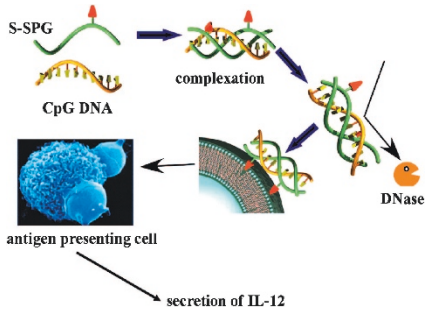
AWARD ACCOUNTS

SPSJ Mitsubishi Chemical Award Accounts

A Novel Polysaccharide/Polynucleotide Complex and its Application to Bio-functional DNA Delivery System

Schizophyllan (SPG) is produced by a fungi as an extracellular β-1,3-glucan and takes a triple helical structure in nature. SPG can form a novel complex with polynucleotides through hydrogen bonding between the two main chain glucoses and the one nucleotide base. The complexed nucleotides can be protected from DNase degradation and the complex can be used as a delivering vehicle. The present paper describes an *in vitro* and *vivo* assay to specifically deliver a CpG DNA to the antigen presenting cells.

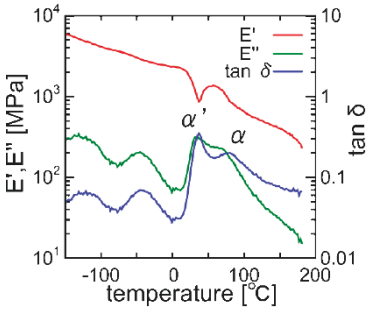


S. MOCHIZUKI and K. SAKURAI
Vol. 41, No. 5, pp 343–353 (2009)

SHORT COMMUNICATION

Novel Primary Dispersion in Viscoelastic Behavior of Ferroelectric Nylon 6

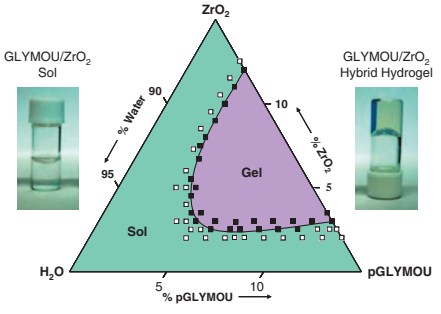
As-quenched ferroelectric amorphous nylon 6 shows a new intense primary relaxation (α') peak for $\tan\delta$ and E'' around 300 K. Activation energy of α' relaxation was estimated to be about 150 kcal/mol, *ca.* three times that of α relaxation. It suggests that loose molecular packing in the ferroelectric amorphous phase makes the large-scale molecular motion possible, when rotational motion of amide groups is activated and *D-E* hysteresis loops can be observed.



T. TAKAHASHI, T. ITOH,
S. FUJIWARA, and M. HASHIMOTO
Vol. 41, No. 5, pp 354–355 (2009)

Interaction between Poly(glyceryl-*N*-(2-methacryloyloxyethyl)urethane) and ZrO_2 Nanoparticles: Formation of Hybrid Hydrogel

The hybrid hydrogel composed of poly(glyceryl-*N*-(2-methacryloyloxyethyl)urethane) (pGLYMOU) and ZrO_2 nanoparticles was prepared utilizing hydrogen bonding interaction between Zr-OH groups of the ZrO_2 nanoparticles and the hydroxyl groups and the urethane groups of pGLYMOU in water. The three-dimensional network structure of pGLYMOU/ZrO_2 hybrid hydrogel could be clearly observed by FE-SEM.



