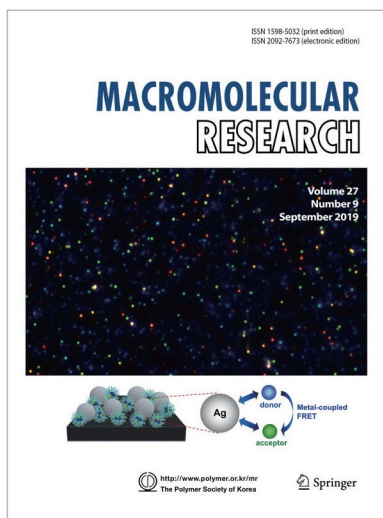


COVER PAPER

Fluorescence Resonance Energy Transfer within Diblock Copolymer Micelles in the Proximity of Metal Nanoparticles

Ki-Se Kim, Jeong-Hee Kim, Seong Il Yoo*, and Byeong-Hyeok Sohn*

Vol. 27, No. 9, pp 905-910 (2019) | SEP 25, 2019 | DOI 10.1007/s13233-019-7127-z



Thin film with diblock copolymer micelles enabled multiple placement of metal nanoparticles and donor-acceptor pair of fluorescent dyes on a nanometer scale to investigate metal-coupled fluorescence resonance energy transfer (FRET). In the micellar assemblies, fluorescence intensities of both donors and acceptors were substantially enhanced, but FRET efficiency was reduced by plasmonic effect. The underlying principle of the observed optical properties has been further discussed in terms of decay processes of the excited dyes in the proximity metal nanoparticles.

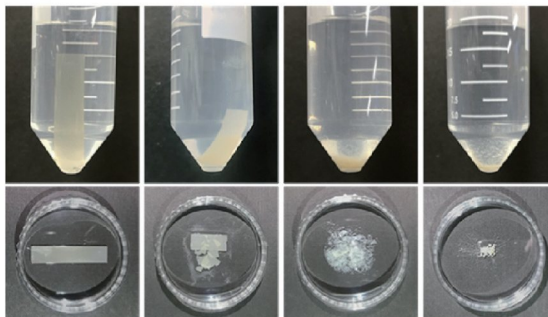
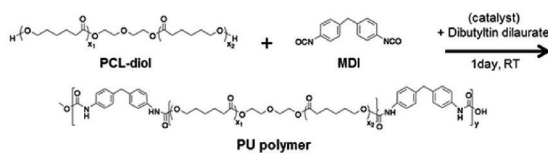
COMMUNICATION

Synthesis and Characterizations of Biodegradable Polyurethane Microspheres with Dexamethasone for Drug Delivery

Juri Park, Min Jeong Lee,
Guk Young Ahn, Tae Hoon Yun,
Inseong Choi, Eun Seong Lee,
Hyunsuk Lee, and Sung-Wook Choi*

Macromol. Res., 27, 839 (2019)

We fabricated biodegradable polyurethane microspheres using poly(ϵ -caprolactone) diol as polyol with different isocyanate ratios. Their tensile properties, degradation rates, and release profiles of dexamethasone were highly affected by the isocyanate ratio.



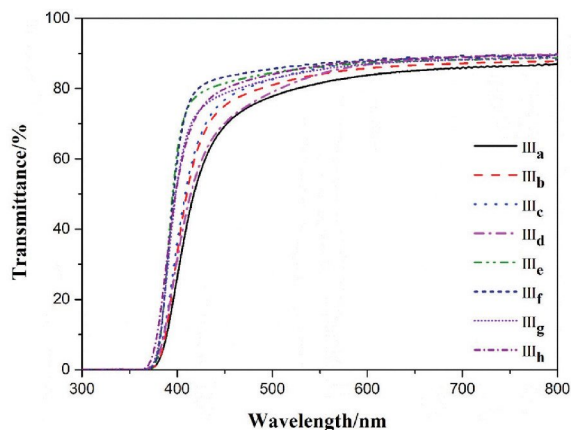
ARTICLES

Effects of Diamines on the Optical Properties of Poly(ether imide)s Derived from 2,2-Bis[4-(3,4-dicarboxyphenoxy)phenyl]propane Dianhydride (BPADA)

Linshuang Li, Yong Xu*, Jianfei Che, Xiaohong Liu, Wei Zhao, and Zhifeng Ye

Macromol. Res., **27**, 843 (2019)

A series of PEIs (III) were prepared from 2,2-bis[4-(3,4-dicarboxyphenoxy)phenyl]propane dianhydride (BPADA) with various aromatic diamines (I_{a-h}) to investigate the effects and differences of ether linkage (-O-) and trifluoromethyl (-CF₃) group affecting the optical properties of PEIs.

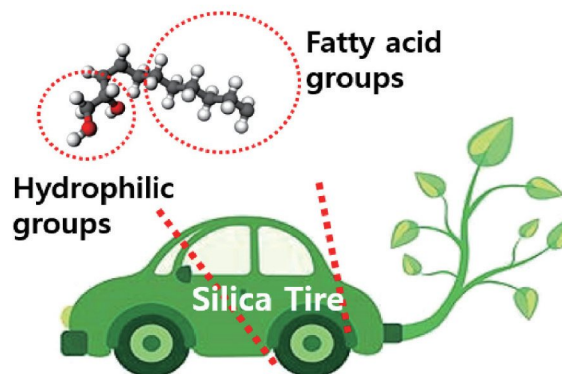


A Study of Silica Reinforced Rubber Composites with Eco-Friendly Processing Aids for Pneumatic Tires

Dongju Lee and Sung Ho Song*

Macromol. Res., **27**, 850 (2019)

The zinc-free processing agents (ZFAs) of the tread formulations with silica are required in the tire industry due to resolve global environmental issues. The synthesized ZFAs are consisted of the fatty acid and hydrophilic groups on opposite ends of the molecules. This structure serves to enhance the dispersion of silica in the rubber matrix. The hydrophilic group reacts with silanols on the silica surface *via* hydrolysis, while the fatty acid group reacts with double bonds on the rubber chain.

