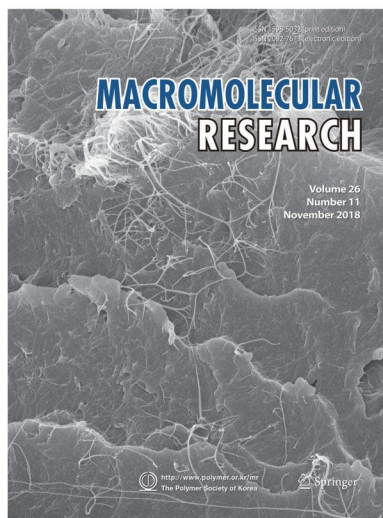


## COVER PAPER

### Effect of Ozone Treatment on Fracture Toughness of Single-Walled Carbon Nanotubes-Reinforced Epoxy Resin Initiated by a Thermal Latent Catalyst

Min-Joo Kang, Fan-Long Jin, and Soo-Jin Park\*

Vol. 26, No. 11, pp 1048-1051 (2018) | NOV 25, 2018 | DOI 10.1007/s13233-018-6138-5



Ozone-treated SWCNTs (O-SWCNT) were synthesized and used to prepare the epoxy/O-SWCNT composites cured by a thermal latent initiator, N-benzylpyrazinium hexafluoroantimonate. Fracture toughness of the epoxy/O-SWCNT composites was significantly enhanced compared to that of neat epoxy resins or epoxy/SWCNT composites. The enhanced mechanical properties could be attributed to the improved dispersion of O-SWCNTs in the epoxy matrix and the increased interfacial interactions between the O-SWCNT and epoxy matrix.

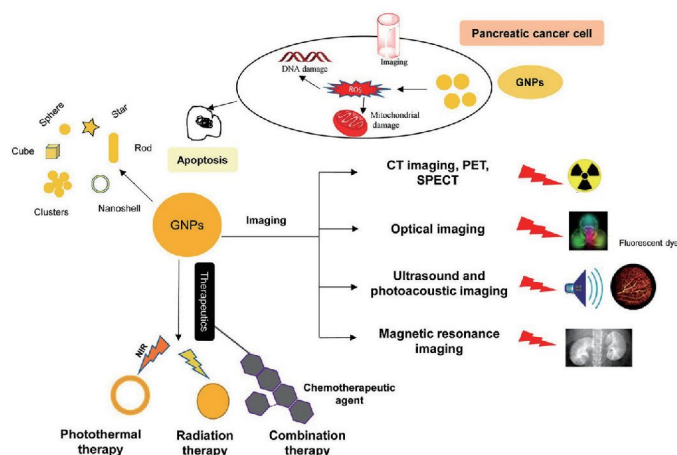
## REVIEW

### Current Applications of Gold Nanoparticles for Medical Imaging and as Treatment Agents for Managing Pancreatic Cancer

Asmita Banstola, Fakhrossadat Emami, Jee-Heon Jeong\*, and Simmyung Yook\*

Macromol. Res., 26, 955 (2018)

Pancreatic cancer is an extremely heterogeneous, malignant disease with a complicated tumor microenvironment and a dismal prognosis. Gold nanoparticles are used as a promising candidate for cellular imaging and therapy of pancreatic cancer, because they provide better permeation and retention, photothermal effects, and simple gold-thiol bioconjugation chemistry for conjugation of desired molecules for targeted drug delivery.



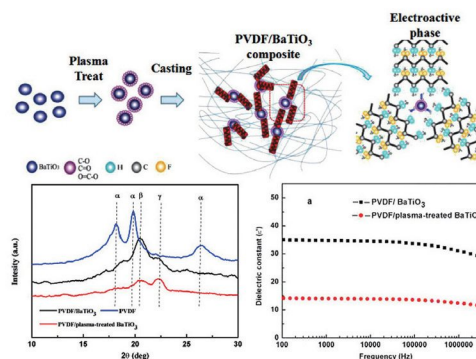
## ARTICLES

### Poly(vinylidene fluoride)/ Plasma-Treated BaTiO<sub>3</sub> Nanocomposites with Enhanced Electroactive Phase

Ran Ding, Lei Gong\*, Ming-ming Li,  
Shu-hua Chen, Shi-ping Zhan,  
Xu-dong Sun, Cheng Zhang,  
and Tao Shao

*Macromol. Res.*, **26**, 965 (2018)

Plasma-modified BaTiO<sub>3</sub> nanoparticles have been incorporated into poly(vinylidene fluoride) (PVDF) matrix to interact with -CH<sub>2</sub>-/-CF<sub>2</sub>- dipoles. The plasma-modified BaTiO<sub>3</sub> acted as nucleating agents due to the strong interaction between the oxygenated groups on the surface of modified BaTiO<sub>3</sub> nanoparticles and PVDF chains. Thus, it resulted in the promotion of  $\gamma$ -phase crystal during the crystallization of PVDF. In addition, the higher dielectric constant and lower dielectric loss were observed in the PVDF/plasma-treated BaTiO<sub>3</sub> composite, in comparison with the unmodified one.

