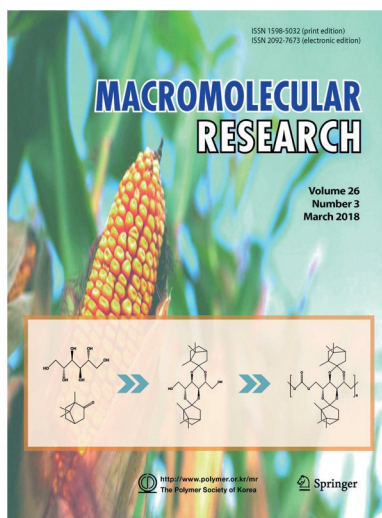


COVER PAPER

Thermally Stable Bio-Based Aliphatic Polycarbonates with Quadra-Cyclic Diol from Renewable Sources

Jeong Eon Park, Wook Kyeom Kim, Da Young Hwang, Gwang Ho Choi, and Dong Hack Suh*

Vol. 26, No. 3, pp 246-253 (2018) | MAR 25, 2018 | DOI 10.1007/s13233-018-6038-8



CM diol (*i.e.*, 2,4:3,5-di-O-camphor-D-mannitol) is bio-based monomer derived from D-mannitol and camphor. A series of copolycarbonates based on CM diol was synthesized and a homo-polycarbonate except bisphenol A (BPA) diol had a high T_g value of 164 °C, which is higher than T_g (138 °C) of polycarbonates based on BPA (BPAPC). In addition, the polycarbonates containing CM diol showed enhanced susceptibility to hydrolysis at acidic solution and decomposed better than BPA-PC.

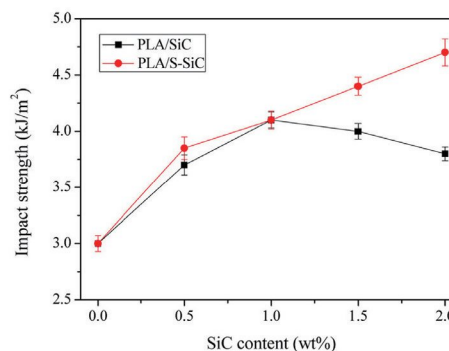
COMMUNICATION

Effect of Surface Modification on Impact Strength and Flexural Strength of Poly(lactic acid)/Silicon Carbide Nanocomposites

Fan-Long Jin*, Heng Zhang,
Shan-Shan Yao, and Soo-Jin Park*

Macromol. Res., **26**, 211 (2018)

The poly(lactic acid) (PLA)/silicon carbide (SiC) nanocomposites exhibited a maximum impact strength at 1 wt% SiC, while the impact strength of the PLA/ surface-modified SiC (S-SiC) nanocomposites improved remarkably with increasing S-SiC content. This can be attributed to the good compatibility between the methylene groups in the S-SiC surfaces and the PLA matrix, which leads to efficient stress transfer and increased resistance to deformation and crack propagation, resulting in increased impact strength.



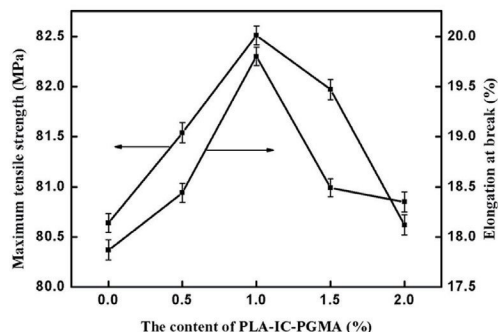
ARTICLES

Preparation, Structure and Performance of Poly(lactic acid)/Poly(lactic acid)- γ -Cyclodextrin Inclusion Complex-Poly(glycidyl methacrylate) Composites

Ya Li and Weijun Zhen*

Macromol. Res., **26**, 215 (2018)

Poly(lactic acid)- γ -cyclodextrin inclusion complex-poly(glycidyl methacrylate) (PLA-IC-PGMA) was synthesized with poly(lactic acid) and γ -cyclodextrin inclusion complex *via* surface initiated atom transfer radical polymerization. Then, the PLA/PLA-IC-PGMA composite was prepared by melt blending using PLA-IC-PGMA as additive. Because the use of compounds with reactive groups can improve the toughness of PLA, mechanical testing analysis showed that the tensile strength and elongation at break of PLA/(1 wt%) PLA-ICPGMA composites were improved by 2.3% and 10.8%.

