「Macromolecular Research」 목차

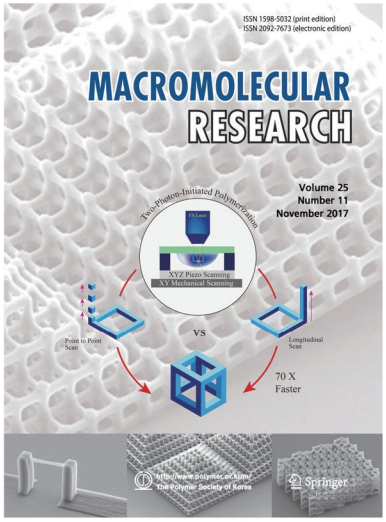
정기간행영문지_ 25권 11호 · 2017년 11월

Cover Paper

Effective Direct Writing of Hierarchical 3D Polymer Micromeshes by Continuous Out-of-plane Longitudinal Scanning

Cheol Woo Ha, Prem Prabhakaran, Yong Son, Kwang-Sup Lee*, and Dong-Yol Yang*

Vol. 25, No. 11, pp 1129-1134 (2017) | NOV 25, 2017 | DOI 10.1007/s13233-017-5144-3



Two-photon lithography is a rapidly expanding lithographic technique based on chemical changes induced by two-photon absorption. Here we demonstrate the advantage of longitudinal scanning of the laser during fabrication of complex hierarchical polymer microstructures. Vertical pillars and walls are fabricated at speeds an order of magnitude faster than conventional scanning techniques leading to 70 times faster fabrication of complex polymerized arrays and hierarchies.

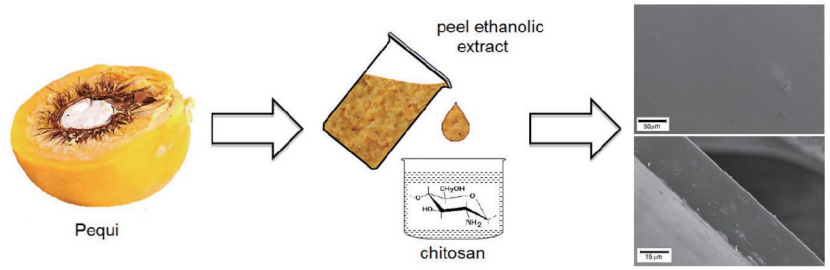
ARTICLES

Processing and Characterization of Chitosan Films with Incorporation of Ethanolic Extract from "Pequi" Peels

Caroline Alves Breda,
Daniella Lury Morgado,
Odílio Benedito Garrido Assis*,
and Marta Cristina Teixeira Duarte

Macromol. Res., **25**, 1049 (2017)

Pequi (*Caryocar brasiliense* Camb.) is a native fruit originally from Brazilian savanna vegetation rich in phenolic active compounds. The incorporation of small amounts of ethanolic extracts from pequi peels (PPE) can improve the antimicrobial activity of chitosan in film forms (solid-state). The association of PPE with chitosan resulted in homogenous blends without interference on the processability of the films. The present study characterizes the physico-chemical changes introduced by the addition of 0.1% w/w of PPE into chitosan film matrices.

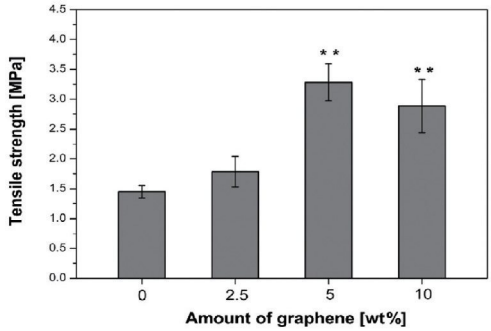


Graphene-Incorporated Nanofibrous Hybrid Membrane with Enhanced Properties

Ueon Sang Shin, Jeong-Soon Park, Jun-Sung Oh, and Eun-Jung Lee*

Macromol. Res., **25**, 1057 (2017)

Guided Bone Regeneration (GBR) membranes modified by incorporating nano-graphene were fabricated to enhance their mechanical performance while maintaining their biological properties. Nano-graphene was incorporated well into the chitosan-silica composite membrane by sol-gel technique. The best strengthening effect was found for membranes containing graphene up to 5%. The membranes containing graphene had nanofibrous structures and such structure improved protein adsorption onto these membranes.