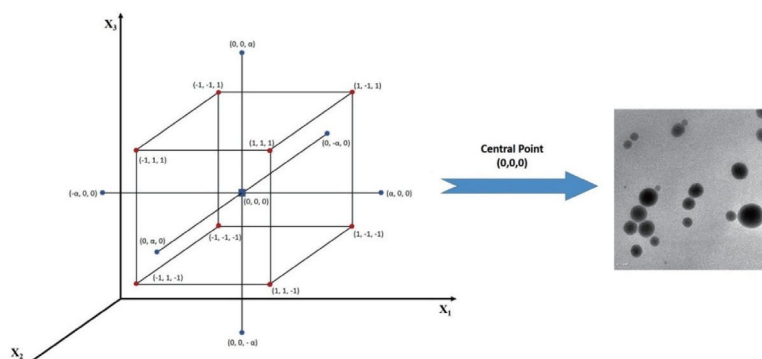


Development and Optimization of Alendronate Sodium Loaded PLGA Nanoparticles by Central Composite Design

Umut Can Oz, Berrin Küçüktürkmen, Burcu Devrim, Ogun Mehmet Saka*, and Asuman Bozkir

Macromol. Res., **27**, 857 (2019)

Nanoparticle formulation parameters including alendronate sodium (AS) content, polymer/surfactant ratio and organic to aqueous phase ratio were optimized to evaluate their effects on particle size, polydispersity index, zeta potential, and entrapment efficiency by using central composite experimental design. The developed quadratic model showed high correlation between predicted response and evaluated parameters.

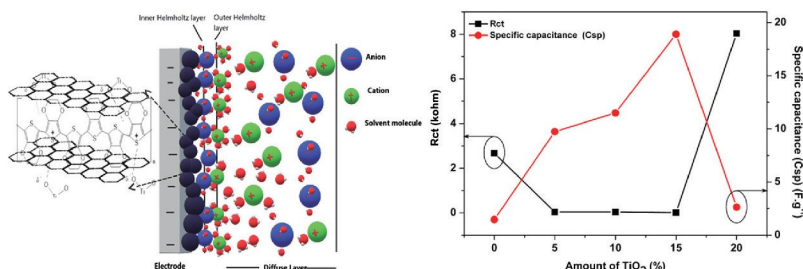


A Ternary PEDOT-TiO₂-Reduced Graphene Oxide Nanocomposite for Supercapacitor Applications

Deniz Gulercan, Daniel Commandeur, Qiao Chen, and A. Sezai Sarac*

Macromol. Res., **27**, 867 (2019)

PEDOT-TiO₂ nanocomposites are synthesized with various content of TiO₂ via emulsion polymerization and as-prepared nanocomposites are blended with reduced graphene oxide to investigate capacitive behaviours. This new ternary nanocomposite of PEDOT-TiO₂-rGO is optimised for use as a supercapacitor electrode, achieving a capacitance of 18.9 F g⁻¹.

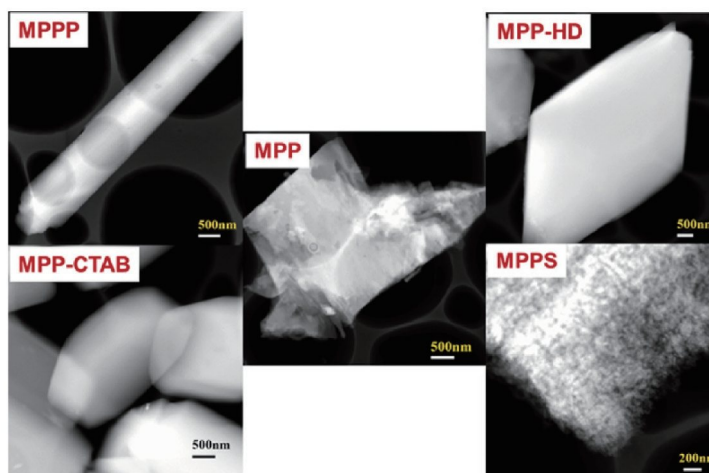


Shape-Controlled Synthesis of Melamine Based Polyamide Materials and Application in Suzuki-Miyaura Coupling Reaction

Jian Chen, Yan Zhang, Tao Li*, and Dajian Zhu*

Macromol. Res., **27**, 876 (2019)

Polyamides with different shapes were synthesized by different templates method using cheap and available melamine and p-phthalic acid as raw materials. Catalytic performance of polyamides supported Pd catalysts with different shapes was compared by Suzuki-Miyaura reaction. Supporters shape influence the interaction between Pd active specie and supporters in the heterogeneous catalysts.