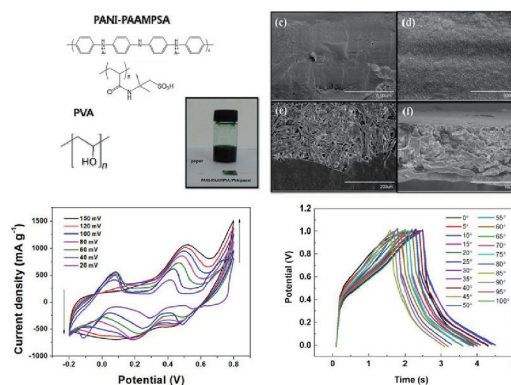


High-Efficiency Flexible and Foldable Paper-Based Supercapacitors Using Water-Dispersible Polyaniline-Poly(2-acrylamido-2-methyl-1-propanesulfonic acid) and Poly(vinyl alcohol) as Conducting Agent and Polymer Matrix

Seung Won Kang and Joonho Bae*

Macromol. Res., **26**, 226 (2018)

Common printing paper is converted to electrode for high-performance flexible and foldable electrochemical supercapacitors using water-dispersible conductive polymer, polyaniline-poly(2-acrylamido-2-methyl-1-propanesulfonic acid) (PANI-PAAMPSA) and poly(vinyl alcohol) (PVA) as conducting agent and polymer matrix, respectively. The paper-based supercapacitors exhibit excellent electrochemical energy storage capability, mechanical durability and flexibility. Our work could open up opportunities of next-generation paper-based electronics and energy storage devices.

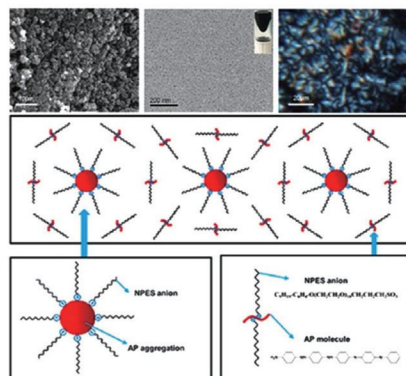


Synthesis and Characterization of a Fluid-Like Novel Aniline Pentamer

Mengkui Wang, Jing Huang, Quanling Yang, Zhikang Liu, Lijie Dong, Shan Wang*, and Chuanxi Xiong*

Macromol. Res., **26**, 233 (2018)

A novel fluid-like aniline pentamer is prepared by doping with nonylphenol polyoxyethylene ether sulfate. It exhibits liquid crystal characteristics without any solvents.

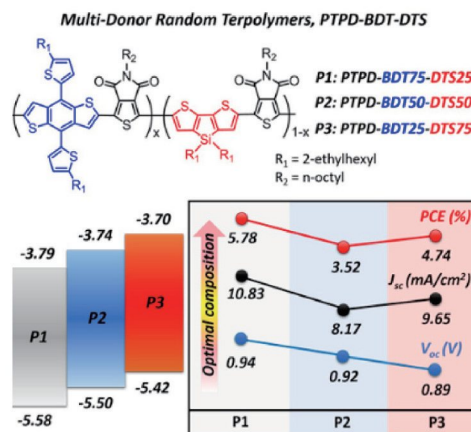


Multi-Donor Random Terpolymers Based on Benzodithiophene and Dithienosilole Segments with Different Monomer Compositions for High-Performance Polymer Solar Cells

Hyojung Heo, Honggi Kim,
Geonik Nam, Donghwa Lee,
and Youngu Lee*

Macromol. Res., **26**, 238 (2018)

New multi-donor random terpolymers composed of two electron-rich units, benzodithiophene (BDT) and dithienosilole (DTS), and one electron-deficient unit, thieno[3,4-c]pyrrole-4,6-dione (TPD) were synthesized. PTPD-BDT75-DTS25 with monomer composition of BDT and DTS (75:25) showed excellent light harvesting ability, low-lying HOMO energy level, and high charge carrier mobility. The polymer solar cells based on the PTPD-BDT75-DTS25 displayed a power conversion efficiency as high as 5.78%.

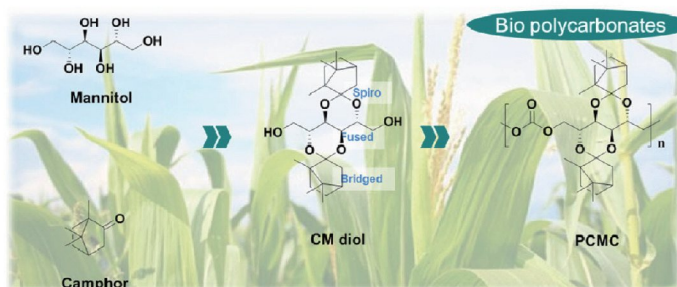


Thermally Stable Bio-Based Aliphatic Polycarbonates with Quadra-Cyclic Diol from Renewable Sources

Jeong Eon Park, Wook Kyeom Kim,
Da Young Hwang, Gwang Ho Choi,
and Dong Hack Suh*

Macromol. Res., **26**, 246 (2018)

Bio-based monomer is derived from D-mannitol and camphor and the rigid structure of this monomer influence the rigidity and thermal properties. A series of copolycarbonates was synthesized and a homo-polycarbonate except BPA had a high T_g value of 164 °C, which is higher than T_g (138 °C) of polycarbonates based on BPA (BPA-PC). The polycarbonates containing it showed enhanced susceptibility to hydrolysis and decomposed better than BPA-PC.

