

國立台灣科技大學九十五學年度碩士班招生試題

系所組別： 高分子工程系碩士班乙組

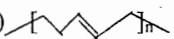
科 目： 高分子科學

1. 共 9 大題，總分 100 分。 2. 請於答案卷內依序作答。

1. Define the following terms:

- (a) Stepwise polymerization and chain polymerization (3%)
- (b) Living polymerization (3%)
- (c) Reactivity ratio (in copolymerization) (3%)
- (d) Chain transfer polymerization (3%)

2. How would you prepare the following polymers? Give monomer structures and catalysts (or initiators), and if you think they are important, solvents and temperatures.

- (a) Isotactic polypropylene (3%)
- (b) Poly(methyl vinyl ether) of narrow molecular weight distribution (3%)
- (c)  (3%)
- (d) Polycaprolactam (2%)
- (e) Poly(ethylene terephthalate) (2%)

3. How many steric isomers (configurational isomers) can you expect from the polymerization of 1,3-butadiene? Please show the chemical structures. (5%)

4. Please show the chemical reactions and structures of the following polymers

- a. Poly(ethylene terephthalate) (2%)
- b. Kevlar fiber (2%)
- c. Polyimide (Kapton) (2%)
- d. Polycarbonate (from bisphenol A) (2%)
- e. Poly(p-phenylene vinylene) (2%)

5. Please choose the suitable polymerization mechanism (cation or anion) for the following monomers: (5%)

- a. isobutylene
- b. vinyl ether
- c. methacrylate
- d. acrylonitrile
- e. Specify the reasons for your choice.

6. a. What is the definition of living polymerization? (2%)

b. Please give at least three experimental criteria as diagnostic characteristics for living polymerization. (3%)



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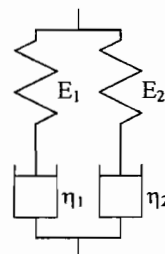
7. 試以 HDPE 與 LDPE 為例，說明分枝結構對相同分子量的高分子，其剪切黏度 (shear viscosity) 與剪切稀化 (shear thinning) 的影響 (10%)。

8. 對於一由兩個 Maxwell 元件並聯之模式 (如右圖所示，其參數分別為 $E_1 = E_2 = 100 \text{ Pa}$ ， $\eta_1 = 2 \text{ Pa-s}$ ， $\eta_2 = 10 \text{ Pa-s}$) 之應力鬆弛實驗，

(a) 其應力鬆弛函數 $G(t)$ 為何？ (5%)

(b) 當長度瞬間增長 50%，20 ms 後之總應力為何？ (5%)

(c) 經過 100 ms 後，左側應力與右側應力之比為何？ (5%)



9. Define the following terms:

a. Intrinsic viscosity (3%)

b. Overlap concentration (3%)

c. Relaxation time (3%)

d. Long period structure (3%)

e. Persistence length (3%)

f. Loss tangent (3%)

g. Free volume (3%)

h. WLF equation (4%)