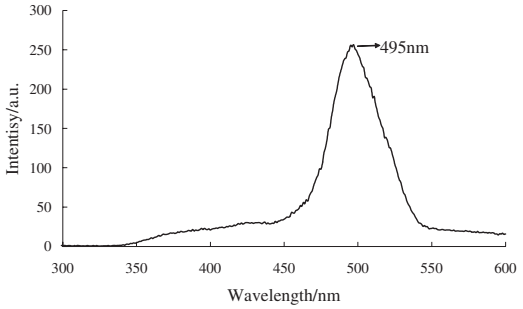
E.-C. KANG, A. OGURA, and T. MORISHITA
Vol. 41, No. 5, pp 356–357 (2009)

Polymer Journal

REGULAR ARTICLE

The Photoluminescence Properties of Hyperbranched Poly(ester-amine)/ZnS Particle Self-Assembled Multilayer Films

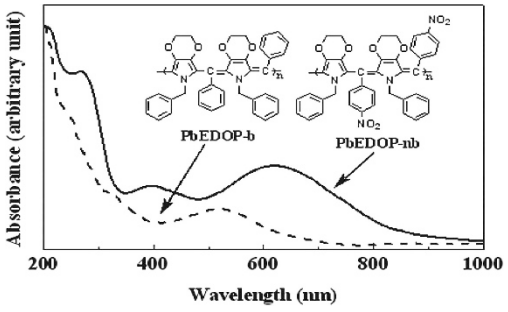
The photoluminescence of the hyperbranched polymer/ZnS multilayer film.



T. QIU, C. SONG, J. YU, and X. LI
Vol. 41, No. 5, pp 358–362 (2009)

Synthesis and Properties of New Small Band Gap Conjugated Polymers: Methine Bridged Poly(3,4-ethylenedioxypyrrole)

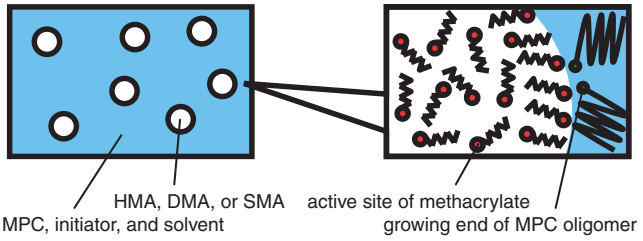
Small band gap conjugated polymers of methine bridged conjugated poly(3,4-ethylenedioxypyrrole) (**PEDOP**) were studied. The theoretical analysis suggested that the incorporating methine-bridge into **PEDOP** decreased the bond length alternation and led to the reduction of band gap. The theoretical band gap of **PEDOP-M** was 0.68 eV, significantly smaller than that of **PEDOP** with 2.44 eV. Methine-bridged **PEDOP**, **PbEDOP-b** and **PbEDOP-nb**, were synthesized by acid-catalyzed polymerization. The experimental band gaps of **PbEDOP-b** and **PbEDOP-nb** also suggested the small band gap characteristics.



J.-H. TSAI, W.-R. TU, C.-L. LIU, W.-C. WU, and W.-C. CHEN
Vol. 41, No. 5, pp 363–369 (2009)

Synthesis of Amphiphilic Copolymers by Soap-free Interface-Mediated Polymerization

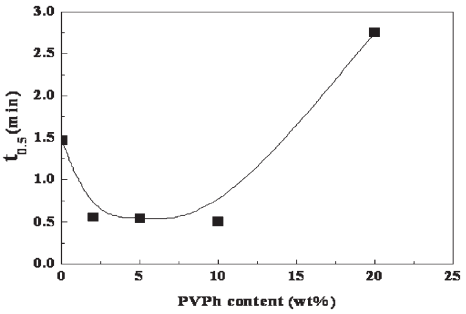
2-methacryloyloxyethylphosphorylcholine (MPC) and alkyl methacrylates, such as *n*-hexyl methacrylate (HMA), *n*-dodecyl methacrylate (DMA), and stearyl methacrylate (SMA), were synthesized by soap-free heterogeneous polymerization. The reaction was carried out with the same monomer concentration but at different solvent compositions. This strategy could control the polymer composition despite the same monomer ratio. It would appear that a change of solvent polarity causes a change of the interface between the solution phase and the alkyl methacrylate phase.