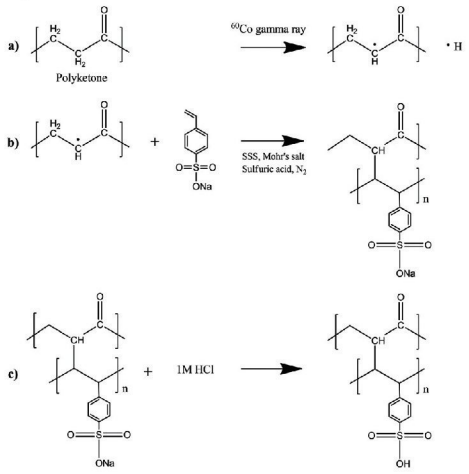


Synthesis of Polyketone-*g*-Sodium Styrene Sulfonate Cation Exchange Membrane *via* Irradiation and Its Desalination Properties

In Sik Kim, Chi Won Hwang, Young Joong Kim, Ali Canlier, Kyung Seok Jeong, and Taek Sung Hwang*

Macromol. Res., **25**, 1063 (2017)

Polyketone was sulfonated followed by radical polymerization at room temperature. The chemical structure was confirmed by FT-IR and XPS. Effect of total irradiation dose and concentration of monomers not only for degree of grafting but also for its chemical and electrical properties was investigated. The synthesized cation exchange membrane was applied to the MCDI cells, in which their efficiencies to remove TDA (total dissolved solids).

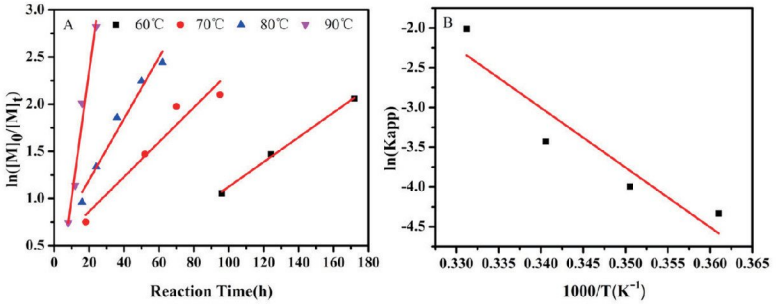


Kinetics of Sn(Oct)$_2$-Catalyzed Ring Opening Polymerization of ε-Caprolactone

Dan Wu, Yin Lv, Rui Guo, Jiahui Li, Aerman Habadati, Bowen Lu, Heyun Wang, and Zhong Wei*

Macromol. Res., **25**, 1070 (2017)

The ring opening polymerization kinetics of ε-caprolactone with Sn(Oct)$_2$ as catalyst and different structures of alcohols as initiators were investigated. The activity of tertiary alcohol was much lower than those of primary and secondary alcohols. The reaction rate and molecular weight of synthesized polymer were influenced by temperature, monomer concentration and system viscosity.

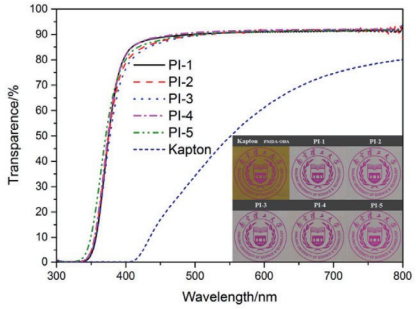


Transparent Fluorinated Poly(imide siloxane) Copolymers with Good Adhesivity

Linshuang Li, Yong Xu*,
Jianfei Che, Xu Su,
Chaoran Song, and Xiuping Ma

Macromol. Res., **25**, 1076 (2017)

All the fluorinated poly (imide siloxane) copolymers are transparent and nearly colorless due to the incorporation of trifluoromethyl (-CF_3) groups which reduce the formation of CTC. The addition of siloxane component increases the adhesion property of fluorinated polyimide and has no negative effects on optical property.

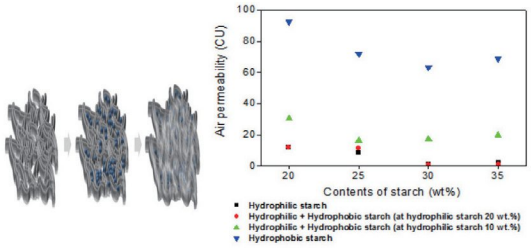


Starch Composites and Their Reduction of Air Permeation for Self-Extinguishable Paper

Kwang Se Lee, Chan Woo Park,
Young-Sin Kim,
and Jong-Duk Kim*

Macromol. Res., **25**, 1085 (2017)

The optimized ratio in terms of a self-extinguishable property of the composite with hydrophilic starch and hydrophobic starch was determined.

