

Iwhan Cho, Sang Won Jeong, and Kyu Myun Hwang
Synthesis and Ring-Opening Metathesis Polymeriza-
tion of Substituted Cyclooctenes : Butadiene-Based
Sequence-Controlled Copolymers

Korea Polymer Journal, 1(1), 1(1993)

For the synthesis of various sequence-controlled copolymers of butadiene with ethylene, propylene, and styrene, the cyclooctene derivatives, 5-phenylcyclooctene (PCO), 4-methyl-6-phenylcyclooctene (MPCO), and 4,6-diphenylcyclooctene (DPCO) were prepared and polymerized with various catalyst systems. The resulting polymers of PCO had the structure of the 1 : 1 : 1 alternating copolymer of butadiene, ethylene, and styrene. Polymerization of MPCO with the catalyst system of $WCl_6(OAr)_2/Et_4Pb$ gave high molecular weight polymers having the mer sequence of butadiene, propylene, and styrene in 1 : 1 : 1 alternating fashion. DPCO was also polymerized to obtain 2 : 1 alternating copolymer of styrene and butadiene.

Yong Soo Kang and Un Young Kim

Asymmetric Membrane Formation via Immersion Pre-
cipitation Method : II. A Membrane Formation
Scheme

Korea Polymer Journal, 1(1), 9(1993)

Upon immersion precipitation of a polymer solution, an asymmetric trilayer membrane has been frequently observed, which constitutes skin, nodular layer and microporous sublayer. In this study, a possible phase separation path for the asymmetric trilayer membrane formation is proposed. It is assumed that a polymer solution would consist of hypothetical three layers for convenience' sake. The first, second and third layers would be transformed into skin, nodular layer and microporous sublayer, respectively. However, the nodular layer would be formed only when the polymer concentration of the second layer is lower than the critical polymer concentration at the nascent moment of the liquid-liquid demixing.

Yong Kiel Sung, Yong Joo Kim, David W. Grainger,
Teruo Okano, and Sung Wan Kim

Bulk and Thermal Characteristics of Poly(ethylene
oxide)-Polystyrene Multiblock Copolymers

Korea Polymer Journal, 1(1), 14(1993)

Phase-separated multiblock copolymers of poly(ethylene oxide) (PEO) and polystyrene (PS) had been syn-

thesized by reacting functionalized telechelic oligomers of each block to create repeating urethane linkages between blocks. Block lengths were varied to change copolymer composition and these effects on bulk and thermal properties were examined. The multiblock copolymers were characterized by Fourier transform infrared analysis, 1H nuclear magnetic resonance spectroscopy and ultraviolet absorption spectroscopy. Thermal analysis using differential scanning calorimetry and thermogravimetric analysis showed that the melting temperature, enthalpy of fusion, and entropy of fusion of the PEO blocks increased with increasing PEO content. The glass transition temperature of the PS component was shifted compared to PS homopolymers. These results are interpreted in terms of a model for PEO-PS copolymers based on various degrees of phase-separated and phase-mixed structure. The activation energies determined for the decomposition of the homopolymers and block copolymers are 198.4 KJ/mol for PEO and 193.9 KJ/mol for PS, respectively.

Dalho Um

Synthesis and Polymerization of a New Acrylic Mono-
mer Containing Bicycloheptenone Moiety

Korea Polymer Journal, 1(1), 21(1993)

A new acrylic monomer containing tetraphenyl-substituted bicycloheptenone moiety was prepared through the designed reaction scheme. The reaction intermediates obtained during the series of reaction were identified. The final product of white solid monomer (mp. : 202~204°C, MW : 593.7) was homopolymerized and copolymerized with methyl methacrylate (MMA) in *N,N*-dimethylformamide (DMF) by using a radical initiator, 2,2'-azobisisobutyronitrile (AIBN). The copolymer reactivity ratios of the monomer and MMA at high conversions were found to be 0.31 and 1.06, respectively, according to the calculation of Kelen-Tüdös method. UV, NMR and elemental analysis were employed to determine the composition of the copolymer. The results from each method were close within an experimental error range.