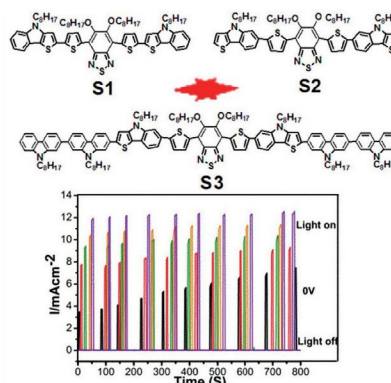


### Laser-Induced Morphology Change Based on Small Molecular Model Compounds Photo-Detector

Ruiping Qin\*, Deen Guo, Jien Yang,  
and Yurong Jiang

*Macromol. Res.*, **26**, 973 (2018)

Three linear small molecules were synthesized. Photo-detectors based on blends of the small molecules and [6,6]-phenyl-C71-butyric acid methyl ester (PC<sub>71</sub>BM) exhibited promising photo response characteristics. Laser induction period for the photocurrent to increase was clearly observed and investigated.

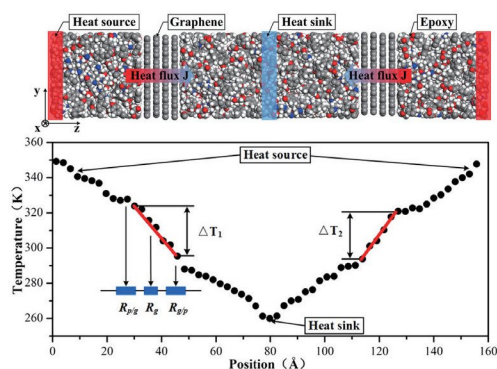


### Theoretical Prediction of Heat Transport in Few-Layer Graphene/Epoxy Composites

Jianhua Zeng, Jiao Li, Peng Yuan,  
and Ping Zhang\*

*Macromol. Res.*, **26**, 978 (2018)

This research paper studies heat transport behaviors within few-layer graphene (FLG)/epoxy composites using molecular dynamics simulations. The influences of interfacial thermal resistance, FLG volume fraction and FLG length on overall thermal conductivity of composites are specifically analyzed. It is found that there is a significant interfacial thermal resistance between FLG and epoxy due to the mismatch of the phonon vibration power spectrum. Furthermore, the interfacial thermal resistance, FLG volume fraction and FLG length play an important role in improving the overall thermal conductivity of FLG/epoxy composites.

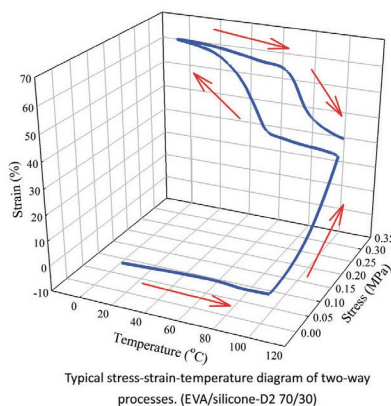


### Preparation and Characterization of Ethylene Vinyl-Acetate Copolymer/Silicone Blends with Excellent Two-Way Shape Memory Properties

Sun-Mou Lai\* and Pei-Yun You

*Macromol. Res.*, **26**, 984 (2018)

Ethylene-vinyl acetate copolymer (EVA) and silicone rubber were melt-blended to form two-way shape memory blends cured with peroxide. Silicone tended to endow the prepared EVA/silicone shape memory blends with high thermal stability, hydrophobicity, and recovery magnitude.  $R_{act}$  (cooling-induced elongation) increased with increasing EVA contents and loads. With increasing silicone contents, the entropy-driven contribution decreased. The suitable balance of EVA and silicone content would endow EVA/silicone blends with featured functionality for various applications.

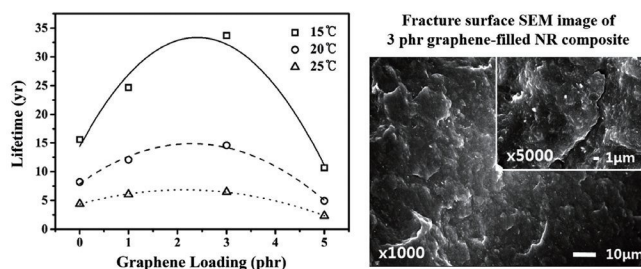


### Accelerated Aging and Lifetime Prediction of Graphene-Reinforced Natural Rubber Composites

Eunjoo Kong, Bumyong Yoon, Jae-Do Nam, and Jonghwan Suhr\*

*Macromol. Res.*, **26**, 998 (2018)

Accelerated lifetime prediction of graphene-reinforced natural rubber composites were investigated by thermal aging test on compression set. In the present study, 3 phr loading of graphene showed the longest lifetime due to efficient thermal energy transfer through the matrix leading to increase in activation energy of polymer chains.

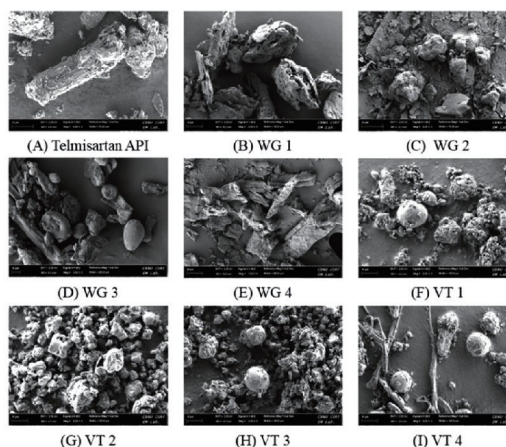


### Improving Solubility of the Telmisartan that is Poorly Water Soluble by Wet Granulation and Vitrification Process

Gi Won Lee, Sung Hyun Jeon, Hun Hwi Cho, Yong Woon Jeong, Han Sol Kim, Min Joung Choi, Jeong Eun Song, and Gilson Khang\*

*Macromol. Res.*, **26**, 1004 (2018)

Telmisartan (TS) is poorly water soluble and bad bioavailability. So, TS is limited by dissolution rate. In this study, we prepared solid dispersion to promote release rate and made sustained release formulation by wet granulation and vitrification. We measured the characterization that was performed using various methods to analyze. In this results, drug solubility almost greater than the original drug. And, so, this results are useful to improve TS in the pharmaceutical industry.