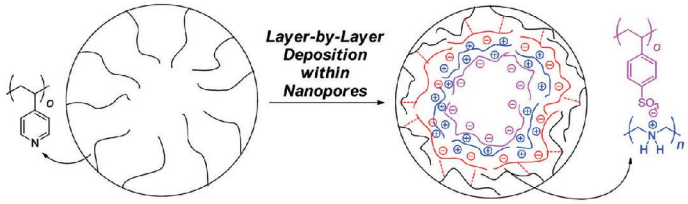


Sequential Coating of Nanopores with Charged Polymers: A General Approach for Controlling Pore Properties of Self-Assembled Block Copolymer Membranes

Julia Baettig, Junki Oh,
Joona Bang, and Anzar Khan*

Macromol. Res., **25**, 1091 (2017)

Alteration of pore properties, surface chemistry and size, in isoporous asymmetric membranes prepared from the assembly of diblock copolymers is demonstrated through layer-by-layer deposition of charged polymers within the nanopores.

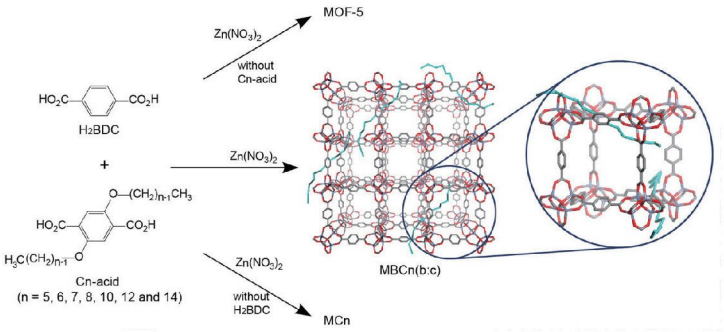


Microporous Metal Organic Framework- Based Copolymers with Efficient Gas Adsorption Capability and High Temporal Stability

Jong-Yeong Jung, Sung-Ho Ko,
Su-Lim Park, Hun-Hee Shin,
Hyun-Chang Oh, Jong-Wan Ryu,
Seung-Chul Lee, O-Pil Kwon*,
and Eun-Young Choi*

Macromol. Res., **25**, 1100 (2017)

We report a simultaneous enhancement in gas adsorption capability and temporal stability observed with new Zn-coordinated 3D copolymers, dubbed MBC*n*, that possess framework structures identical to MOF-5. For the synthesis of MBC*n*, a mixture of benzenedicarboxylate (BDC) and C*n*-acid, analogue of BDC with non-polar alkoxy side chains, has been used as organic ligand. The improved properties of MBC*n* illustrate the potency of the strategy in development of new microporous metal-organic hybrid materials.

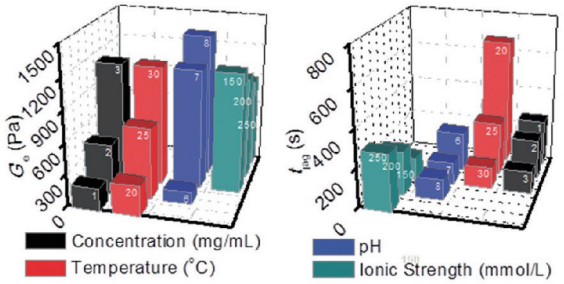


Systematic Modulation of Gelation Dynamics of Snakehead (*Channa argus*) Skin Collagen by Environmental Parameters

Juntao Zhang, Benmei Wei, Lang He, Chengzhi Xu, Dong Xie, Kyung-Wook Paik, and Haibo Wang*

Macromol. Res., **25**, 1105 (2017)

The influence of environmental parameters on the gelation of fish-sourced collagen was systematically revealed. The gelation dynamics and the equilibrium elastic moduli of fish-sourced collagen were accelerated by higher collagen concentrations, higher incubation temperatures, physiological or basic pH, and lower ion strength. In addition, SEM and TEM results confirmed that the mechanical property of collagen gels are directly related to the density of fibrils (rather than their size), and the relationship between the biological and mechanical properties of these collagen gels was evaluated.