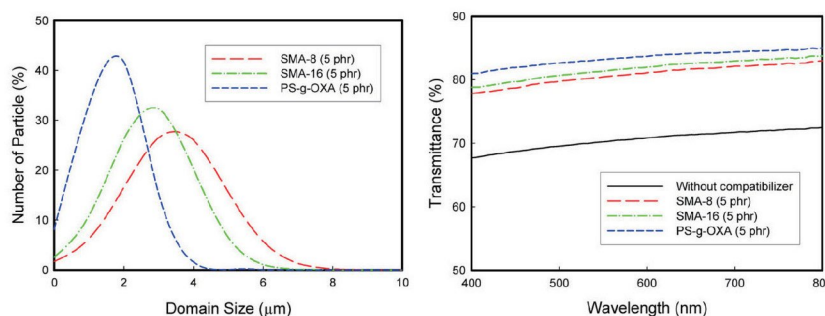


The Effects of Compatibilizers on the Morphological, Mechanical, and Optical Properties of Biaxially Oriented Poly(ethylene terephthalate)/Syndiotactic Polystyrene Blend Films

Kweon Hyung Han, Myung Geun Jang,
Kyu Jin Juhn, Choonglai Cho,
and Woo Nyon Kim*

Macromol. Res., **26**, 254 (2018)

The morphological results of the poly(ethylene terephthalate) (PET)/syndiotactic-polystyrene (s-PS) (70/30) blends revealed that when the 5 phr polystyrene-*g*-oxazoline (PS-*g*-OXA) was used as a compatibilizer, the domain size showed minimum and narrowest size distribution. The transmittance of the blend film showed the highest value (83.7%) for the biaxially oriented PET/s-PS (70/30) blend films with the PS-*g*-OXA (5 phr), compared with that of the blends without compatibilizer (70.8%) at the wavenumber of 600 nm.

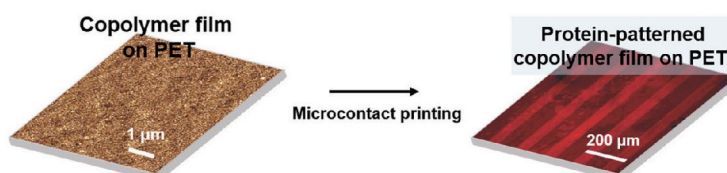


Protein-Patterning on Functionalized, Non-Biofouling Poly[*N*-acryloxysuccinimide-co-oligo(ethylene glycol) methyl ether methacrylate] Film-Coated PET Surfaces

Gyeongyeop Han, Yoonyoung Kim, Kyungtae Kang, Bong Soo Lee*, and Jungkyu K. Lee*

Macromol. Res., **26**, 263 (2018)

We successfully fabricated poly(ethylene terephthalate) (PET) surfaces through a perfluoroaryl azide-based photochemical reaction, and subsequently formed an intrinsically activated, non-biofouling poly[*N*-acryloxysuccinimide-co-oligo(ethylene glycol) methyl ether methacrylate] on the surface through surface-initiated, controlled radical polymerization. The grafted copolymer film on PET facily generated a protein pattern using microcontact printing technique without employing both an activation step to introduce an active functional group (*e.g.*, succinimidyl ester) and a passivation process for minimizing non-specific adsorption. Consequently, we characterized the functionalized PET surfaces by using various methods including contact angle measurement, X-ray photoelectron spectroscopy (XPS), scanning probe microscopy (SPM), field-emission scanning electron microscopy (FE-SEM). In addition, we evaluated the non-biofouling efficacy of the protein-patterned copolymer film on PET by confocal laser scanning microscopy.