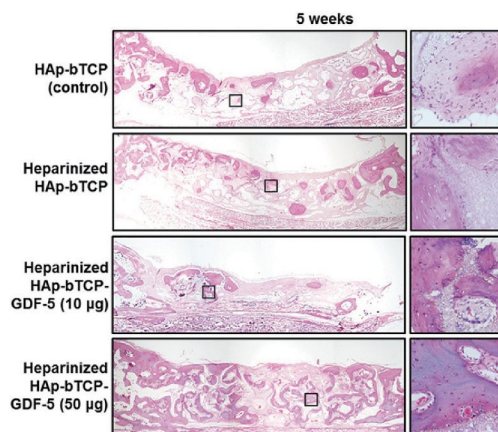


# **Osteoblastic Differentiation of Functionalized Biphasic Hydroxyapatite and b-Tricalcium Phosphate with Recombinant Human Growth and Differentiation (rhGDF-5)**

Joo-Young Ohe, Byung-Joon Choi, Junho Jung, Jeewan Chun, Youngjae Yoon, and Yong-Dae Kwon\*

*Macromol. Res.*, **26**, 1011 (2018)

Animal tests *in vivo* showed the healing effect of the heparinized hydroxyapatite and b-tricalcium phosphate (HAp-bTCP)-growth-differentiation factor-5 (GDF-5) as compared to the control and heparinized HAp-bTCP on the defected bone. Hematoxylin/eosin (H&E) stained histological cross-sections after 5 weeks. The formation of the regenerated bone with typical structure of immature bone in the heparinized HAp-bTCP-GDF-5 (50  $\mu$ g) groups was observed.

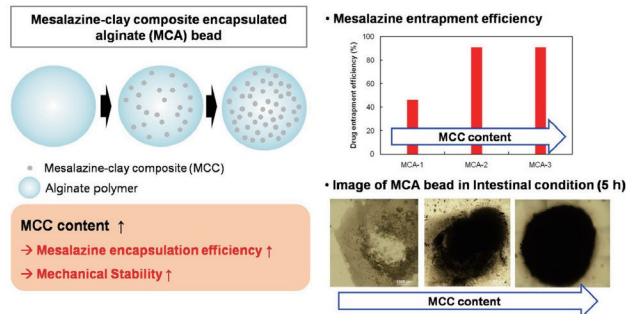


# **Preparation of Mesalazine-Clay Composite Encapsulated Alginate (MCA) Bead for Targeted Drug Delivery: Effect of Composite Content and CaCl<sub>2</sub> Concentration**

Hye-Jin Hong\*, Hyeon Su Jeong, Ki-Min Roh, and Ilmo Kang\*

*Macromol. Res.*, **26**, 1019 (2019)

For targeted mesalazine delivery, a mesalazine-clay composite encapsulated alginate (MCA) bead was prepared. The preparation conditions of the MCA beads considerably affected drug entrapment efficiency, swelling property, and drug release profile. In particular, increase in mesalazine-clay composite (MCC) content in the MCA bead leads to significant improvement in mesalazine loading efficiency and prevent destruction caused by over-swelling of the MCA bead in intestinal condition.

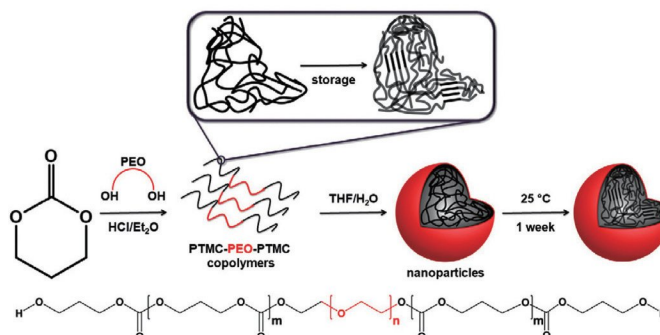


# **Nanoparticles Based on Poly(trimethylene carbonate) Triblock Copolymers with Post-Crystallization Ability and Their Degradation *in vitro***

Lucie Reinišová, Filip Novotný, Martin Pumera, Katarína Kološtová, and Soňa Hermanová\*

*Macromol. Res.*, **26**, 1026 (2018)

Poly(trimethylene carbonate) (PTMC)-based copolymers with molar masses of 3-9 kg/mol were prepared by metal-free ring-opening polymerization using dihydroxy-terminated poly(ethylene oxide) as a macroinitiator. Micellar nanoparticles self-assembled from these copolymers had a size of less than 130 nm. Amorphous copolymers with more than 39 mol% of carbonate units and representative particles are prone to the rearrangement of PTMC chains during storage and thus undergo post-crystallization.