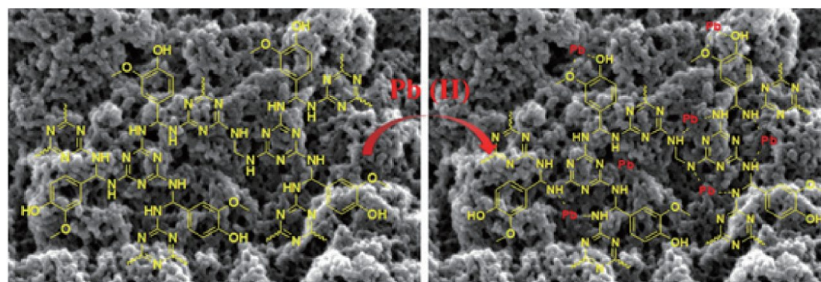


Novel Hierarchically Porous Melamine-Vanillin Polymer: Synthesis and Application for the Pb(II) Ion Removal in Wastewater

Hong-Gyu Seong, Jihyeong Ryu, Yingjie Qian, Jae Il So, Sung-Hyeon Baek, and Sang Eun Shim*

Macromol. Res., **27**, 882 (2019)

A novel cost-effective and environmentally-benign porous melamine-vanillin polymer (MVP) was synthesized and utilized for the removal of Pb(II) ions. The MVP possessed a high surface area of 745 m² g⁻¹ with a hierarchically porous structure consisting of 1 nm and 3-50 nm pores. Due to the copious functional groups and the hierarchical pore size distribution, MVP was found to exhibit a good adsorption performance toward Pb(II) ions. The adsorption process was well-fitted to the Langmuir adsorption isotherm and the pseudo-1st-order kinetic model.

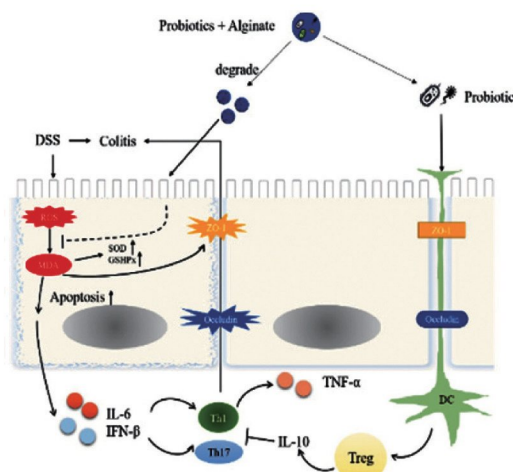


Alginate and Probiotics Synergistically Reversed Dextran Sulfate Sodium Salt (DSS)-Induced Gut Barrier Damage

Cheng Zhao, Qiongyuan Hu,
Xiuwen Wu*, Guopu Chen,
Hua Wu, and Jianan Ren*

Macromol. Res., **27**, 888 (2019)

Alginate has been widely used as carrier for drug delivery system. However, few researches realized the importance of its role as a dietary fiber. This study emphasized its role in alleviating inflammation and synergistical effect with probiotics.

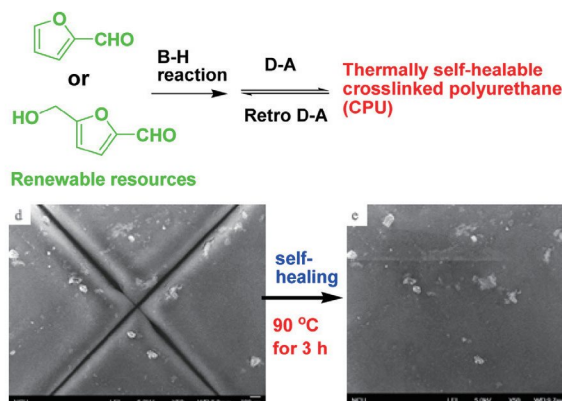


Thermally Healable Polyurethanes Based on Furfural-Derived Monomers via Baylis-Hillman Reaction

Qinghua Huang, Fanghong Yang,
Xingxing Cao, Zhongyu Hu,
and Chuanjie Cheng*

Macromol. Res., **27**, 895 (2019)

Two novel dense acrylate monomers containing diol groups are synthesized from furfural and 5-hydroxymethyl furfural *via* Baylis-Hillman reaction. These monomers as diols react with TDI and HDI to obtain the corresponding linear polyurethane oligomers. Further Diels-Alder reaction between furan groups on the oligomers and 4,4'-bismaleimidediphenylmethane (BMI) affords reversible crosslinked polyurethanes (CPU). The CPU can be apparently self-healed completely at 80-90 °C.

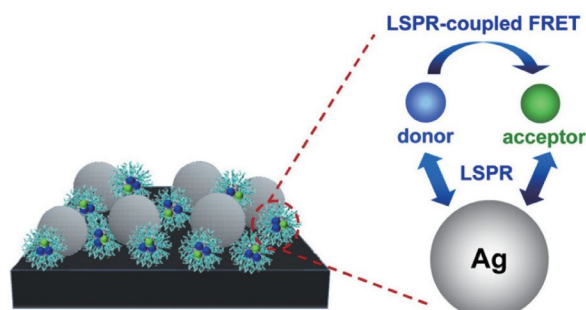


Fluorescence Resonance Energy Transfer within Diblock Copolymer Micelles in the Proximity of Metal Nanoparticles

Ki-Se Kim, Jeong-Hee Kim,
Seong Il Yoo*,
and Byeong-Hyeok Sohn*

Macromol. Res., **27**, 905 (2019)

Polystyrene-*block*-poly(4-vinylpyridine) (PS-PVP) micelles encapsulating a donor-acceptor pair of fluorescence dyes have been introduced to silver nanoparticle-coated substrate. In the assembled structure, the efficiency of fluorescence resonance energy transfer between donors and acceptors was reduced by plasmonic effect, which would be useful for multicolor-lighting applications with enhanced fluorescence intensities.