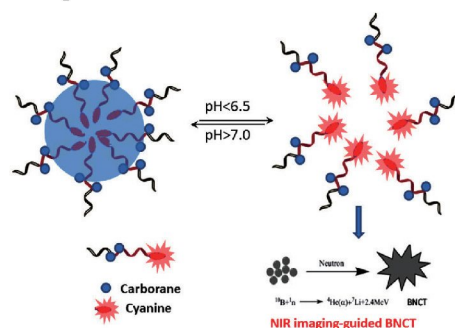


pH-Sensitive Polypeptide Conjugated with Carborane Clusters and Cyanine for NIR Bioimaging and Multi-Therapies

Zheng Ruan*, Pan Yuan, Titao Jing, Tao Xing*, and Lifeng Yan*

Macromol. Res., **26**, 270 (2018)

The polypeptide POEGMA-PmCbA-PASP-Cy (PPCy) nanoparticles is carborane contained polypeptide for boron neutron capture therapy (BNCT). It is pH-sensitive which disassemble under acidic environment caused by protonation of tertiary amine. The size and surface charge changes during environment from neutral to acidic. And the whole nanoparticles shows nice *in vitro* cellular uptake ability and biocompatibility for potential further therapeutic.

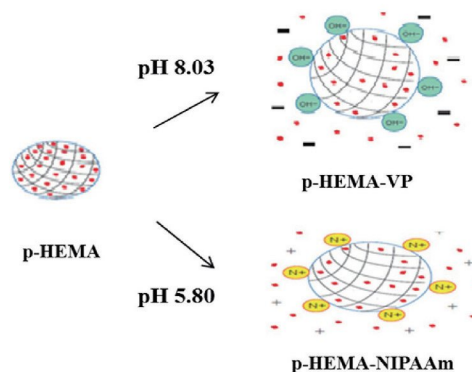


pH Sensitive Soft Contact Lens for Selective Drug-Delivery

Guenhei Kim, Hyeok Jung Kim, and Hyeran Noh*

Macromol. Res., **26**, 278 (2018)

We developed a drug delivery soft contact lens depending on physical factors and external environment of changes in tear pH 5.8~8.35. This poly(hydroxyethyl methacrylate)-poly(*N*-isopropylacrylamide) (p-HEMA-NIPAAm) hydrogels lens swelled at acidic solution exhibiting high diffusion coefficient. However, HEMA with vinylpyrrolidone (VP) hydrogels swelled significantly more at basic solution. This is due to that anionic hydrogels in acidic solution is shrunken due to the electric attraction force within the hydrogel network; the opposite phenomenon appears when the solution is basic.

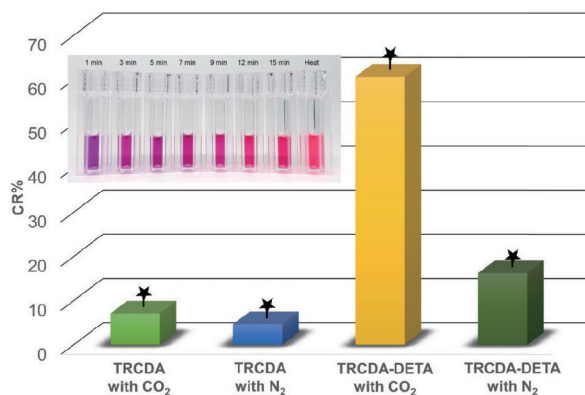


Polyamine-Functionalized Polydiacetylene (PDA) Vesicles for Colorimetric Sensing of Carbon Dioxide

Kyung Woo Kim*, Jeong Min Lee,
Yong Min Kwon, Tae-Young Choi,
Jaon Young Hwan Kim,
Seungseob Bae, and Jong-Am Song

Macromol. Res., **26**, 284 (2018)

Ocean acidification resulting from anthropogenic CO₂ has led to severe threats to marine biodiversity and ecosystems. Therefore, an effective CO₂ sensing system is necessary for marine environment monitoring. Here, we newly synthesized 10,12-tricosadiynoic acid (TRCDA)-diethylenetriamine (DETA) vesicles and demonstrated its capability for detecting CO₂ within 3 min. These results indicated that TRCDA-DETA can be an effective tool for CO₂ detection, and their unique properties may have potential applications in multiple fields.



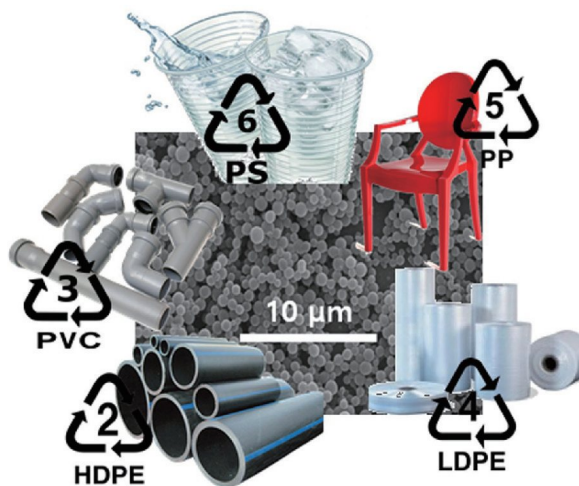
NOTE

Fabrication of Microspheres of Five Commodity Polymers Employing the Same Protocol

