(8)

(2)

CENTRE FOR POLYMER SCIENCE AND ENGINEERING
PTL 701 POLYMER CHEMISTRY
MAJOR TEST

Date 30/11/2006
TX 120, 1-3 P.M
Max Marks = 80

Attempt all questions:

Q 1. Suggest a method for the preparation of

(i) Styrene–Butadiene–Styrene block copolymers with predefined molecular weight with narrow polydispersity index.
(ii) Syndiotactic polypropylene
(iii) Polystyrene with terminal indanyl structures
(iv) Fast curing phenolic resins
(v) Isotactic polypropylene

(15)

Q2. Account for the following (any five)

(i) Crosslinking in UF resins was observed inspite of the fact that only symmetrical dimethyol urea can be prepared.
(ii) Colored products are obtained during the crosslinking reaction of resoles
(iii) Nitrogen content in the crosslinked novolacs is dependent on the amount of crosslinker as well as on the temperature of crosslinking reaction, when heated above 180^0 C
(iv) Colored products are formed when 2,6-dimethyl phenol reacts with stoichiometric amounts of oxygen in copper catalysed reaction in the presence of pyridine
(v) During the polymerization of propylene using Zieglar Natta initiators, molecular weight of polymer decreased in the presence of hydrogen
(vi) In HI initiated polymersation of isobutyl vinyl ether high molecular weight polymer is obtained only when I_2 is added to the system

(20)

Q 3. Write short notes on :

a) Melamine formaldehyde resin
b) Vinyl ester resin
c) Metathesis polymerization
(d) Atom transfer radical polymerization

(20)

P.T.O

Q4 (a) Derive an integrated copolymer equation?

(b) Consider the copolymerization of methyl acrylate (1) and vinyl acetate (2). The following composition was found

Mole percent of methyl acrylate	
In feed	In copolymer
7.5	44.1
15.4	69.9
32.6	82.8
74.4	96.8

Calculate reactivity ratios.

(c) Calculate reactivity ratios for the copolymerization of monomers in pair.

	Q	e
Methyl methacrylate	0.40	0.75
Vinyl Chloride	0.20	0.044

(10+5)

Q 5. (a) $4x10^{-2}$ moles of sodium naphthalene was dissolved in THF and then 2 moles of styrene was added rapidly. The total final volume of the solution was 1 litre. It was found that half the monomer was polymerized in 1000sec. Calculate k_p and DP.

(5)

(b) Differentiate between resoles and novolacs

(c) rale of tertiary amines and aromatic diamines during curing of epoxy resins

Or

Derive an expression for the rate of polmerisation of stoichiometric and non-stoichiometric amounts of adipic acid a hexamethylene diamine. Indicate the assumptions inherent in the derivation.

(5)

Name: _____

Entry No. _____ Grp. _____

CHL101 - INTRODUCTION TO THERMODYNAMICS

Time : 2 hours
Max. Marks : 80

Date: 28. 11. 2006

Major Examination

Part A (20 Marks)
WRITE ON THIS SHEET ONLY

1. Is there any physical significance of the derivatives $(\partial u/\partial s)_v$ and $(\partial u/\partial v)_s$? Which Maxwell relation is obtainable with the help of these ?

2. When can we expect the Raoult's law to be valid for real systems ?

3. Sketch a typical $P\text{-}x_1\text{-}y_1$ plot for a non-azeotropic system, say methanol-water, at a given temperature. Clearly mark the dew point curve, bubble point curve, tie line, $x_1 = 0$, $x_2 = 0$ pressures, vapor fraction for some z_1, P. How will the plot change for an azeotropic system e.g. ethanol-water (for this show only the plot) ?

4. Define partial molar property $\overline{M}_i$ for species 'i' in a mixture. What is its significance ? Is it a true property or a function of what ? Write the Gibbs-Duhem equation using $\overline{M}_i$.

5. Differentiate between g_i, g_i^R, g_i^{id}, g, g^E and Δg^{mixing}.

6. Differentiate between $\hat{f}_i^{ig}$, $\hat{f}_i$, and $\hat{f}_i^{id}$. Write $\hat{f}_i$ in terms of $\bar{g}_i$ and also in terms of T, P and $\bar{z}_i$.

7. Is activity coefficient γ_i related to fugacity coefficients $\hat{\phi}_i$, ϕ_i ? If so, write the relation.

8. For the reaction CH_4 (g) $\rightarrow$ C (s) + $2H_2$ (g) at some T and P, for which ideal gas mixture may be assumed for the gas phase, write the equation which will allow the calculation of compositions at equilibrium. Standard states of the species in $\Delta g°$ for the reaction have the same physical state as shown in the above reaction. Start with the relation between fugacities and K. State other assumption (if any) that you may have made.