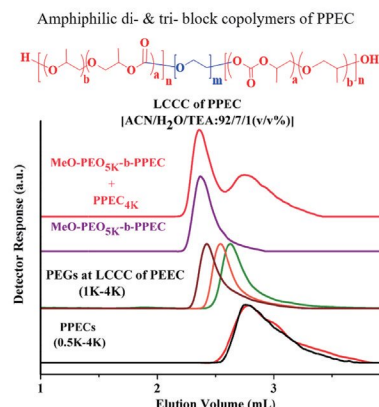
Cover Paper

Poly(propylene ether carbonate)-Based Di- and Tri-Block Copolymers: Synthesis and Chromatographic Characterization

Rubina Abdul-Karim,
Syed Ghulam Musharraf,
and Muhammad Imran Malik*

Macromol. Res., **27**, 911 (2019)

Novel di- and tri-block copolymers of polyethylene glycol (PEG) as hydrophilic and poly(propylene ether carbonate) (PPEC) as a hydrophobic block, are reported for the first time. Liquid chromatographic critical conditions of PEG and PPEC established for the first time, are used for meticulous analysis of synthesized block copolymers.

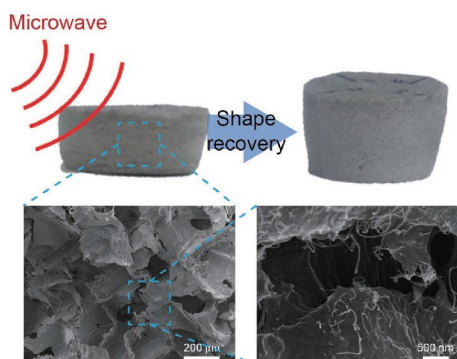


Carbon Nanotubes Embedded Shape Memory Polyurethane Foams

Hyung Min Kim, Juhyuk Park,
Zheng Min Huang, Jae Ryoung Youn*,
and Young Seok Song*

Macromol. Res., **27**, 919 (2019)

Smart composite foams were made of carbon nanotubes (CNTs) and a shape memory polyurethane (SMPU) that can be heated with microwaves. The CNTs/SMPU composite foams were fabricated by using a porogen leaching method. The composite foams showed not only improved mechanical properties but also unique thermal properties with the low CNT content. Addition of CNTs into the foams allows the microwave absorption and temperature increase of the foam. The thermo-responsive shape memory characteristics of the CNTs/SMPU foams were evaluated while changing the exposure time of microwave irradiation. Morphological and thermogravimetric analyses of the composite foams were carried out to broaden the view of smart porous materials.



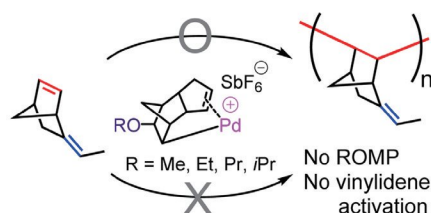
NOTE

Alkoxy-Substituted Dicyclopentadienedichloropalladium(II) Complexes for the Vinyl Polymerization of 5-Ethylidene-2-Norbornene

Xiaopeng Cui, Feng Bai, Huiping Li,
Jing Guo, Binyuan Liu*, and Il Kim*

Macromol. Res., **27**, 926 (2019)

Four different alkoxy-substituted dicyclopentadienedichloropalladium(II) complexes prepared by the reaction of PdCl_2 with appropriate alcohols yield active catalysts after *in situ* activation with SbF_6^- for the vinylic polymerization of 5-ethylidene-2-norbornene (ENB). The ENB is regioselectively incorporated into the backbone through the endocyclic carbon-carbon double bond, leaving the ethylidene double bond unreacted.

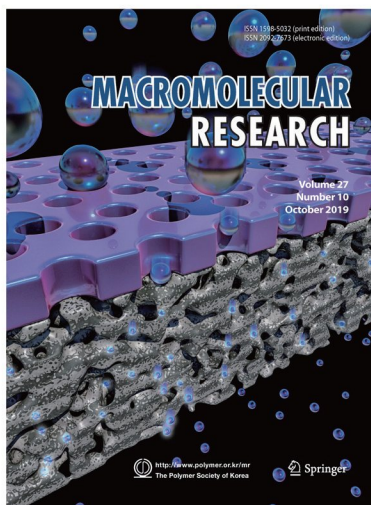


COVER PAPER

Mesoporous Composite Membrane Based on Block Copolymer Self-Assembly

Jin Wook Lee, Jin Hoo Kim, Deuk Ju An, Jung Ki Lee, Nowon Kim, and Seung Hyun Kim*

Vol. 27, No. 10, pp 974-981 (2019) | OCT 25, 2019 | DOI 10.1007/s13233-020-8013-4



The composite membranes consisting of a BCP active layer and a PSf supporting layer exhibited effective size-selective filtration. The membrane structure is ideal for filtration, providing high flux and selectivity due to high density and small size of nanopores in the active layer. The composite membrane presented in this work can be used for the applications of separation and purification by taking full advantage of the simplicity of the membrane preparation process.