Yechan Lee, Dong-Eun Kang,
and Il Kim*

Macromol. Res., **26**, 291 (2018)

Uniform microspheres of five commodity polymers, high density polyethylene, low density polyethylene, polypropylene, polystyrene and poly(vinyl chloride) are fabricated by employing the same protocol: *i.e.* precipitation followed by evaporation. By tuning solvent/nonsolvent combination, polymer microspheres of their average particle diameter around 1 μm with reasonably uniform distributions are successfully fabricated.



COVER PAPER

Two New Triply Periodic Bicontinuous Network Structures for Molten Block Copolymers

Junhan Cho*

Vol. 26, No. 4, pp 380-387 (2018) | APR 25, 2018 | DOI 10.1007/s13233-018-6054-7



A new bicontinuous network morphology is identified for molten block copolymers. Its crystal symmetry is identical to that of double gyroids ($Ia\bar{3}d$). However, the new morphology may reveal better catalytic or transport activities because it possesses more holey surface with higher surface area than double gyroids.

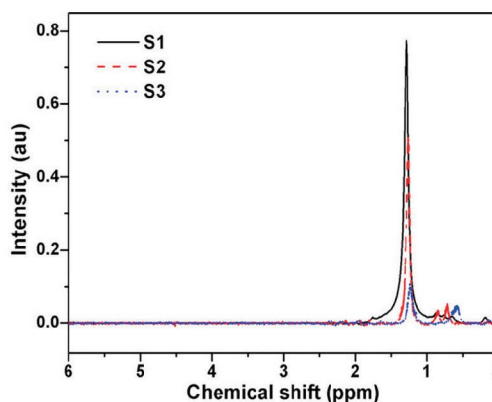
ARTICLES

Synthesis of Metallocene Catalyzed Ethylene 1,7-Octadiene Copolymer: Effect of Copolymerization on Polymer Properties

Mostafizur Rahaman,
Ibnelwaleed Ali Hussein*,
Ali Aldalbahi, Anwar Parvez,
and Joao B. P. Soares

Macromol. Res., **26**, 295 (2018)

Metallocene catalyzed polyethylene homopolymer and ethylene 1,7-octadiene copolymers were synthesized and characterized. The results show that these polymers were high density polyethylene. Though the molecular weight, melting temperature, d -spacing, crystallite size, % crystallinity, tensile modulus, tensile strength, and tensile strain at break decrease with the increase in comonomer content but there is the increment in electrical conductivity and dielectric property.

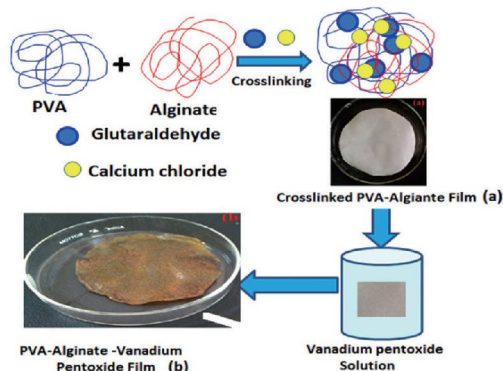


Study of Mechanical, Optical, and Electrical Behaviors of Calcium Alginate/Poly(vinyl alcohol)-Vanadium Pentoxide Bionanocomposite Films

Anil Kumar Bajpai*,
Anjana Goswami, Jaya Bajpai,
and Benoy Kumar Sinha

Macromol. Res., **26**, 305 (2018)

Environmentally friendly technology is necessary to reduce the different harmful effect of technological development. The calcium alginate/poly(vinyl alcohol) (PVA)-vanadium pentoxide bionanocomposite could be good future materials to replace the present cathode material of Li-ion batteries, because of their low cost and biodegradable nature.