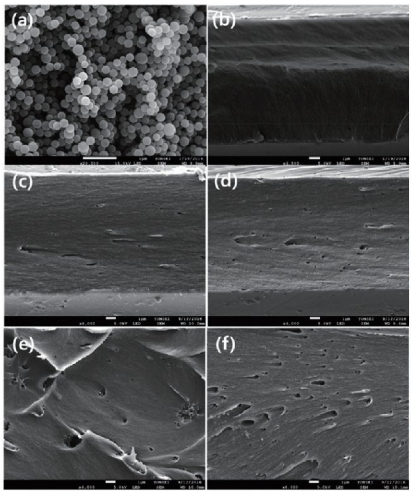


Low Dielectric Transparent Poly(amide-imide) Thin Film with Nano Scale Porous Structure

Juheon Lee, Sangrae Lee, Kwangin Kim, Taewon Yoo, Gunhwi Kim, and Haksoo Han*

Macromol. Res., **25**, 1115 (2017)

A transparent poly(amide-imide) (PAI) was synthesized with good thermal and optical properties and after that silica nano particles were introduced and removed for nano porous polymer matrix. PAI with nano porous structure show transparent colorless properties and low dielectric constant in range of 3.2-2.5. PAI with nano porous structure could be used in transparent coating and electronic materials.

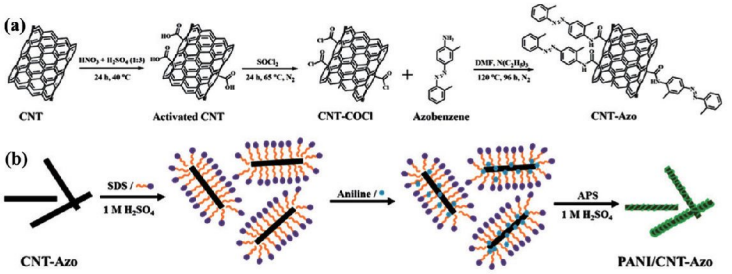


Synthesis and Characterization of Polyaniline-Grafted CNT as Electrode Materials for Supercapacitors

Umashankar Male, Bo Kyoung Shin, and Do Sung Huh*

Macromol. Res., **25**, 1121 (2017)

Polyaniline (PANI) was grafted with carbon-nanotubes (CNT) via azobenzene (Azo) to increase the pseudo-capacitance of PANI. CNT was functionalized with azobenzene and used in the in-situ polymerization of aniline using emulsion polymerization. Morphology of the grafted composites showed a higher uniform growth in PANI/CNT-Azo composite than PANI/CNT composite. The results show grafting of PANI onto CNT via Azo helps to achieve higher capacitance than non-grafted PANI/CNT and PANI materials.

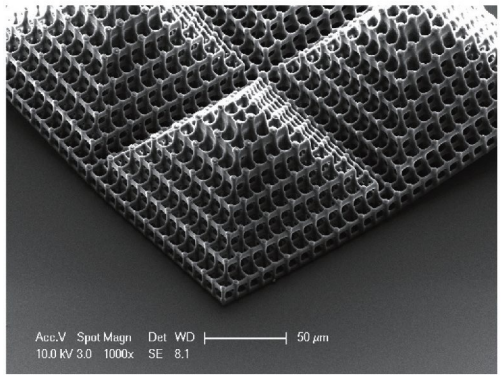


Effective Direct Writing of Hierarchical 3D Polymer Micromeshes by Continuous Out-of-plane Longitudinal Scanning

Cheol Woo Ha, Prem Prabhakaran, Yong Son, Kwang-Sup Lee*, and Dong-Yol Yang*

Macromol. Res., **25**, 1129 (2017)
Cover Paper

We have demonstrated the fast fabrication of hierarchical three-dimensional microstructures by two-photon lithography involving continuous out-of-plane longitudinal scanning. This method constitutes continuous scanning of the laser along the z-axis during the fabrication of hexahedral structures, rather than conventional point-to-point laser scanning. This approach has been shown to yield an order of magnitude improvement in the time of fabrication.