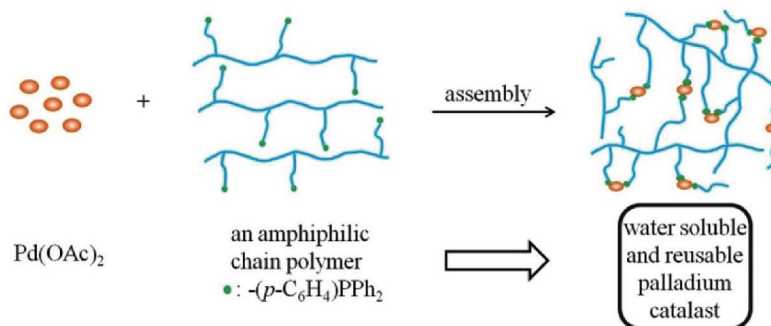
ARTICLES

Triphenylphosphine-Containing Thermo-Responsive Copolymers: Synthesis, Characterization and Catalysis Application

Tao Chen*, Shuo Zhang, Laiyu Hua, Zhenkai Xu, Lei Zhou, and Jiping Wang*

Macromol. Res., 27, 931 (2019)

A series of copolymers of 4-(diphenylphosphino) styrene (DPPS), di(ethylene glycol) methyl ether methacrylate (DEGMA) and oligo(ethylene glycol) methyl ether methacrylate (average molecule weight is 300, OEGMA₃₀₀) (P(DEGMA-co-DPPS-co-OEGMA₃₀₀)) with different lower critical solution temperature (LCST) were synthesized and well characterized. Based on the copolymers, a thermo-responsive and water soluble assembled catalyst of Pd(OAc)₂ and amphiphilic polymer was developed and applied to the Suzuki-Miyaura reaction in water. The catalyst can be easily recovered by heating/centrifugation of the polymer aqueous solution, and reused at least five cycles without obvious decrease in catalytic activity.

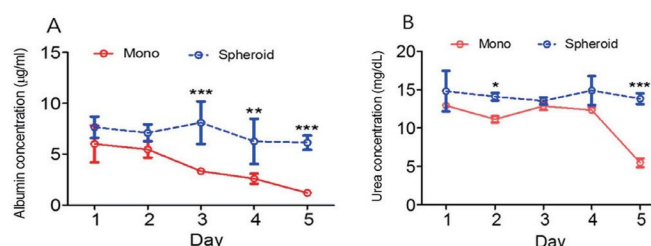


Efficient Formation of Three Dimensional Spheroids of Primary Hepatocytes Using Micropatterned Multi-Well Plates

Dong-Ho Ha, Phuong Mai Thi, Perna Chaudhary, and Jee-Heon Jeong*

Macromol. Res., **27**, 938 (2019)

The albumin secretion was significantly higher in spheroids than monolayer at day 3, 4, and 5 of *in vitro* culture (Figure A). The urea synthesis by hepatocyte spheroids followed the same trend as albumin secretion. On day 5, a rapid declination in urea synthesis was observed in case of 2D cultured cells, whereas urea synthesis by spheroids remained constant. Moreover, urea synthesis was significantly higher in hepatocyte spheroids than monolayer at day 2 and day 5 (Figure B). Functionality of monolayer cultured hepatocyte and hepatocyte spheroids. (A) Albumin secretions and (B) urea synthesis by monolayer cultured hepatocytes and hepatocyte spheroids.

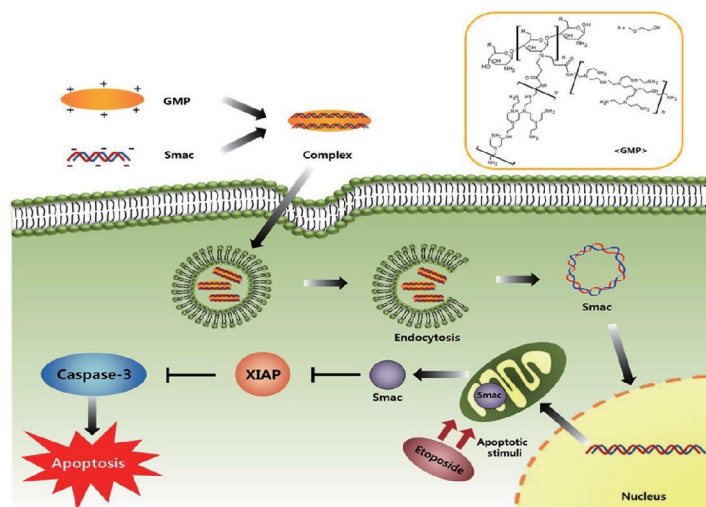


Smac Gene Delivery by the Glycol Chitosan with Low Molecular Weight Polyethylenimine Induces Apoptosis of Cancer Cells for Combination Therapy with Etoposide

Yoonhee Bae, Young Hwa Lee, Kyung Soo Ko, Jin Han*, and Joon Sig Choi*

Macromol. Res., **27**, 944 (2019)

In this study, we demonstrated the characteristics of glycol chitosan-methyl acrylate-polyethylenimine (GMP) as an enhanced Smac gene delivery vector. Our results indicate that GMP/FLAG-Smac shows scant cytotoxicity, enhanced transfection efficiency, and cellular uptake and can sensitize etoposide-induced apoptotic death through the regulation of mitochondrial membrane permeability in MDA-MB-231 cell line. Our study suggests that GMP/FLAG-Smac complexes may be potentially combined with chemotherapeutics as a combinatorial anti-cancer therapy.