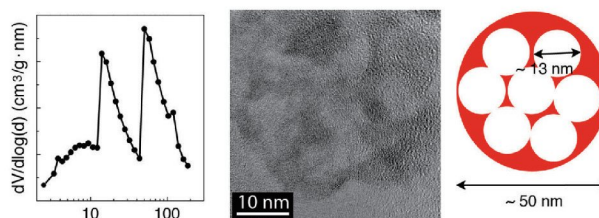


Porous Carbon Networks with Nanosphere-Interconnected Structure via 3-Aminophenol-Formaldehyde Polymerization

Deul Kim, Seokjin Yun,
Sangeun Chun*, and Jihoon Choi*

Macromol. Res., **26**, 317 (2018)

Mesoporous carbon networks with a bimodal pore size distribution in their hierarchical nanostructure were prepared by 3-aminophenol and formaldehyde polymerization on the silicon dioxide (SiO₂) cores. Systematic control of the ratio of carbon precursors and silica nanoparticles provides a better control of the microstructure in hybrid nanoparticles with a shell of variable thickness composed of well-defined 3-aminophenol and formaldehyde resins, resulting in the tunability of their pore size distribution.

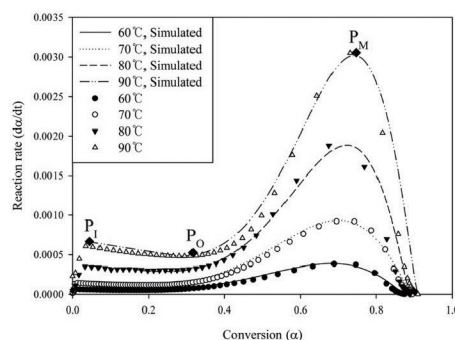


Effect of Azo and Peroxide Initiators on a Kinetic Study of Methyl Methacrylate Free Radical Polymerization by DSC

Eun Ju Lee, Hee Jung Park,
Se Mi Kim, and Kee Yoon Lee*

Macromol. Res., **26**, 322 (2018)

Free radical polymerization of methyl methacrylate was investigated in the presence of azo and organic peroxide initiator, such as 2,2'-azobisisobutyronitrile (AIBN), 1,1-bis(*tert*-butylperoxy) cyclohexane (BTBPC), *tert*-butyl peroxyneodecanoate (TBPND), and *tert*-butyl peroxy-2-ethylhexanoate (TBPEH) under isothermal condition (T_{iso} = 60~90 °C). The reaction heat generated in the bulk polymerization of methyl methacrylate was measured using a differential scanning calorimeter (DSC). The degree of polymerization and its reaction rate were expressed as a function of conversion (α) and its rate ($d\alpha/dt$), respectively. We confirmed that autoacceleration proceeded predominantly during the autoacceleration regime (τ_{auto}) appearing after the onset of autoacceleration of MMA polymerization. In this work, kinetic models consisting of two contributions, such as n^{th} order reaction and a kinetic equation representing autoacceleration, were suggested. The combined kinetic models were simulated and compared with the experimental data to evaluate the reliabilities.

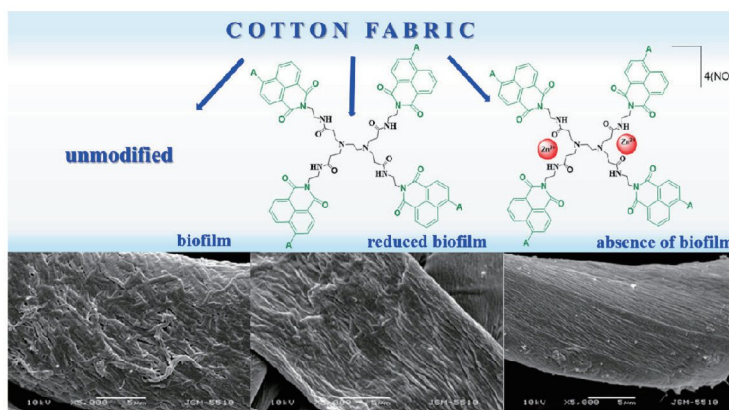


Synthesis and Characterization of a New PAMAM Metallo dendrimer for Antimicrobial Modification of Cotton Fabric

Desislava Staneva,
Evgenia Vasileva-Tonkova*,
Paula Bosch, Peter Grozdanov,
and Ivo Grabchev*

Macromol. Res., 26, 332 (2018)

The antimicrobial activity of a PAMAM dendrimer and its Zn(II) complex was studied against Gram-positive and Gram-negative bacteria and yeasts. The results showed enhanced inhibitory activity of the Zn(II) complex in comparison with the ligand. Deposition of the dendrimer on cotton fabric was found to prevent the formation of bacterial biofilm, which is a good indicator of using this dendrimer to produce antibacterial cotton fabrics.