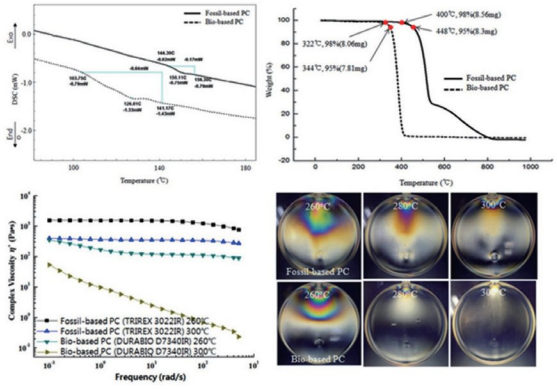


Comparison of Thermal and Optical Properties and Flowability of Fossil-based and Bio-based Polycarbonate

Jung Hyun Park, Myung Sool Koo, Sung Hwan Cho, and Min-Young Lyu*

Macromol. Res., **25**, 1135 (2017)

Material properties of fossil-based polycarbonate (PC) and bio-based PC have been compared. Glass transition temperature and thermal stability were measured by differential scanning calorimetry, differential thermal analysis, and thermal gravimetric analysis. Viscosity and flow length were measured to discuss a flow property. Optical characteristics were discussed using haze, transmittance, and birefringence.

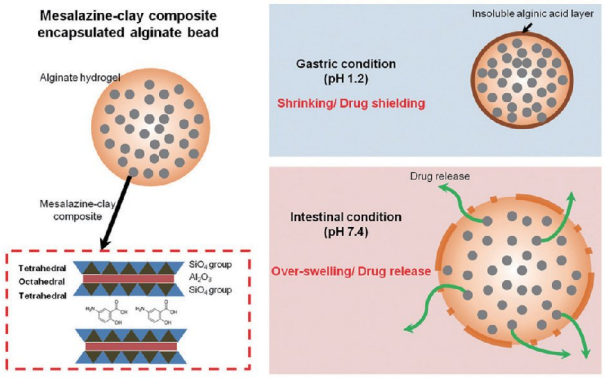


pH-Sensitive Mesalazine Carrier for Colon-Targeted Drug Delivery: A Two-Fold Composition of Masalazine with a Clay and Alginate

Hye-Jin Hong*, Jiwoong Kim, Yong Jae Suh, Daeyoung Kim, Ki-Min Roh, and Ilmo Kang*

Macromol. Res., **25**, 1145 (2017)

Because mesalazine is colon target drug, release of mesalazine should be controlled. For sustained release, mesalazine is intercalated into montmorillonite (MMT) clay and then it is encapsulated in alginate bead, pH sensitive polymer. MMT enhances mesalazine entrapment in alginate bead. Alginate forms insoluble layer in acidic, gastric condition and prevents mesalazine release. Otherwise it is over-swelling in slightly alkaline, intestinal condition and then mesalazine is released to medium.



「Macromolecular Research」 목차

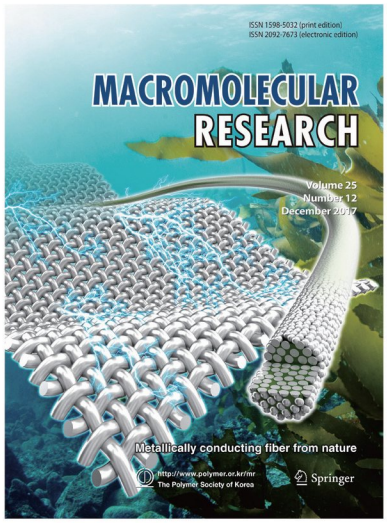
정기간행영문지_ 25권 12호 · 2017년 12월

Cover Paper

Fabrication of Highly Conductive Fibers by Metal Ion-Exchange Using a Simply Modified Wet-Spinning Process

Tae Ho Lee, Jae Ho Kim, and Jun Young Lee*

Vol. 25, No. 12, pp 1230-1236 (2017) | DEC 25, 2017 | DOI 10.1007/s13233-017-5167-9



Ag nanoparticle (AgNP) embedded Ca-alginate conducting fiber (AgNP/Ca-alginate fiber) shows extremely efficient conducting AgNP networks not only on the surface but also in the inside of the fiber, resulting in the metallic conductivity as high as 2,000 S/cm. The fiber is so flexible to fabricate the conductive woven and knitted fabrics with extremely low surface resistivity of 0.6 Ω/□. It is, therefore, suggested that AgNP/Ca-alginate fiber spun in this study can be applied as flexible 1-dimensional or 2-dimensional electrical conductors in various flexible or wearable electronic devices.