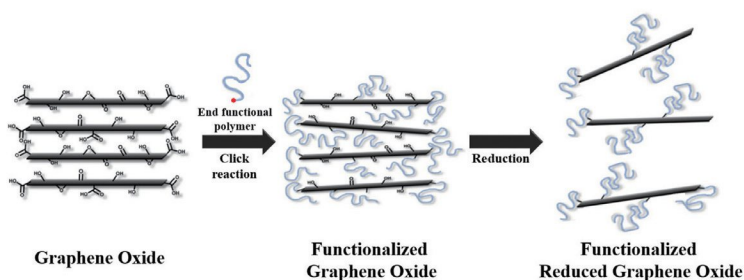


Preparation of Thin-Layer Graphene Using RAFT Polymerization and a Thiol-Ene Click Reaction

Minho Kwon, Taeheon Lee, Youngsil Lee, Jong Hun Han*, and Hyun-jong Paik*

Macromol. Res., **27**, 955 (2019)

We synthesized poly(sodium 4-styrenesulfonate) (PSS) using RAFT polymerization with chain transfer agent (CTA) as the end functional group. After aminolysis, CTA was transferred to thiol group which can react with double bond on graphene oxide *via* thiol-ene click reaction. The click product (f-GO) was further reduced and the reduced f-GO exhibited a good dispersion in water owing to the steric effect and charge-charge repulsion of attached polymer.

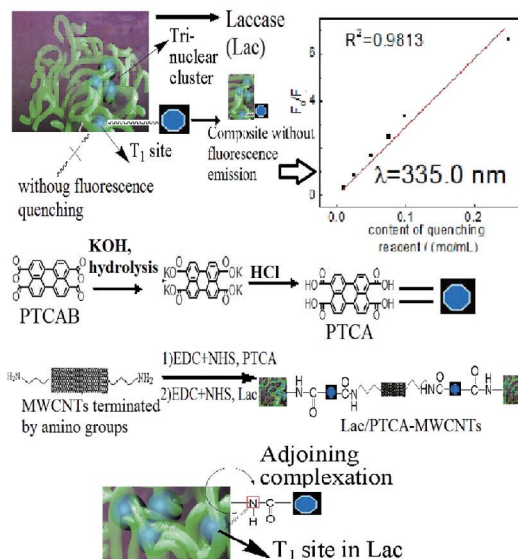


Negative Impact of Adjacent Coordination on Direct Electrochemistry and Enzymatic Catalysis of Laccase Immobilization onto Multi-wall Carbon Nanotubes Functionalized by Perylene Derivative

Han Zeng*, Wen Shan Huo,
Fang Wang, and Ting Mei Ma

Macromol. Res., **27**, 963 (2019)

Illustration in preparation of Nano-composite with Lac integration on the basis of perylene tetracarboxylic terminated multi-wall carbon nano-tubes and the strong interaction between aromatic groups as well as enzyme molecules leading to fluorescence quenching.



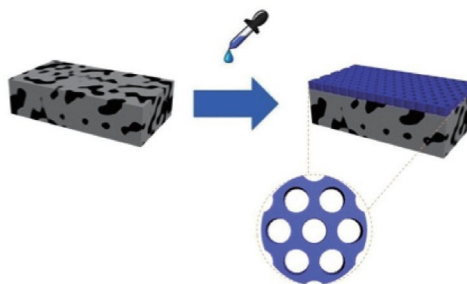
Mesoporous Composite Membrane Based on Block Copolymer Self-Assembly

Jin Wook Lee, Jin Hoo Kim,
Deuk Ju An, Jung Ki Lee,
Nowon Kim, and Seung Hyun Kim*

Macromol. Res., **27**, 974 (2019)

Cover Paper

Quite simple yet robust route to fabricate mesoporous composite membranes is demonstrated that are composed of block copolymer as a top active layer and polysulfone membrane as a supporting layer. The membrane structure ideal for filtration and separation is produced by simple fabrication without additional process for controlling the nanostructure. The high pore density and small pore size at the top layer of the composite membrane can provide high permeability as well as size-dependent selectivity.

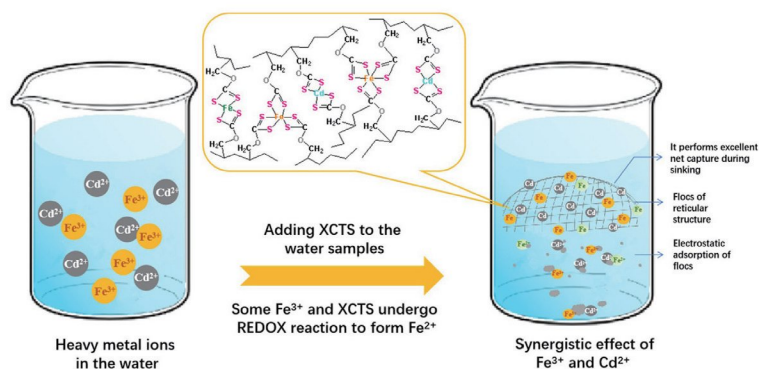


Removal of Cd(II) Ions from Wastewater by Compounding an O-Xanthogenated Chitosan Schiff Base and Fe(III) Ions

Kai Yang, Gang Wang*, Fulong Liu,
and Yanxia Zhao

Macromol. Res., **27**, 982 (2019)

As O-xanthogenated chitosan Schiff base (XCTS) chelated easier with Fe(III) ions in aqueous solutions, the approach compounded Fe(III) ions and XCTS promotes the removal efficiency of Cd(II) ions with the help of the induced flocculation by Fe(III) ions and the synergistic effect among metal ions.