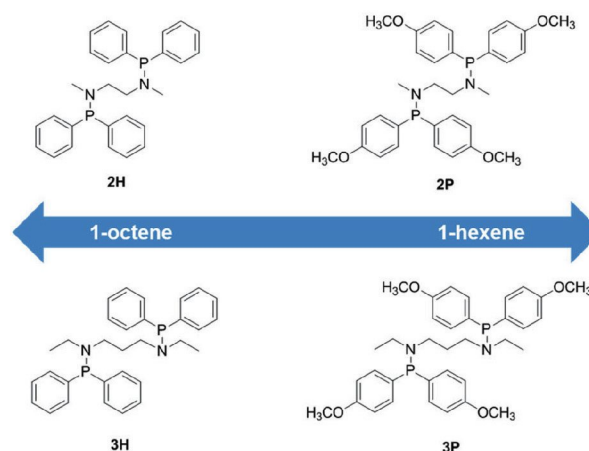


Ligand Modification for Selectivity Control in Selective Ethylene Oligomerization

Yun Ah Kim, Seong Jin Oh,
Seowon Cho, and Kyung-sun Son*

Macromol. Res., 26, 341 (2018)

In situ-generated chromium catalysts bearing a series of aminophosphine ligands were prepared and studied for the steric influence of the ligands on the selectivity in ethylene oligomerization. Also, two different mechanisms proposed for selective ethylene oligomerization were evaluated based on our experimental results.

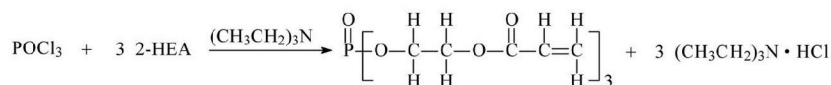


Preparation and Properties of Halogen-Free Flame Retardant and High Refractive Index Optical Resin via Click Chemistry

Chaoyun Luo, Jiandong Zuo*,
Fuquan Wang, Yanchao Yuan,
Feng Lin, and Jianqing Zhao

Macromol. Res., 26, 346 (2018)

Although optical resins with high refractive indexes or with halogen-free flame retardancy have been respectively investigated, halogen-free flame retarded resins with high refractive indexes have rarely been reported. Halogen-free flame retardant tri(acryloyloxyethyl) phosphate was synthesized by 2-hydroxyethyl acrylate (HEA) and phosphorus oxychloride *via* one-step method and then the obtained product was cured with pentaerythritol tetrathio glycolic by click chemistry reaction to produce halogen-free P-S containing flame retarded optical resins. The obtained optical resins had better thermal stability, higher refractive indices and excellent flame retarding property.

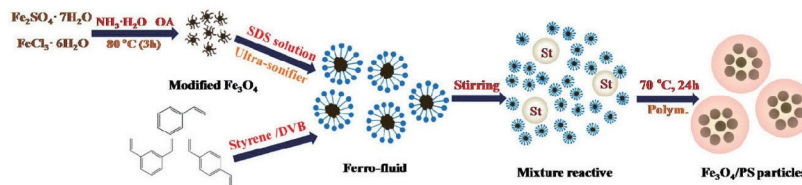


Magnetite Embedded Mini-Emulsion Polymerized Polystyrene Particles and Their Magnetorheology

Min Wook Kim, Dong Hun Bae,
Seung Hyuk Kwon,
and Hyoung Jin Choi*

Macromol. Res., **26**, 353 (2018)

Novel Fe_3O_4 -encapsulated polystyrene (PS) hybrid particles were synthesized by a new fabrication method involving mini-emulsion polymerization, and their magnetorheological (MR) properties were examined using a rotational rheometer under applied magnetic field strengths. The Fe_3O_4 /PS-based MR fluid showed typical Bingham-behavior in the presence of an external magnetic field.

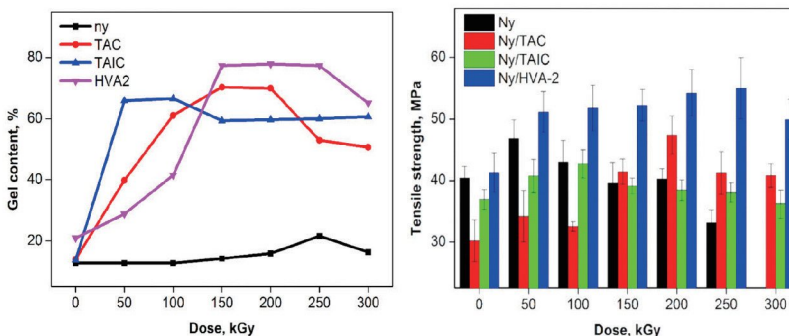


Effect of Electron Beam Irradiation on the Mechanical and Thermal Properties of Ternary Polyamide Copolymer

Chengwen Cui and Yong Zhang*

Macromol. Res., **26**, 359 (2018)

Ternary polyamide copolymer (tPA) and crosslinking co-agents generate free radicals upon electron beam irradiation. At appropriate doses, tPA containing crosslinking co-agent is more prone to crosslinking reactions. The gel content and tensile strength of tPA are therefore significantly improved. Compared with the other two crosslinking co-agents *N,N'*-*m*-phenylene dismaleimide (HVA-2) is more effective in increasing the gel content. The gel content of tPA/HVA-2 increases to 77% at 150 kGy and its tensile strength increases to 53 MPa at 250 kGy.