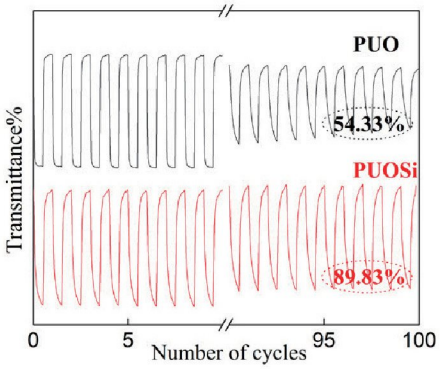
ARTICLES

Synthesis and Characterization of Electrochromic Polyurea Containing Oligoanilines and Silicon Groups

Yanyan Li, Mingying Yin, Ying Yan, Ce Wang, Xincai Liu, and Danming Chao*

Macromol. Res., **25**, 1153 (2017)

A novel electrochromic polyurea containing electroactive oligoanilines and crosslinkable silicon groups has been designed and synthesized, whose crosslinked network structure (c-PUOSi) would effectively enhanced the stability of electrochromic behavior through the densification of polyurea film. Moreover, the enhanced adhesion between the polymeric film and ITO substrate would also improve electrochromic stability.

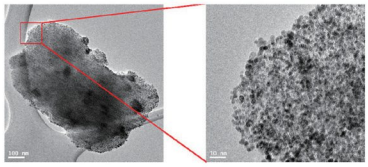


Highly Durable Platinum Nanoparticles on Carbon Derived from Pitch-Based Carbon Fibers for Oxygen Reduction Reaction

Gil-Seong Kang, Cheol-Ho Lee, Youn-Ki Lee, Geun Seok Chai, Doh C. Lee, Sungho Lee*, and Han-Ik Joh*

Macromol. Res., **25**, 1158 (2017)

One of the factors limiting the commercialization of fuel cells is the low durability of catalyst supports such as carbon blacks. Here, we newly introduced a highly durable catalyst support derived from pitch-based carbon fibers. The carbon fiber based catalyst support showed high crystallinity and fabricated catalyst showed superior durability to those of a commercial catalyst using carbon blacks. It is suggested that an increase in crystallinity was attributed to prevent elimination of platinum and carbon support.

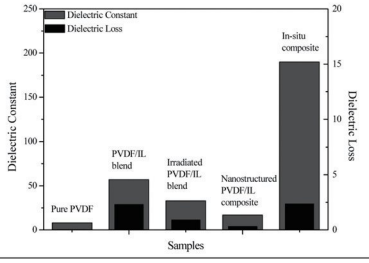


Performance Improvement of Poly(vinylidene fluoride) by *In Situ* Copolymerization of Methyl Methacrylate and Ionic Liquid

Xiujie Bi, Shixin Song, and Shulin Sun*

Macromol. Res., **25**, 1163 (2017)

1-Butyl-3-vinylimdazolium tetrafluoroborate ([BVIM][BF_4]) and methyl methacrylate (MMA) copolymers were prepared in poly(vinylidene fluoride) (PVDF) solution. Soxhlet extraction showed more than 60% copolymers were grafted onto the PVDF chains. The introduction of [BVIM][BF_4] enhanced the electrical conductivity and dielectric constant of PVDF. The present method improved the stability of ionic liquid in PVDF composites and the composites showed potential applications in sensor and actuator fields.

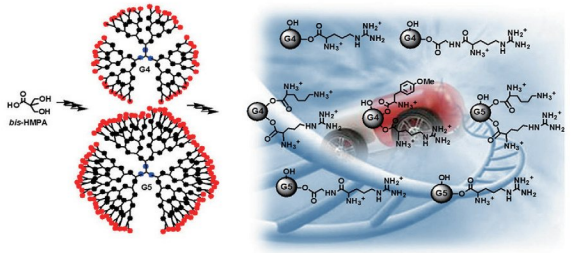


Synthesis and Characterization of Polyester-Based Dendrimers Containing Peripheral Arginine or Mixed Amino Acids as Potential Vectors for Gene and Drug Delivery

Silvana Alfei* and Sara Castellaro

Macromol. Res., **25**, 1172 (2017)

Seven new fourth and fifth generation polyester-based dendrimers with several peripheral hydroxyl groups were prepared from 2,2-*bis*(hydroxymethyl)propanoic acid and were decorated with arginine, amino acids and arginine-glycine dipeptide. Their degradable inner matrix and polycationic periphery, their size and surface charge and their buffer capacity much more higher than that of fourth generation polyamidoamines (G4-PAMAMs) make them a promising crew of new non-toxic potential vectors for gene and drug delivery.