Donghwan Cho and Wayne L. Mattice

Chiroptical Properties and Intrachromophoric Interac-
tions in Oligomeric and Polymeric Molecules of Procy-
anidins

Korea Polymer Journal, 1(1), 27(1993)

The chiroptical characteristics of the series of procya-

nidin oligomers (dimer through hexamer) and polymer connected by epicatechin monomeric unit(s) with $4\beta \rightarrow 8$ interflavan bond(s) were extensively studied in this paper, based on solvent and molecular weight dependences of the molar ellipticity per mean residue, $[\theta]$, significantly observed between 210 and 250 nm. A dramatic increase in the $[\theta]$ of procyanidin molecules larger than the dimer suggests that the interaction between aromatic chromophores located in chiral positions with respect to each other becomes pronounced above the trimer. A simple model for intrachromophoric interaction provides good agreement between the experimental and calculated values of the circular dichroism ($\Delta\epsilon$) for the oligomeric and polymeric molecules of procyanidins.

Jae-rock Lee and J. Jeong

Effect of Processing Conditions on Impact Fracture of Glass Fiber Mat/Polypropylene Composites
Korea Polymer Journal, 1(1), 34(1993)

The commercial glass fiber mat (from Hankook Fiber Co., Ltd.) was impregnated by polypropylene (5030 from Daehan Petrochemical Co., Ltd.) and the change of their impact strength and fracture surface were examined as a function of the processing conditions. The maximum processing temperatures of 180 °C, 200 °C and 220 °C were tested. The specimens were preheated for 1, 2 and 3 minutes, and then they were pressed for 0.5, 1 and 2 minutes with the applied pressures of 0.2 and 0.4 MPa. The highest impact strength was obtained with the specimens which were impregnated at 220 °C with 1 minute of pressing and 0.2 MPa of applied pressure after 2 minutes of preheating. The effect of recrystallization was obscure in this case. The severe thermal gradient in the specimen during cooling was detrimental to the impact strength.

Yeong-Soon Gal, Bal Jung, Won-Chul Lee, and Sam-Kwon Choi

Polymerization of 3,3-Diethoxy-1-propyne by Transition Metal Catalysts
Korea Polymer Journal, 1(1), 40(1993)

The polymerization of 3,3-diethoxy-1-propyne having acetal functional group by various Mo- and W-based catalysts. MoCl_5 and MoCl_5 -organoaluminum catalyst systems give some moderate yield of polymer (30~41%). Mo-based catalyst systems were found to be more effective for the present polymerization of 3,3-diethoxy-1-propyne than W-based catalyst systems. The MoCl_5 -EtAlCl₂ catalyst system yielded the best results. The resulting polymers were found to be insoluble in most organic solvents regardless of the polymerization conditions and the catalyst employed. The infrared spectrum of polymer

showed neither the acetylenic hydrogen stretching nor the carbon-carbon triple bond stretching frequencies in contrast with that of the monomer. Thermal properties of the resulting polymer were also studied.

Sung-Hoe Yoon, Jae Heung Lee, Kil-Yeong Choi, and Byung Kwon Min

Phase Separation Behaviors during Polymerization in the Linear Blends and Semi-Interpenetrating Polymer Networks: 1. Intensity Changes in the Transmitted Light during Polymerization
Korea Polymer Journal, 1(1), 45(1993)

Phase separation behavior for the mixture of polystyrene (PS) and poly(*n*-butyl acrylate) (PBA) was investigated when PBA was in situ polymerized from the homogeneous solution of PS and *n*-butyl acrylate (BA) monomer. The nearly monodisperse PS was used to eliminate the molecular weight distribution effect on the phase separation behavior. The turbidity method was used to follow the phase separation progressed with polymerization. The intensity of the transmitted light was recorded as a function of the polymerization time. The effects of the concentration, the PS molecular weight, the polymerization temperature and the crosslinking agent on the phase separation behavior were investigated. As the concentration and the molecular weight of PS were increased, the onset time to phase separation decreased, and the rate of phase separation increased. The introduction of a crosslinking agent to the BA mixture retarded the phase separation for the semi-interpenetrating polymer network (S-IPN) with the high molecular weight PS. In contrast to this, for the S-IPN of the low molecular weight PS, the phase separation was accelerated with increasing the amount of the crosslinking agent.