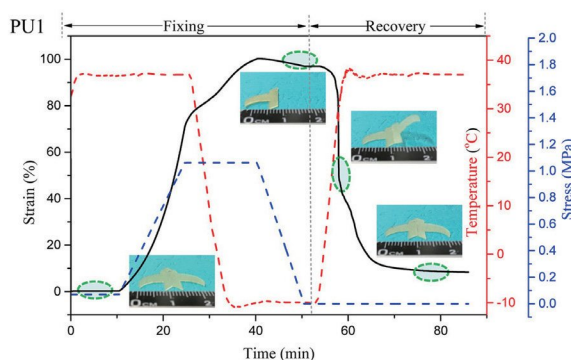


### Tunable Shape Memory Polyurethane Networks Cross-Linked by 1,3,5,7-Tetrahydroxyadamantane

Shuqin Fu, Jiaping Zhu,  
and Shaojun Chen\*

*Macromol. Res.*, **26**, 1035 (2018)

It can be seen that PU1 samples can be elongated to nearly 100% strain at 37 °C. The calculated values for  $R_f$  and  $R_r$  for PU1 were 97% and 92%, respectively. The good shape fixity and good shape recovery ratio of PU1 confirmed that PU1 have body temperature triggered shape memory performance.

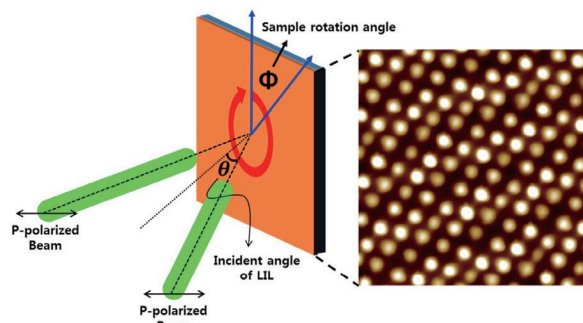


### Nature-Inspired Quasicrystal SRG Using Fibonacci Sequences in Photo-Reconfiguration on Azo Polymer Films

Kang-Han Kim, Kuk Young Cho\*,  
and Yong-Cheol Jeong\*

*Macromol. Res.*, **26**, 1042 (2019)

In this study, we present the fabrication route of quasicrystal surface relief grating (SRG) of azopolymer. Based on photo-reconfigurable azobenzene property, various morphologies of grating patterns were inscribed on azopolymer thin-films by two-beam coupling light interference lithography (LIL) process. Multiplexing the LIL with different rotation sequence on azopolymers resulted in unusual surface structures including quasicrystal-like SRGs with Fibonacci sequences in rotational LIL. We investigated the effect of rotation sequence on the grating patterns by atomic force microscope, revealing that rotation sequence is a critical parameter determining surface structures of azopolymer films.



## NOTE

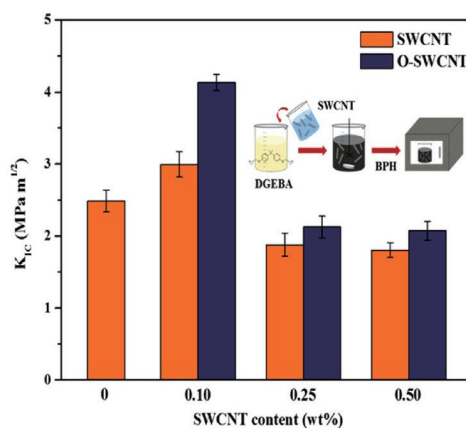
### Effect of Ozone Treatment on Fracture Toughness of Single-Walled Carbon Nanotubes-Reinforced Epoxy Resin Initiated by a Thermal Latent Catalyst

Min-Joo Kang, Fan-Long Jin,  
and Soo-Jin Park\*

*Macromol. Res.*, **26**, 1048 (2018)

Cover Paper

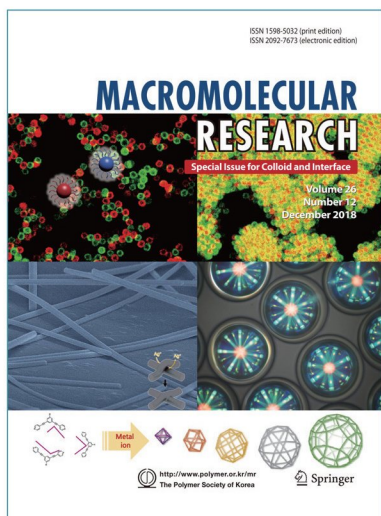
Diglycidylether of bisphenol A (DGEBA)/single-walled carbon nanotube (SWCNT) composites were prepared by solution blending of SWCNT and epoxy matrix. The fracture toughness of DGEBA/ozone-treated SWCNT composites was significantly higher than that of neat epoxy resins or DGEBA/SWCNT composites.



## COVER PAPER

### Special Issue: Colloid and Interface

Gi-Ra Yi, Guest Editor, Macromolecular Research



In this special issue, there are four invited review articles on fast-growing state-of-the-art researches in colloid and interface, which includes DNA-coated colloids for programmable materials, transparent electrodes based on silver nanowires, liquid-crystal emulsions for structural colors and molecular cages for drug delivery. In this cover art, two images in top row are confocal micrographs of two different dyed DNA-coated colloids before and after assembly. In second row, there are scanning electron microscopy image of silver nanowires on flexible substrates on the left, which were fused at junction after post treatment with silver salt, and optical micrograph of emulsion droplets with liquid crystals showing reflective colors on the right. In the bottom, schematic diagram shows that how organic ligands with metal ions form molecular cages which could be utilized for loading drug and then released in specific target site.