R. KOJIMA, M. C. Z. KASUYA, K. ISHIHARA, and K. HATANAKA
Vol. 41, No. 5, pp 370–373 (2009)

Kinetic Analysis on Effect of Poly(4-vinyl phenol) on Complex-Forming Blends of Poly(L-lactide) and Poly-(D-lactide)

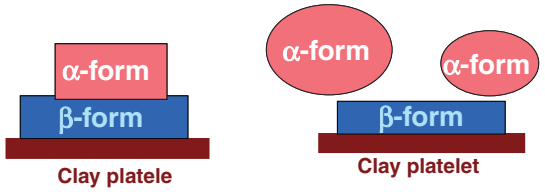
Ternary blends of amorphous PVPh and crystalline stereocomplex of PLLA and PDLA were investigated on phase behavior and crystallization kinetics. At low contents, PVPh is miscible and well dispersed in the ternary blends, but PVPh may aggregate to nanodomains by self-associated hydrogen-bonding upon extended annealing. PVPh serves as an effective agent in reducing the spherulite sizes of the PLLA/PDLA crystals, which may be favorable in controlling the macroscopic properties of ternary blends. The PVPh nanodomains also help accelerate the stereo-complex crystallization.



S.-H. Li and E. M. Woo
Vol. 41, No. 5, pp 374–382 (2009)

Effect of Blended Montomollironite on Crystallization of Poly(vinylidene fluoride)

Poly(vinylidene fluoride) (PVDF) crystallizes as *β*-form crystal on clay surface of PVDF/organo-clay (organically modified clay) nanocomposites and PVDF/natural-clay (non-modified clay) composites systems. This result is one of the important evidence for that the crystallization mechanism is the epitaxial growth of the PVDF *β*-form crystal on the surface of clay platelets. In our experiment, PVDF crystallization behavior depends on amount of clay surface exposed to PVDF matrix and a degree of super-cooling.

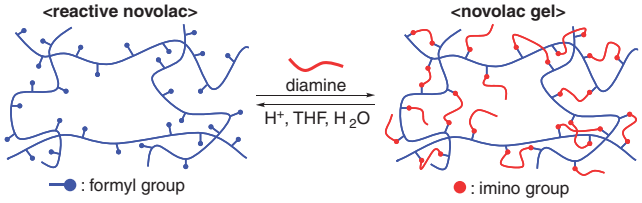


Epitaxial growth of the PVDF β-form crystal on the surface of clay platelets.

E. Yamada, A. Nishioka, H. Suzuki, G. Murasawa, K. Miyata, T. Koda, and S. Ikeda
Vol. 41, No. 5, pp 383–388 (2009)

Synthesis of a Formyl Group-Containing Reactive Novolac

The addition-condensation of 2,4,6-trimethoxybenzaldehyde (**1**) and 1,3,5-trimethoxybenzene (**2**) with formaldehyde was carried out to obtain **3** (M_n:4200, M_w/M_n:1.2) without side reactions on formyl groups of **1**. The imination of **3** with 1,5-diaminopentane successfully proceeded to give the gel (**5**). The temperature at 5% loss in weight of **5** (335 °C) slightly decreased compared to that of **3** (351 °C). These results indicate that **3** can be utilized as a reactive polymer, and form the thermostable gel *via* the imine moiety.

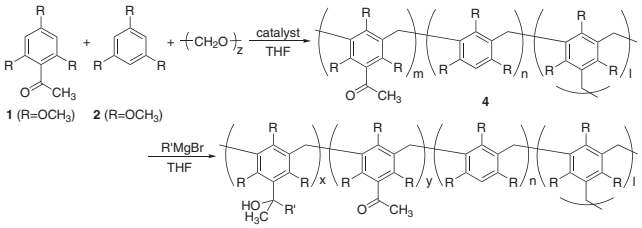


T. Nemoto, I. Amir, and G. Konishi
Vol. 41, No. 5, pp 389–394 (2009)

Polymer Journal

Synthesis of Alkoxylated Phenolic Resins Containing an Acetyl Group and Their Functionalization by Grignard Reaction