S. H. Lee and M. H. Suh

Structure-Property Relationship of Oriented Thermotropic Liquid Crystalline Polymers
Korea Polymer Journal, 1(1), 51(1993)

In order to predict the elastic properties of thermotropic liquid crystalline polymers (TLCPs), a simple model based on the composite structure associated with a nematic domain, typical of liquid crystalline system, is presented. In this model, we assume that the volume fraction and aspect ratio of oriented nematic domains vary with the degree of orientation. We estimate the structural parameters as a function of orientation using the well known Halpin-Tsai equations as a basis for the model. The results of such analysis indicate that the degree of liquid crystallinity and aspect ratio of nematic domains are highly dependent on the orientation and this *in situ*

formation of the fiber like nematic domains potentially leads to high modulus and high strength properties that are not obtainable with conventional reinforcing fibers.

Chong-Su Cho, Hee-Yong Kim, and Yong Kiel Sung
Synthesis and Structural Study of an ABA Block Copolymer Consisting of Poly(γ -ethyl L-glutamate) as the A Component and Poly(ethylene oxide) as the B Component

Korea Polymer Journal, 1(1), 57(1993)

ABA type block copolymers composed of poly(γ -ethyl L-glutamate)(PELG) as the A component and poly(ethylene oxide)(PEO) as the B component were obtained by polymerization of γ -ethyl L-glutamate N-carboxyanhydride, initiated by amine groups at both ends of PEO. From circular dichroism measurements in trifluoroethanol solution as well as from infrared spectra measurements in the solid state, it was found that the polypeptide block exists in the α -helical conformation, as in PELG homopolymer. Wide-angle X-ray diffraction patterns show basically similar reflections as the PELG homopolymer.

Suh Bong Rhee, Myong-Hoon Lee, Bong Seok Moon, and Yongku Kang

Synthesis and Characterization of Poly(*N*-methyl isoindole): A Soluble Conducting Polymer

Korea Polymer Journal, 1(1), 61(1993)

A soluble conducting polymer, poly(*N*-methyl isoindole), was prepared by chemical and electrochemical oxidation of *N*-methyl isoindole. The polymer structure was proposed from the IR and elemental analyses. The conductivity of the polymer was measured to be in the range of 10^{-6} – 10^{-4} S/cm depending on the extent of doping. The electrochemical properties were also studied by examining the cyclic voltammograms of the polymer. This polymer was soluble in DMF or DMSO, and the electrochemical properties of the solution cast film were almost identical to those of the film freshly prepared.

Furthermore, poly(*N*-methyl isoindole) showed good electrochromic property by changing its color from golden yellow in reduced state to dark green in oxidized state. We have prepared a unique electrochemical UV cell to study the *in situ* spectroelectrochemical properties of poly(*N*-methyl isoindole).

Moonsoo Park and Ronald Salovey

Structure Dependent Flow Behavior of Low Molecular Weight Polystyrene Composites Containing Crosslinked Polymeric Beads

Korea Polymer Journal, 1(1), 69(1993)

The steady shear viscosity and dynamic moduli of low molecular weight polystyrene (PS) composites containing monodisperse crosslinked polymeric beads were measured with a cone and plate rheometer. Three different mixing temperatures were tried in preparing the polystyrene composites in melt state. At each temperature mixing was conducted at 50 rpm for the first 7.5 minutes followed by 100 rpm for another 7.5 minutes, with 0.2 weight % anti-oxidant added. A sample melt-mixed at 175 °C, the highest mixing temperature, showed a large agglomeration of polymeric beads, and the rheological properties with a yield stress. The yield stress was more pronounced with polar beads such as polymethyl methacrylate (PMMA) beads than with non-polar beads such as PS beads. On the other hand, a sample melt-mixed at 125 °C, the lowest mixing temperature, produced the most uniform dispersion of polymeric beads, and exhibited the lowest rheological properties with no yield stress. A low molecular weight PS composite containing 20% of 0.2 μ m PS beads crosslinked with 5 mole% divinylbenzene (DVB) showed time dependent "aging" phenomenon at 180 °C. We suggest that an affinity of a matrix and beads allowed movement of polymer chains and polymeric beads at elevated temperature, and as a consequence, PS beads have agglomerated, resulting in a large increase in rheological properties.