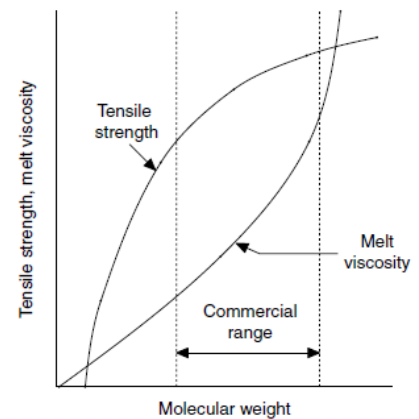


[Midterm exam of 2015]

1. With the drawing on the right, answer the following questions.

- Of the two properties shown, one is dependent on number average molecular weight and the other on weight average. Tell which is which, and give the equation that present each dependency.
- Explain your answer to (a) by showing why.
- How is the 'commercial range' settled?



2. For supramolecular polymerization, answer the following questions.

- Suggest a molecular structure that can be utilized for supramolecular polymerization.
- Explain why you suggested the structure of (a).
- What is the characteristics of the polymers formed by supramolecular polymerization? In other words, why do you want to prepare a polymer with supramolecular polymerization?

3. For T_g and T_m , answer the following questions.

- Of the two, one is a first- and the other is a second-order phase transition. Tell which is which, and explain why.
- The two temperatures of a polymer is related to each other. What do you call this relation, and what does this mean?
- Explain why this relation exists in terms of the factors determining the two.

4. (a) There are two types of anti-oxidants. How is the one different from the other in terms of function?

(b) Show how they work with an example of each.

(c) Of the four types of UV stabilizer, two types are the same to the two types of anti-oxidant. What are the other two, and what is the function of each?

(d) There are two types of plasticizer. What are they and how is the one different from the other in terms of the structure?

5. (a) How is the extrusion-grade resin different from the injection-grade resin for a polymer?

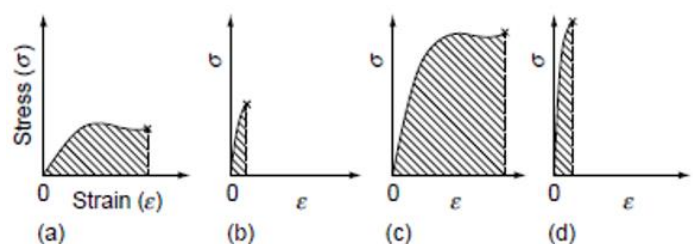
(b) How is RIM diferent from RTM?

(c) How is DMC diferent from SMC?

6. For the stress-strain curves on the right and with the words of 'strong', 'stiff', 'tough', 'ductile', and their antonyms, answer the following questions.

(a) What are the features in common and those in difference between (a) and (c)? Explain your answer.

(b) Curve (a) and (b) were obtained for the same polymer. Explain how this happen.



7. (a) Explain how the time-temperature superposition principle is expressed by WLF equation.

(b) Explain how the time-temperature-strain equivalence is observed in yield behavior of polymers.

[Midterm exam of 2016]

1. For entanglement of polymer chains, answer the following questions.
 - (a) What is 'entanglement molecular weight'?
 - (b) Describe the two methods that can estimate the 'entanglement molecular weight'.
2. Semicrystalline polymers are not soluble in solvent.
 - (a) Explain the reason for insolubility using thermodynamic quantities.
 - (b) Based on the answer to (a), what would you do to solubilize a semicrystalline polymer?
3. For thermal properties of polymers, answer the following questions.
 - (a) How do you differentiate thermal stability from heat resistance of polymers?
 - (b) Many of thermally stable polymers are also heat-resistant. Explain the reason in terms of their structure.
 - (c) Many of thermally stable and heat-resistant polymers are also fire-retardant. Explain the reason in terms of their structure.
 - (d) What are HDT and VSP, and how are they determined? Do they reflect thermal stability or heat resistance?
4. Name the appropriate process for the production of the following object, and briefly explain the procedure.
 - (a) a product with cellular core and dense skin
 - (b) a hollow product with rigid skin
 - (c) small and simple-shape objects of a thermoset
 - (d) transparent bottle of a semicrystalline polymer
 - (e) glass fiber-reinforced crosslinked polyurethane car bumper
 - (f) a fiber with perfectly round cross-section
5. You can describe 'conductive' as 'of low resistivity' or 'antonym of insulating'. Describe followings in the same manner; 'of low or high ---' AND 'antonym of ...'.

strong, stiff, hard, transparent
6. Explain briefly the followings with your own words.
 - (a) time-temperature superposition
 - (b) ductile-brittle transition