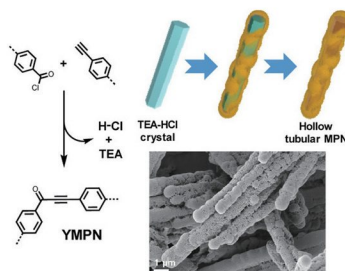


Synthesis and Functionalization of Ynone-Based Tubular Microporous Polymer Networks and Their Carbonized Products for CO₂ Capture

Jeongmin Lee and Ji Young Chang*

Macromol. Res., 27, 991 (2019)

Tubular structures composed of ynone-based microporous polymer networks were synthesized by a template guided process in which the template formed *in situ*. The polymers were functionalized with amino groups and could be used as precursors of nitrogen-doped porous carbon materials with high CO₂ adsorption capacities.

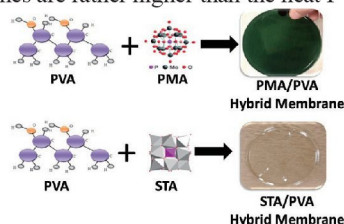


Fabrication and Application of Silicotungstic Acid/Polyvinyl Alcohol and Phosphomolybdic Acid/Polyvinyl Alcohol Hybrid Membrane for Pervaporative Dehydration of Isopropanol Solution

Derya Unlu*

Macromol. Res., 27, 998 (2019)

Hybrid membranes were prepared by loading silicotungstic acid (STA) and phosphomolybdic acid (PMA) into polyvinyl alcohol (PVA) matrix. The membranes were characterized by scanning electron microscopy (SEM), Fourier transform infrared (FTIR), contact angle meter, thermogravimetric analysis (TGA) and X-ray diffraction (XRD). The separation performance of hybrid PVA membranes was compared over that of neat PVA membrane for dehydration of aqueous isopropanol mixtures by using the pervaporation (PV) process. The PV experiments were carried out over the feed water composition of 5-20 wt%, temperature range of 30-60 °C and heteropolyacid amount of 5-20 wt%. The usage of hybrid membranes for separating water from the organic solvents results in high flux and selectivity values. Of all the membranes studied, 5 wt% STA loaded hybrid PVA membrane and 5 wt% PMA loaded hybrid PVA membrane exhibited the best separation performance. While the flux and selectivity values are 0.499 kg/m²h and 12848 for 5 wt% STA loaded hybrid PVA membrane, these values are 0.471 kg/m²h and 74991 for 5 wt% PMA loaded hybrid PVA membrane. The flux and selectivity values of neat PVA membrane are quite lower as compared to the hybrid membranes. Neat PVA membrane has 0.360 kg/m²h of flux and 36 of selectivity values. From this study, it is concluded that theselectivity and flux values of hybrid membranes are rather higher than the neat PVA membrane.

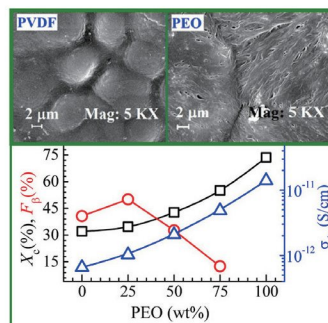


Polymer Compositional Ratio-Dependent Morphology, Crystallinity, Dielectric Dispersion, Structural Dynamics, and Electrical Conductivity of PVDF/PEO Blend Films

Priyanka Dhatarwal and Ram Jeewan Sengwa*

Macromol. Res., 27, 1009 (2019)

This research demonstrates the compositional ratio-dependent structural and dielectric behaviour of the solution cast PVDF/PEO blend films. The results confirm that the spherulite morphology changes enormously, the degree of crystallinity and dc electrical conductivity enhance non-linearly, β -phase anomalously changes, and the dielectric permittivity increases at lower audio frequencies but decreases at radio frequencies with the increase of PEO concentration in these polymer blend films. Further, the PVDF crystals produce significant hindrance to the segmental dynamics of the PEO chain.

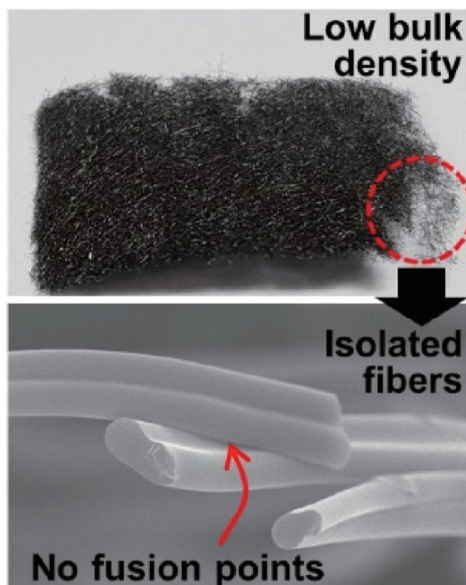


The Preparation and Properties of Isotropic Pitch-Based Carbon Felt Prepared by Solvent-Supported Dual Concentric Electrospinning

Dae Eon Jung, Dabin Chung,
Seong-Ho Yoon,
and Byoung Chul Kim*

Macromol. Res., **27**, 1024 (2019)

Electrospinning of isotropic pitch with a solvent-supported dual concentric nozzle yielded a precursor of carbon in the unusual form of felt, in which electrospun fibers were highly isolated from each other with few fusion points. The carbon felt so obtained had extremely low bulk density because of abundant empty spaces between fibers.