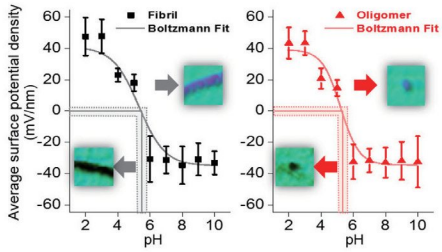


Nanoelectrical Characterization of Amyloid-β_{42} Aggregates *via* Kelvin Probe Force Microscopy

Wonseok Lee, Hyungbeen Lee, Yeseong Choi, Kyo Seon Hwang, Sang Woo Lee, Gyudo Lee*, and Dae Sung Yoon*

Macromol. Res., **25**, 1187 (2017)

Amyloid-β (Aβ) is a major pathological hallmark of Alzheimer's disease. Electrostatic interaction is critical in Aβ aggregation as well as Aβ-induced neuronal dysfunction. Thus, characterizing the electrical properties of Aβ aggregates is quite necessary. Electrophoresis has been used to measure the electrical properties of Aβ. However, because of the amyloid solutions including various amyloidogenic derivatives (*e.g.*, oligomers and fibrils), this technique has a limitation in analyzing the electrical properties of individual oligomers and fibrils. To address this issue, we characterize the nanoelectrical properties (*i.e.*, surface potential) of individual Aβ_{42} aggregates (oligomers and fibrils) depending on pH using Kelvin probe force microscopy (KPFM).

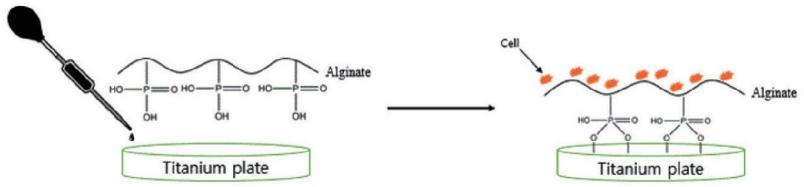


Development of Phosphonated Alginate Derivatives as Coating Material on Titanium Surface for Medical Application

Seung Hyun Noh, Eun Hye Kim, Ga Dug Han, Jae Won Kim, Yoshihiro Ito, Jae-Gwan Lee, and Tae Il Son*

Macromol. Res., **25**, 1192 (2017)

Alginate derivative was prepared to be coated on titanium surface for improving osseointegration. It was modified by reaction of alginate and 3-aminopropylphosphonic acid. The phosphonate group of P-alginate was identified by ^{31}P NMR. There was a specific peak derived from phosphonate group at about 24 ppm from external standard. X-Ray photoelectron spectroscopy (XPS) and water contact angle measurement were carried out for characterization of titanium surface treated with P-alginate. To confirm toxicity, cytotoxicity test was performed. Cell-adhesion test was demonstrated to improve cell adhesion on titanium surface.

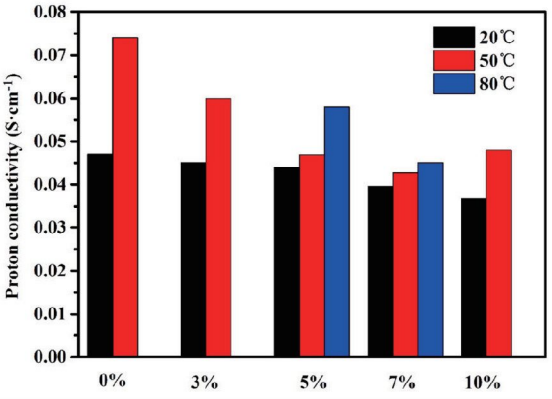


Cross-Linked Sulfonated Poly(arylene ether nitrile)s with Low Swelling and High Proton Conductivity

Jingchun Liu, Penglun Zheng, Mengna Feng, Renbo Wei*, and Xiaobo Liu*

Macromol. Res., **25**, 1199 (2017)

A series of sulfonated poly(arylene ether nitrile) (SPEN) cross-linked composite membranes were prepared to potential candidates as PEM in DMFCs. Results indicated that SPEN-DABSA membranes exhibited high proton conductivity (>0.03 S · cm^{-1}) and oxidative stabilities (>59%). The membranes showed much weight loss around 250 ℃ which exhibited excellent thermal stabilities. The membranes also exhibited laigh water uptake at low temperature (<50 ℃). Besides, the IEC values and FTIR also exhibited in article.

