

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

M.A./M.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2012

SECOND YEAR

APPLIED CHEMISTRY

Paper : XIV (Polymer Science)

Date : 17/12/2012

Time : 11 am – 1 pm

Full Marks : 50

Group-A

1. State whether the following statements (any ten) are "TRUE" or "FALSE" 10x1=10
 - a. Homogeneous polymer blends are rare.
 - b. N330 is an example of hard carbon black.
 - c. Working principles of a DSC and a DTA are same.
 - d. P.V.C. of a paint is "pigment volume concentration".
 - e. Wet sand is an example of "dilatant" fluid.
 - f. Hardness of a polymer is indicative of its strength property.
 - g. A "viscoelastic" polymer can be interchangeably called "elastoviscous".
 - h. PTFE has exceptionally high crystallinity.
 - i. An inorganic phase appears brighter than an organic phase under SEM.
 - j. Cryomicrotomy is the only method for sample preparation for TEM analysis.
 - k. Thixotropy is time dependent rheological behavior.

2. State in following cases, what analytical technique you should use with proper reasoning (any five): 5x2=10
 - a. Morphology analysis of EPDM-PP blend.
 - b. Weight average molecular weight determination of polystyrene.
 - c. To find the amount of silica added to a rubber product.
 - d. To assign purity of a rubber cure accelerator.
 - e. Determination of volume crystallinity of HDPE.
 - f. To find the melt processing window of a polymer
 - g. To find dynamic response of a polymer under different temperature.

3. Justify the following statements (any ten): 10x2=20
 - a. A polymer in rubbery state achieves true rubberiness only after vulcanization/crosslinking.
 - b. Crystalline polymers are preferably molded via injection molding.
 - c. Die swell of a polymer should be reduced to get better processing characteristics.
 - d. Silane coupling agents are generally recommended for silica-rubber mixing.
 - e. SBS has two T_g but SBR has a single T_g .
 - f. A Maxwell model does not mimic creep behavior exhibited by a polymer.
 - g. High hysteresis loss of a polymer indicates its poor dynamic response under load.
 - h. Loss tangent measurement against temperature yields more accurate T_g value as compared to monitoring either storage or loss modulus.
 - i. An extruder is a shaping instrument while a hydraulic press is a finishing instrument.
 - j. The stress-strain behavior of a polymer deviates once the strain rate is altered.
 - k. N110 usually yield higher modulus than N220.
 - l. Glassy state of a polymer is recognized as a "metastable" state.

Group-B

Answer any two questions

4. a. What is polymer compounding? Why it is needed? 3+2=5
b. Explain the effect of rubber mastication on its molecular weight.
5. a. Calculate stress relaxation using a Maxwell mechanical model. 3+2=5
b. For dynamic application what should be your choice- a faster or a slower relaxing polymer?
Explain your answer.
6. a. How batch size in a rubber mixing mill is calculated? 2+3=5
b. Explain the concept of LCST and UCST in polymer blending with example.
7. a. Differentiate between hardness and toughness properties of a polymer. 3+2=5
b. "Rubbers are inherently tough"- explain this statement.

