

(7+7)