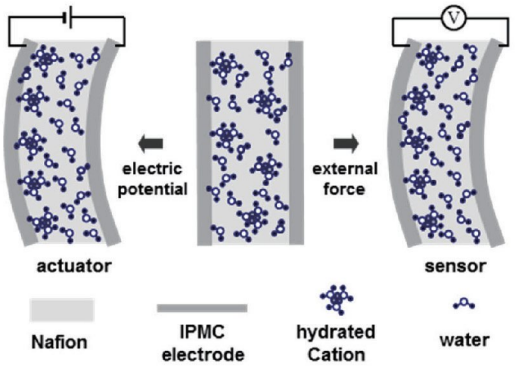


Fabrication and Characterization of an Ionic Polymer-Metal Composite Bending Sensor

Dae Seok Song, Dong Gyun Han, Kyehan Rhee, Dong Min Kim*, and Jae Young Jho*

Macromol. Res., **25**, 1205 (2017)

A robust and stable bending sensor was fabricated with ionic polymer-metal composite (IPMC) and its performance was examined. The relation between the sensor signal and the curvature was confirmed in various conditions, which included the one when the sensor is surface-mounted on the static and dynamic finger-joint. The IPMC sensor was characterized to be superior to mechanical sensors in sensitivity and resolution.

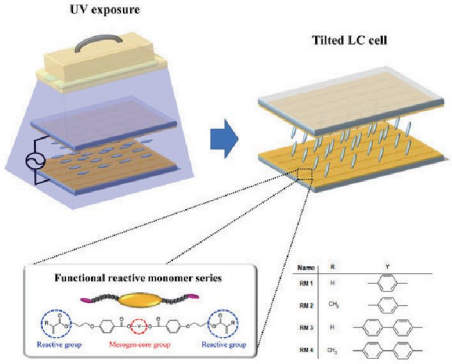


Fabrication of New Photoreactive Vertical Alignment Thin Layers for Fast Switching Liquid Crystal Display

Eun Hyoung Bae, Chunho Kim, Intae Son, Chi Hyeong Cho, Changsu Min, Taehyeon Kang, Hongsuk Suh, and Jun Hyup Lee*

Macromol. Res., **25**, 1212 (2017)

We report a controlled approach for the fabrication of a uniform, vertically stable, and fast electro-optical switching alignment layer for liquid crystal display through simple coating and subsequent UV process of new photoreactive vertical alignment layers. The proposed method using newly designed bi-functional monomers provides superior electro-optical performance to the conventional polyimide (PI) alignment technology.

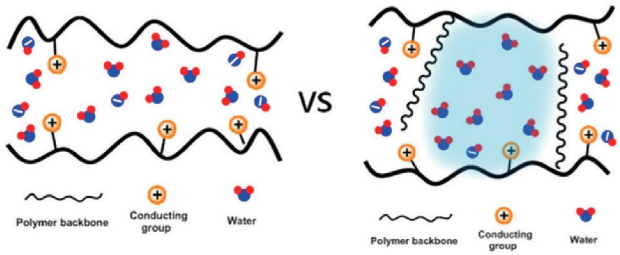


Hydrophobic Comb-Shaped Polymers Based on PPO with Long Alkyl Side Chains as Novel Anion Exchange Membranes

Haeryang Lim and Tae-Hyun Kim*

Macromol. Res., **25**, 1220 (2017)

The hydrophobic comb-like alkyl-substituted and quaternary ammonium-functionalized poly(2,6-dimethyl-1,4-phenylene oxide) (AQA-PPOs) were prepared as novel anion exchange membranes. The effect of the alkyl side chain content on the conductivity, alkaline stability and other physicochemical properties were also investigated by preparing the AQA-PPOs with various alkyl chain composition. It was found that an increase in both conductivity and alkaline stability was observed due to the increased water uptake for the AQA-PPO membranes having the higher alkyl contents.



Fabrication of Highly Conductive Fibers by Metal Ion-Exchange Using a Simply Modified Wet-Spinning Process

Tae Ho Lee, Jae Ho Kim, and Jun Young Lee*

Macromol. Res., **25**, 1230 (2017)
Cover Paper

Ag nanoparticle (AgNP) embedded Ca-alginate conducting fiber (AgNP/Ca-alginate fiber) shows extremely efficient conducting AgNP networks not only on the surface but also in the inside of the fiber, resulting in the metallic conductivity as high as 2,000 S/cm. The fiber is so flexible to fabricate the conductive woven and knitted fabrics with extremely low surface resistivity of 0.6 Ω/□. It is, therefore, suggested that AgNP/Ca-alginate fiber spun in this study can be applied as flexible 1-dimensional or 2-dimensional electrical conductors in various flexible or wearable electronic devices.