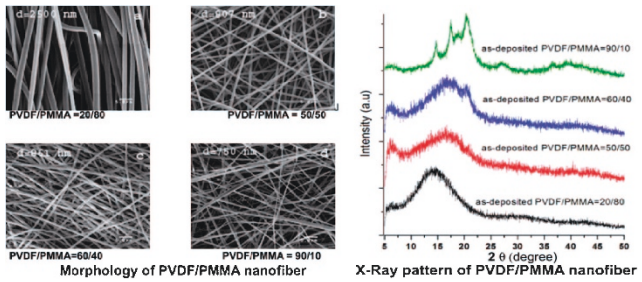
We synthesized acetyl group-containing phenolic resins as novel reactive polymers. The addition-condensation of 2,4,6-trimethoxyacetophenone (**1**) and 1,3,5-trimethoxybenzene with formaldehyde (feed ratio: 1:1:2) proceeded without side reactions to obtain polymer, **4**, in 22% yield, in which the content of **1** was found to be 25%. The reactions of **4** with Grignard reagents were carried out to evaluate the reactivity of acetyl groups in **4**. The reactions proceeded at some parts of acetyl groups; therefore, **4** is a reactive novolac.



T. NEMOTO, I. AMIR, and G. KONISHI
Vol. 41, No. 5, pp 395–401 (2009)

Preparation of PVDF/PMMA Blend Nanofibers by Electrospray Deposition: Effects of Blending Ratio and Humidity

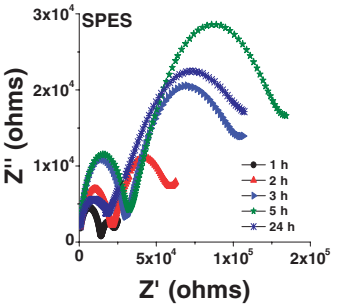
The PVDF/PMMA blend nanofibers with various blending ratios were prepared by electrospray deposition (ESD). Both the blending ratio and the humidity influenced the morphology and the average diameter of the as-deposited fiber. Higher content of PVDF gave thinner fiber with higher degree of crystallinity. The formation of beads on fiber was reduced by the increase in humidity.



M. NASIR, H. MATSUMOTO, M. MINAGAWA, A. TANIOKA, T. DANNO, and H. HORIBE
Vol. 41, No. 5, pp 402–406 (2009)

Effect of Sulfonation on Thermal, Mechanical, and Electrical Properties of Blends Based on Polysulfones

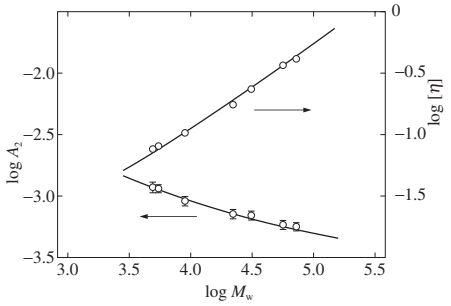
Different blends based on both sulfonated and non-sulfonated polysulfones have been obtained and their thermal, mechanical, and electrical properties have been determined. By using an statistical design of experiences it is possible to determine the region of compositions where the properties are more favourable.



A. LINARES and R. BENAVENTE
Vol. 41, No. 5, pp 407–415 (2009)

Characterization of Linear Poly(*N*-isopropylacrylamide) and Cloud Points in its Aqueous Solutions

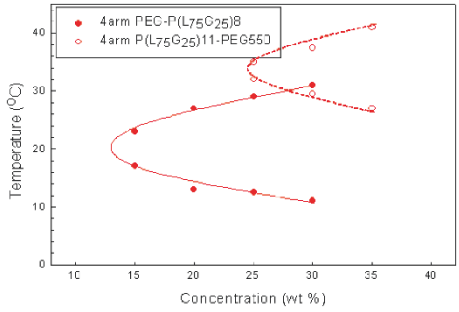
The second virial coefficient A_2 and intrinsic viscosity $[\eta]$ as functions of the weight-average molecular weight M_w determined in methanol at 25.0 °C for linear poly(*N*-isopropylacrylamide) synthesized by living anionic polymerization are simultaneously analyzed on the basis of the Kratky–Porod wormlike chain with excluded volume. The chain stiffness λ^{-1} is estimated to be 18 Å, which is almost the same as those determined for typical flexible polymers.



