DMF와 Benzene에서 PS-PEG-PS의 solution거동

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Solution behavior of PS-PEG-PS triblock copolymer in DMF and Benzene

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1. Introduction

ABA triblock copolymer made up of long middle block(B) and short terminal blocks(A) is being widely used as thermoplastic elastomers. Block copolymers with non-polar hydrophobic polystyrene and polar hydrophilic poly(ethylene glycol) blocks has been prepared and the physical properties of the solutions of PS-PEG-PS in polar (dimethyl formamide, DMF) and non-polar solvent (benzene) were investigated[1-3].

2. Experimental

2.1. Material

Triblock copolymer, PS-PEG-PS was prepared by radical polymerization. Number-average molecular weight (M_n) of PS and PEG blocks were 1,800 and 4000, respectively. Polydispersity was measured to be 1.07. DMF and benzene (Duksan Co., Korea) were used without further purification.

2.2. Measurement of physical properties

The molecular parameters of obtained PS-PEG-PS was characterized by gel permeation chromatography(GPC). GPC measurement was carried out at 25 °C using a Waters 616 HPLC chromatography equipped with Waters 2410 refractive index detector.

^{1}H-NMR spectra were recorded with a Vraian VXR/Unity 300 in $CDCl_3$ with TMS as internal reference.

Intrinsic viscosity was measured at 25 and 55 °C by Ubbelohde viscometer (Schott Co.) over the concentration range 0.1 ~ 0.5 g/dl.

3. Results and Discussion

3.1. ^{1}H-NMR

Figure. 1 shows the ^{1}H NMR spectra of PS-PEG-PS in $CDCl_3$ solvents. A peak at δ=3.64 stands for methylene protons of PEG blocks. Peaks at δ=6.64 and 7.05 represent the phenyl ring protons in PS blocks.

3.2. Viscometry

Figure. 2 shows plot of the relative viscosity (η_{rel}) vs concentration (c) for PS-PEG-PS. All

solutions give a linear relationship. At 25 °C PS-PEG-PS solution in DMF gives higher viscosity than that in benzene because of electrical charge effect. At 55 °C, however, both solutions give similar viscosity.

4. References

1. Yu K, Eisenberg A. Macromolecules 1996;29:6359.
2. Szleifer I, Carignano MA. Macromol Rapid Commun 2000;21:423.
3. Jialanella GL, Firer EM, Piirma I. J Polym Sci Part A: Polym Chem 1992;30:1025.

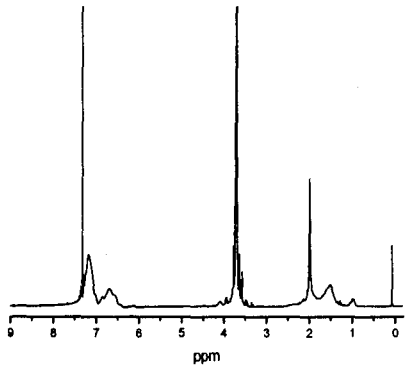

Figure 1. ^{1}H-NMR spectra of PS-PEG-PS.

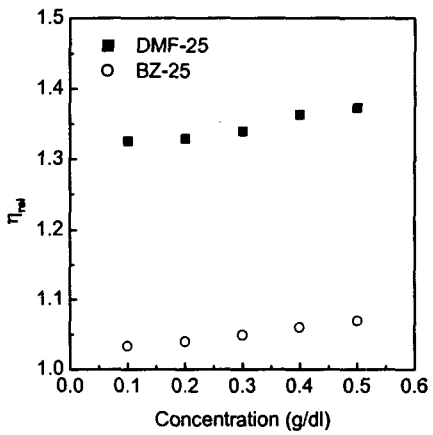

Figure 2. Plots of relative viscosity (η_{rel}) vs concentration for PS-PEG-PS solutions in DMF and Benzene at 25 °C.

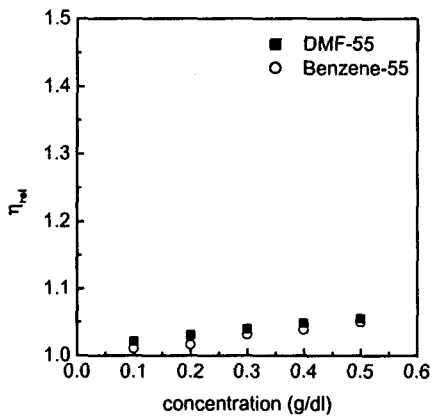

Figure 3. Plots of relative viscosity (η_{rel}) vs concentration for PS-PEG-PS solutions in DMF and Benzene at 55 °C.