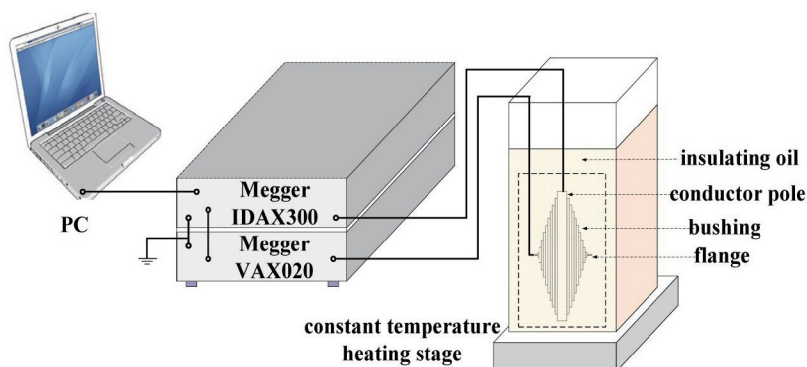


The Influence of Temperature and Aging on the Characteristic Parameters of Dielectric Spectroscopy of Epoxy Resin Impregnated Paper Insulation

Yongqiang Wang*, Yu Luo,
and Changhui Feng

Macromol. Res., **27**, 1030 (2019)

This study aimed to investigate the effects of temperature and aging on the characteristic parameters of dielectric spectra of epoxy resin impregnated paper insulation. A broadband dielectric spectra test platform was established and an equivalent physical model of the valve side dry-type bushing of the converter transformer was developed. Different degrees of thermal aging were performed at 130 °C for 0, 4, 8, 16, and 32 days. In addition, variation of the complex permittivity and dielectric loss factors of epoxy resin impregnated paper at different temperatures and different degrees of aging was revealed. The dielectric spectra test results were fitted using the Havriliak-Negami (HN) relaxation model. The characteristic parameters were extracted, and the influences of temperature and aging on the characteristic parameters of the HN model were analyzed. The results show that in the low frequency range, temperature and aging exert greater influences on the complex permittivity. In the high frequency range, temperature and aging have smaller effect. The relaxation time and temperature satisfy the relationship of the Arrhenius equation, and the relaxation strength increases exponentially with increasing temperature. The relaxation time τ , the relaxation intensity $\Delta\epsilon$, the shape parameter α , and the shape parameter β can characterize the aging degree of paper insulation. A linear relationship between relaxation and aging times, and an exponential relationship between relaxation intensity and aging time were revealed.



Preparation and Evaluation of Cross-Linked Chitosan/Silver Sulfide Luminescence Nanocomposites by Using Green Capping Agent Against Some Pathogenic Microbial Strains

Mohammad hasan Moshafi,
Mehdi Ranjbar*, and Neda Hedayatifar

Macromol. Res., 27, 1038 (2019)

Silver sulfide (Ag_2S) nanoparticles were cross-linked with chitosan as a biodegradable and bioactive polymer. The Chitosan/ Ag_2S nanocomposites were synthesized for the first time using the multistage distillation with the micellization-assisted ultrasonic method. The designed nanocomposites system was evaluated for *in vitro* efficient antibacterial activity. Various factors including the concentration of surfactants, pulse time, power irradiation, and interaction between these factors will directly affect different properties of the cross-linked Chitosan/ Ag_2S nanocomposites.

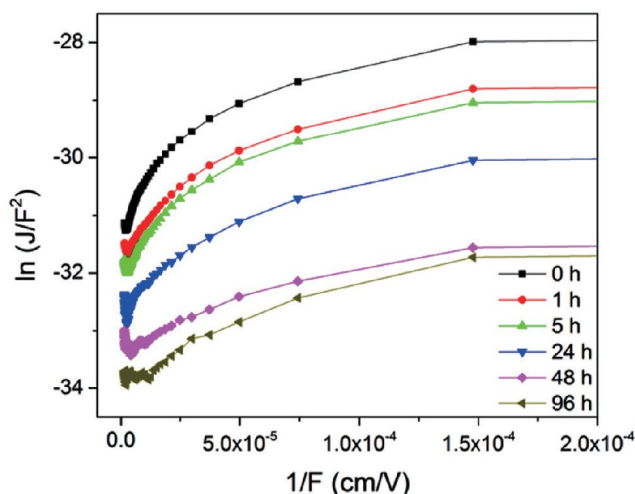


Fowler Nordheim Plot Analysis of Degradation in P3HT:PCBM Thin Film MIM Devices

Vinamrita Singh* and Ramesh Kumar

Macromol. Res., 27, 1045 (2019)

Metal-Insulator-Metal type devices based on P3HT:PCBM have been examined to understand the effect of degradation on the charge injection and transport phenomena using the Fowler Nordheim (FN) plots with time. A clear transition from thermionic emission to tunneling is observed, and the transition voltage at which this occurs reduces with time. Appearance of multiple inflexion points with time in the FN plots is explained on the basis of recombination and majority charge carriers within the device. Comparative studies have been carried out on multi-walled carbon nanotube doped samples, which indicate similar behavior for fresh and degraded samples.



Click Chemistry-Induced Terminally Crosslinked Poly(ether sulfone) as a Highly Conductive Anion Exchange Membrane Under Humidity Condition

Dayoung Yun, Taeun Yim,
Oh Joong Kwon, and Tae-Hyun Kim*

Macromol. Res., 27, 1050 (2019)

A terminally crosslinked anion exchange membrane (AEM) is developed by a copper-catalyzed click reaction of a poly(ether sulfone) (PES) multiblock copolymer having piperidinium as a conducting group, and using PEG-functionalized-azide (PEG-azide) as a crosslinker. This terminally crosslinked AEM shows excellent OH⁻ conductivity under the actual fuel cell operation condition (at 80 °C and 95% RH).