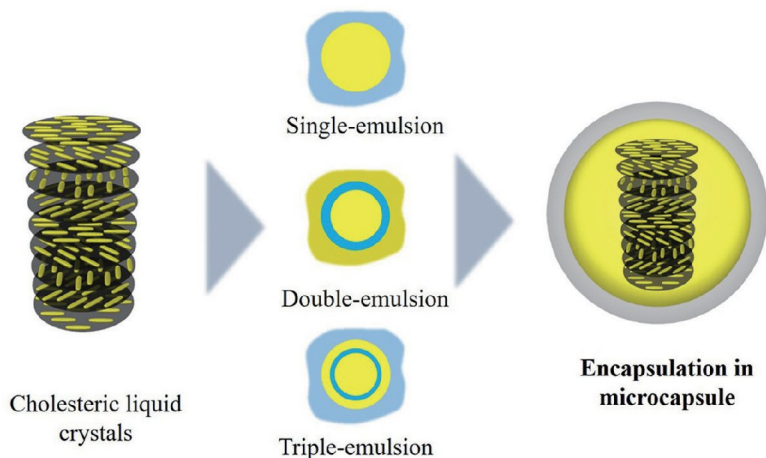
## REVIEWS

### Controlled Encapsulation of Cholesteric Liquid Crystals Using Emulsion Templates

Sang Seok Lee and Shin-Hyun Kim\*

*Macromol. Res.*, **26**, 1054 (2018)

Cholesteric liquid crystals (CLCs) show unique photonic bandgap properties, which are appealing for various optical applications. To provide a practical platform of CLCs, the fluidic CLCs have been encapsulated by a solid shell. This review comprehensively summarizes the encapsulation technologies based on emulsion templates and the applications of CLC-laden microcapsules, including displays, anti-forgery materials, sensors, and lasers.



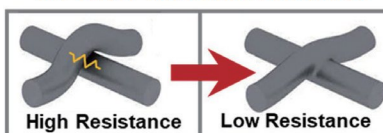
### Junction Welding Techniques for Metal Nanowire Network Electrodes

Hyungseok Kang, Gi-Ra Yi,  
Young Jun Kim\*,  
and Jeong Ho Cho\*

*Macromol. Res.*, **26**, 1066 (2018)

Transparent conductive electrodes (TCEs), which offer advantages of high electrical conductivity and optical transparency, are essential components of practical high-tech optoelectronics such as touch panels, e-papers, organic light-emitting diodes, and solar cells. Solution-processed Ag nanowires (AgNWs) have been considered as a practical alternative TCE material suitable for industrial-scale mass production. However, the contact resistance at AgNW junctions strongly affects the total sheet resistance of AgNW electrodes. In recent years, various welding techniques for AgNW network electrodes have been developed with the aim of decreasing their sheet resistance while maintaining their optical transmittance. In this paper, we present a review of various welding methods such as thermal-mechanical welding, light welding, chemical welding, and metal-plating welding.

#### Junction Welding Methods for Silver Nanowire Electrode

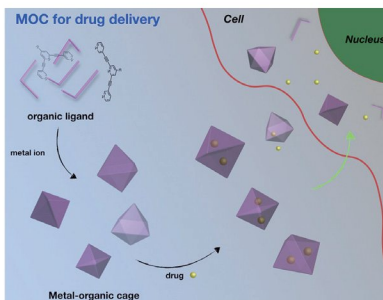


### Molecular Engineering of Metal-Organic Cycles/Cages for Drug Delivery

Nicola Judge, Lang Wang,  
Yannis Yan Lum Ho,  
and Yufeng Wang\*

*Macromol. Res.*, **26**, 1074 (2018)

The assembly of nanoscale materials with well-defined size and shape is an intriguing approach to aid in drug design and delivery. Of the various nano-structures that have been synthesised, metal-organic cycles and cages (MOCs), featuring great structural versatility, have emerged as promising components in cancer chemotherapeutics. We review the recent progress of exploiting self-assembled MOCs as anticancer drugs as well as drug carriers. Particularly molecular engineering designs allow MOCs to carry drugs with specificity, and interface with biological systems whilst possessing the desired stability, cytotoxicity, and compatibility. A special focus is given to the functionalization method of integrating MOCs with polymers, leading to the synthesis of colloidal nanoparticles-micelles and vesicles-that possess combined properties and extended system tunability.

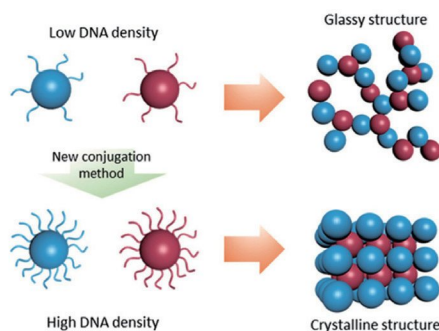


### DNA-Coated Microspheres and Their Colloidal Superstructures

Jeongbin Moon, In-Seong Jo,  
Etienne Ducrot, Joon Suk Oh,  
David J Pine, and Gi-Ra Yi\*

*Macromol. Res.*, **26**, 1085 (2018)

DNA-coated microspheres can be bound with other particles with complementary DNA brushes below the melting temperature and unbound above the melting temperature. We discussed how DNA are coated on microspheres and their areal density are improved. Furthermore, we have discussed how these DNA-coated microspheres can assemble into colloidal superstructures.