K. KOBAYASHI, S. YAMADA, K. NAGAOKA, T. KAWAGUCHI, M. OSA, and T. YOSHIZAKI
Vol. 41, No. 5, pp 416–424 (2009)

Temperature-Sensitive Sol-Gel Transition Behavior of Biodegradable Four-Arm Star-Shaped PEG-PLGA Block Copolymer Aqueous Solution

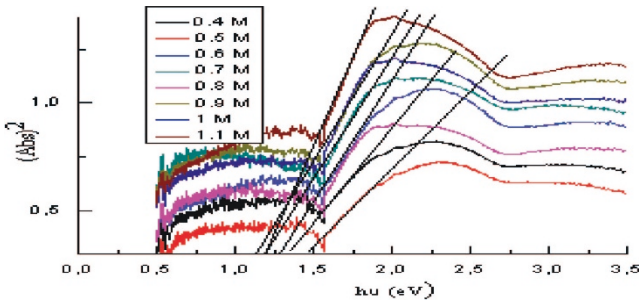
Biodegradable four-arm star-shaped poly(ethylene glycol-*b*-DL-lactic acid-*co*-glycolic acid) block copolymers (4arm PEG-PLGA) were synthesized by ring-opening polymerization of DL-lactide and glycolide using 4arm PEG as an initiator and $Sn(oct)_2$ as a catalyst. In aqueous solution, they showed reversible sol to gel to sol transition behavior while increasing the temperature from 0 °C to 40 °C. 4arm PEG-PLGA formed gels at lower CGC (13 wt %) than the inverse 4arm PLGA-PEG (24 wt %) due to the differences in their molecular structures.



S. J. LEE, C. W. PARK, and S. C. KIM
Vol. 41, No. 5, pp 425–431 (2009)

Influence of Dibenzoyl Tartaric Acid on the Electrical Performances of the Polyaniline

The micro-fibres structure can be obtained by direct doping of the polyaniline by dibenzoyl tartaric acid DBTA as chiral doping agent and methanol as solvent of dopant and surfactant. The polyaniline was produced by direct oxidative polymerization of the chiral unit of repetition of aniline monomer. The influence of the molar report/ratio of DBTA to aniline was studied on FT-IR and UV-visible-NIR properties, the thermal (TGA), the morphological structure (SEM) and electrical properties (I-V, C-V curves and the gap).

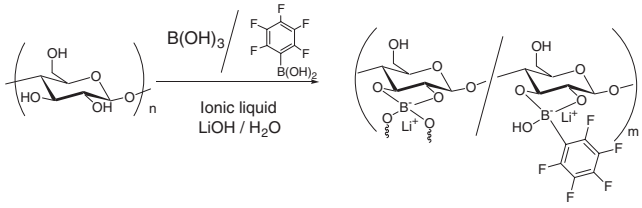


N. NAAR, S. LAMOURI, B. BELAABED, T. KOUROUGHLI, and N. GABOUZE
Vol. 41, No. 5, pp 432–436 (2009)

Polymer Journal

Enhanced Ionic Conduction in Organoboron Ion Gels Facilely Designed *via* Condensation of Cellulose with Boric Acids in Ionic Liquids

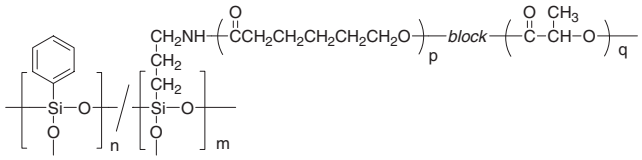
Enhanced ionic conduction was observed in organoboron ion gels prepared by condensation between cellulose and boric acids in ionic liquids. The obtained ion gels bearing highly dissociable lithium borate structure exhibited maximum ionic conductivity of over 10^{-3} Scm^{-1} at 303 K.