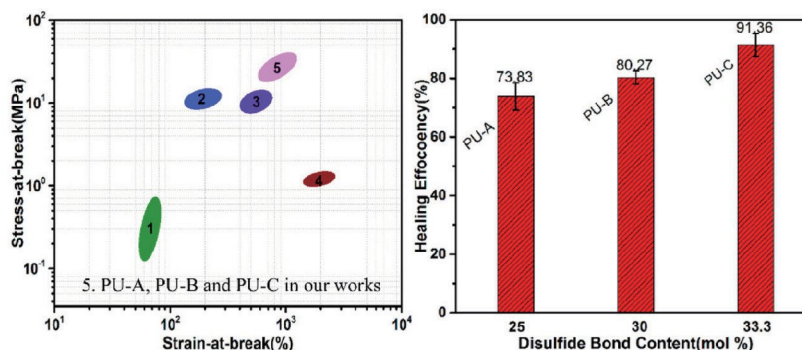


Self-Healing and Shape Memory Linear Polyurethane Based on Disulfide Linkages with Excellent Mechanical Property

Lei Ling, Jinhui Li, Guoping Zhang*,
Rong Sun, and Ching-Ping Wong

Macromol. Res., **26**, 365 (2018)

Self-healing linear polyurethanes with excellent mechanical properties were prepared by facile synthetic process. The polymers exhibit efficient and stable thermal healable abilities and shape memory effect, which possess great potential in various applications.

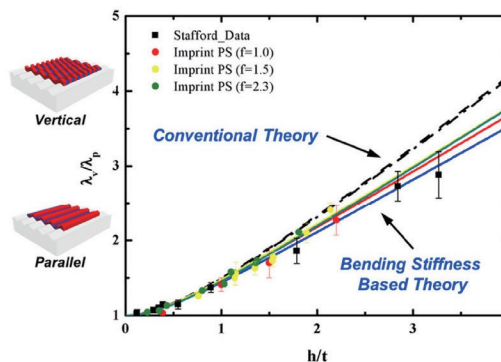


Effect of the Orientation and Bending Stiffness of Nanopatterned Films on Wrinkling

Dokyeong Kwon, Do Min Kim,
Soo Min Choi, Hyo Seon Suh,
Yoon Young Kim, Hyunsik Yoon*,
and Kookheon Char*

Macromol. Res., 25, 374 (2018)

In this report, we propose a model to predict the microscale wrinkling of nanopatterns by neglecting in-plane stiffness in a thin residual layer region. The simplified model for analyzing systems with large variations in feature sizes can explain the dependence of the bending and in-plane moduli on the nanoscale patterns, and the results are in good agreement with the experimental data.

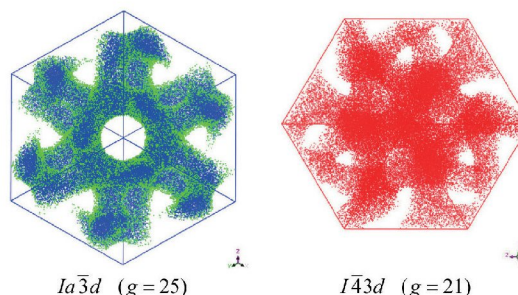


Two New Triply Periodic Bicontinuous Network Structures for Molten Block Copolymers

Junhan Cho*

Macromol. Res., 26, 380 (2018)

New triply periodic bicontinuous network morphologies with $Ia3d$ and $I43d$ symmetries, where the channels of minor components are wholly connected with tetrapod units. Therefore, the number of independent holes (genus g) becomes larger than that of double gyroids or double diamonds.



Cover Paper

High-Performance Printed Circuit Board Materials Based on Benzoxazine and Epoxy Blend System

Seon Ho Lee, Ki Seok Kim,
Ji Hye Shim, and Cheol-Hee Ahn*

Macromol. Res., 26, 388 (2018)

Monobenzoxazine and epoxy blend films showed a lower dissipation factor around 0.005 frequency/10 GHz and poor mechanical property, while polybenzoxazine and epoxy blend films exhibited a lower dissipation factor around 0.006 and excellent mechanical property as well as adhesiveness to CCL, which implied that benzoxazine resin could be a new candidate in the preparation of films displaying excellent electrical insulation.