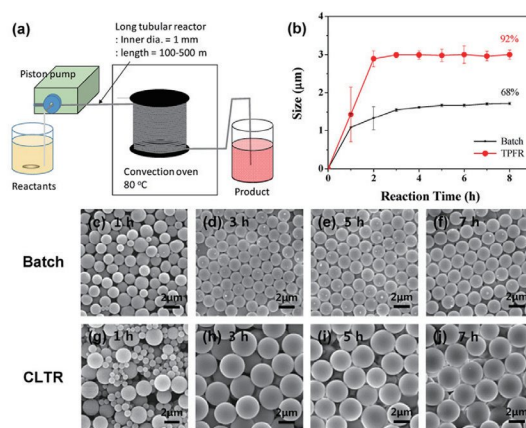
## COMMUNICATIONS

### High Yield Synthesis of Polystyrene Microspheres by Continuous Long Tubular Reactor and Their Application to Antiglare Film for High Resolution Displays

Jin Han, Myoung Sang You,  
Bum Jun Park\*, and Sang Hyuk Im\*

*Macromol. Res.*, **26**, 1095 (2018)

Uniform polystyrene (PS) microspheres are synthesized by dispersion polymerization in a continuous long tubular reactor (CLTR) system, whereas the batch reactor system yields ~1.8 fold smaller PS microspheres because the CLTR system has higher conversion (~92%) and more number of nuclei at early stage than the batch system (~68%) due to better heat transfer.

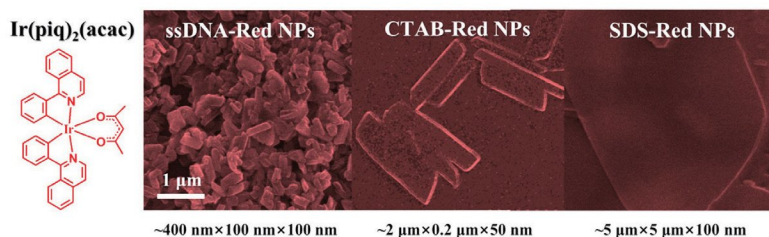


### Fabrication of Red-Light Emitting Organic Semiconductor Nanoparticles via Guidance of DNAs and Surfactants

Jin Hyuk Park, Seung Hyuk Back,  
Hyeon Mun Jeong,  
and Dong June Ahn\*

*Macromol. Res.*, **26**, 1099 (2018)

In this research, red-light emitting organic semiconductor nanoparticles with the guidance of DNAs and surfactants were fabricated, for the first time, by using phosphorescent Ir(piq)<sub>2</sub>(acac). The nanoparticles with CTAB exhibited rectangles and those with SDS had micro-plates. Single-stranded DNA interestingly induced nano-rods.



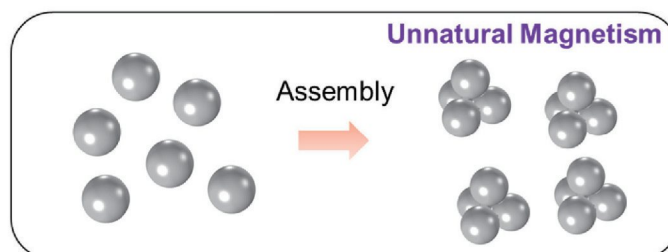
## ARTICLES

### Fundamental and Practical Limits of Achieving Artificial Magnetism and Effective Optical Medium by Using Self-Assembly of Metallic Colloidal Clusters

Kwangjin Kim, Ji-Hyeok Huh,  
Doyoung Yu, and Seungwoo Lee\*

*Macromol. Res.*, **26**, 1103 (2018)

The self-assembly of metallic colloidal clusters (so called plasmonic metamolecules) has been viewed as a versatile, but highly effective approach for the materialization of the metamaterials exhibiting artificial magnetism at optical frequencies (including visible and near infrared (NIR) regimes). Indeed, several proofs of concepts of plasmonic metamolecules have been successfully demonstrated in both theoretical and experimental ways. Nevertheless, this self-assembly strategy has barely been used and still remains an underutilized method. For example, the self-assembly and optical utilization of the plasmonic metamolecules have been limited to the discrete unit of the structure; the materialization of effective optical medium made of plasmonic metamolecules is highly challenging. In this work, we theoretically exploited the practical limits of self-assembly technology for the fabrication of optical magnetic metamaterials.

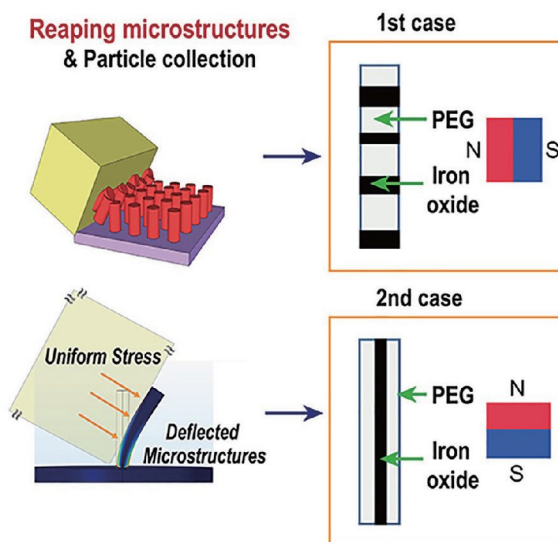


### Magnetically-Programmable Cylindrical Microparticles by Facile Reaping Method

Hyeongho Min, Youngjin Choi,  
Jaeyun Kim, Jungwook Kim\*,  
and Changhyun Pang\*

*Macromol. Res.*, **26**, 1108 (2018)

We analyzed the force balance of hairy architectures to explain the uniform cutting process, which is based on operating zones with various geometries and material elasticity. Here, the alignments of mono-/multi-dispersed iron oxide ( $\text{Fe}_3\text{O}_4$ ) in microparticles can be tunable by changing the external magnetic field during replications. Furthermore, the collective reversible motions of different magneto-responsive polyethylene glycol (PEG) particles were observed when the external magnetic field was controlled.