N. MATSUMI, Y. NAKAMURA, K. AOI, T. WATANABE, T. MIZUMO, and H. OHNO
Vol. 41, No. 5, pp 437–441 (2009)

Synthesis of Grafted Polysilsesquioxane by Ring-Opening Polymerization of Lactide

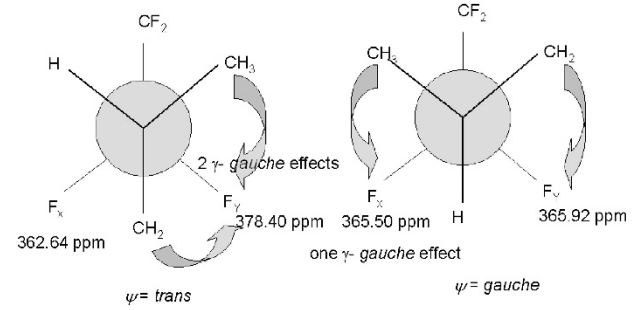
The polysilsesquioxane having amino and phenyl groups was utilized as a macroinitiator for the ring-opening polymerization of L-(−)-lactide (**LA**) in the presence of a catalytic amount of the base, prepared from triazabicyclodecene and allyl isocyanate. By the polymerization, the polysilsesquioxanes having the graft chains of poly(**LA**) was obtained. The procedure was applicable to the introduction of the block copolymer of **LA** and ε-caprolactone (**CL**), in which the polysilsesquioxane having the graft chains of poly(**CL**) was used as the macroinitiator.



M. KASHIO, T. SUGIZAKI, S. YAMAMOTO, and O. MORIYA
Vol. 41, No. 5, pp 442–448 (2009)

A ^{19}F NMR Signal Assignment and a Detailed Structural Study of Alternating Tetrafluoroethylene-Propylene Copolymer by High Resolution ^{19}F NMR Spectroscopy and Computational Chemistry

Simplified ^{19}F NMR spectra of Tetrafluoroethylene-propylene-(TFE-P) alternating copolymers are measured in solution by *J*-resolved and COSY techniques. Thus geminal fluorine nuclei on the carbon atom adjacent to CH_2 groups and those on the carbon atom adjacent to $CHCH_3$ groups are assigned accurately. Also the two CF_2-CF_2 pairs of connection are found and these two pairs are assigned to *meso* or *racemic* configurations, respectively. Further, the conformational exchange of TFE-P copolymers in solution is discussed in a wide temperature range.



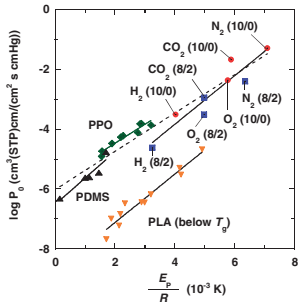
S. KUROKI
Vol. 41, No. 5, pp 449–454 (2009)

Polymer Journal

NOTE

Temperature Dependence on Gas Permeability and Permselectivity of Poly(lactic acid) Blend Membranes

The preexponential constant (P_0) of Blend 10/0 and Blend 8/2 poly(lactic acid) (PLA) membranes, glassy PLA homopolymers, poly(propylene oxide) (PPO), and polydimethylsiloxane (PDMS) as a function of the activation energy of gas permeation (E_P). The data of both Blend 10/0 and Blend 8/2 membranes were gathered around the line of rubbery polymers PPO and PDMS. On the other hand, those of the glassy PLA homopolymers were located below the line of rubbery polymers.



T. KOMATSUKA and K. NAGAI

Vol. 41, No. 5, pp 455–458 (2009)