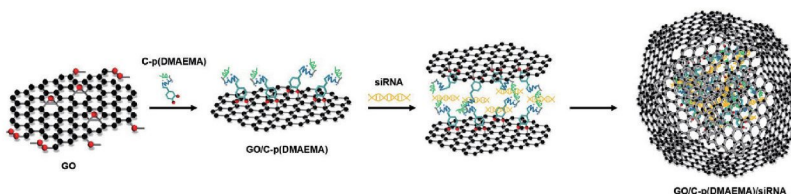


### Cellular Delivery of siRNA Using Poly(2-dimethylaminoethyl methacrylate)-Functionalized Graphene Oxide Nano-Wrap

Jung Eun Lee, Kyuri Lee,  
Jeong A Nam, Aesun Kim,  
So Young Lee, Min Sang Lee,  
Nak Won Kim, Yue Yin,  
Ji Won Park, Sung Young Park\*,  
and Ji Hoon Jeong\*

*Macromol. Res.*, **28**, 1115 (2018)

Facile synthesis of a graphene (GO)-based 2-dimensional (2D) carrier for cellular delivery of siRNA, which can enclose siRNA molecules in the GO nano-wrap by folding back the flexible nano-sheets. The dim sum-like carrier can mediate improved cellular siRNA in the presence of serum proteins.

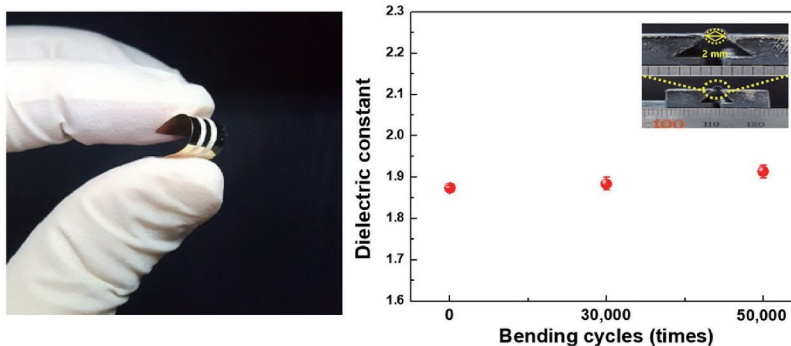


### Inkjet Printing of $\text{SiO}_2$ Hollow Spheres/Polyimide Hybrid Films for Foldable Low-k ILD

Min Kyu Kim, Sung Hwan Hwang,  
Hyun Sung Jung, Tae Sik Oh,  
Jong Hee Kim, and Ji Beom Yoo\*

*Macromol. Res.*, **26**, 1123 (2018)

The inkjet printing of  $\text{SiO}_2$  hollow spheres and polyimide hybrid films is useful with an ultra-low dielectric constant and high thermal stability for foldable display electronics.



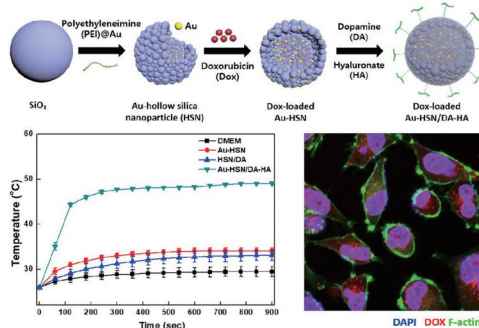


# Facile Synthesis of Surfactant-Free Au Decorated Hollow Silica Nanoparticles for Photothermal Applications

Ju Ri Seo, Hyung Woo Choi,  
Da Eun Kim, Da Yeon Park,  
Eun-Joong Kim,  
and Bong Geun Chung\*

*Macromol. Res.*, **26**, 1129 (2018)

Hollow silica nanoparticle loaded with Au nanocomposites (Au-HSN) is easily prepared by surfactant-free synthetic approach. It shows largely improved a dual therapeutic effect in cancer cells by chemo- and photothermal therapy.

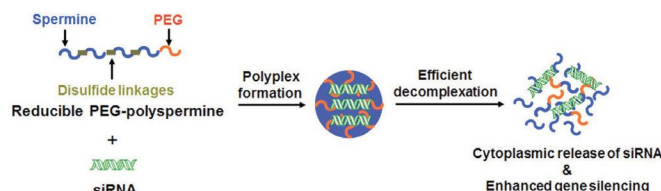


# Bioreducible Polyspermine-Based Gene Carriers for Efficient siRNA Delivery: Effects of PEG Conjugation on Gene Silencing Efficiency

Suk Ho Bhang, Kyuwon Kim,  
Won Jong Rhee, and Min Suk Shim\*

*Macromol. Res.*, **26**, 1135 (2018)

Bioreducible poly(ethylene glycol) (PEG)-conjugated polyspermine was developed for efficient siRNA delivery. PEG-conjugated polyspermine was able to form stable nano-sized polyplexes with siRNA. Disulfide linkages in the polymer resulted in enhanced cytoplasmic release of siRNA. PEG conjugation to polyspermine enhanced gene silencing efficiency due to weakened siRNA condensation, which leads to facilitated siRNA release into the cytoplasm.

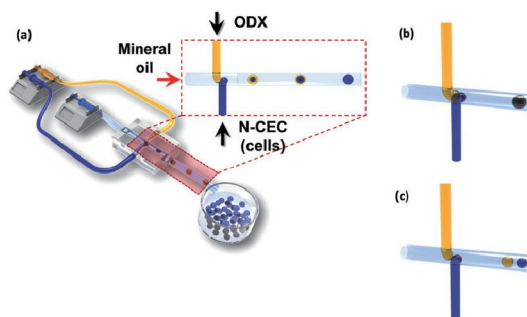


# Interfacial Compression-Dependent Merging of Two Miscible Microdroplets in an Asymmetric Cross-Junction for In Situ Microgel Formation

Yeonseok Jang, Chaenyung Cha,  
Jinmu Jung\*, and Jonghyun Oh\*

*Macromol. Res.*, **26**, 1143 (2018)

Controlling the merging of different microdroplets in a microfluidics system could generate a multitude of complex droplets because of their inherent surface tension, but poses a significant challenge because of their high surface tension. Here, a novel microfluidic merging technique is introduced using an asymmetric cross-junction geometry which increases the interfacial compression between two microdroplets. Microdroplets of two viscous polymer solutions, oxidized dextran (ODX) and N-carboxyethyl chitosan (N-CEC), which can undergo a crosslinking reaction *via* Schiff base formation, are allowed to merge at the asymmetric cross-junction without the assistance of additional merging schemes. The N-CEC and ODX microdroplets being formed at their orifices contact at a more favorable position to overcome their interfacial tension through this asymmetric geometry, until the interfacial layer breaks and pushes the former (with higher viscosity) into the latter. On the other hand, a typical symmetric cross-junction geometry cannot induce merging, because of insufficient interfacial compression generated by direct collision between two droplets. The merged N-CEC and ODX droplets soon become completely homogeneous *via* diffusion, ultimately leading to *in situ* microgel formation. Changing the concentration of ODX further controls the crosslinking density of the microgels. In addition, the viability of cells encapsulated within the microgels is well maintained, demonstrating the biocompatibility of the entire process. Taken together, the microfluidic merging technique introduced here could be broadly applicable for engineering cell-encapsulated microgels for biomedical applications.



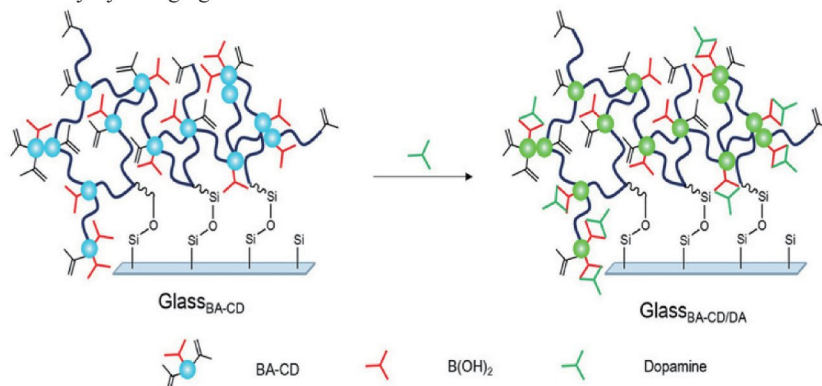


### Label-Free Detection of Dopamine based on Photoluminescence of Boronic Acid-Functionalized Carbon Dots in Solid-State Polyethylene Glycol Thin Film

Ga-Young Lee, Sundas Munir, and Soo-Young Park\*

*Macromol. Res.*, **26**, 1150 (2018)

Reactive boronic acid-functionalized carbon dots (rBA-CDs) on the glass substrate shows good dopamine detection performance with outstanding stability and fluorescence visibility by changing color.

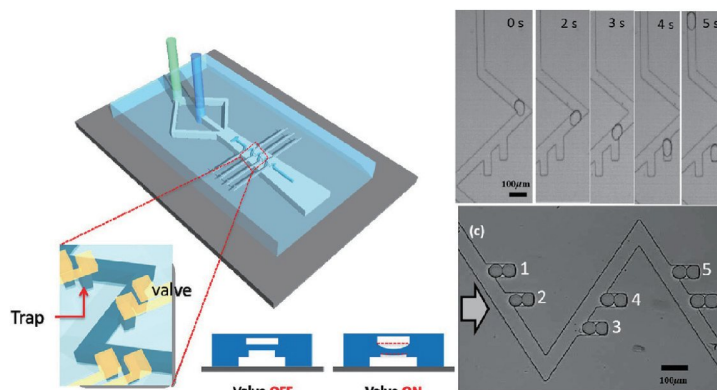


### On-demand Microfluidic Manipulation of Thermally Stable Water-in-Perfluorocarbon Emulsions

Mun-Bae Jang, Taewoo Moon, Jae-Hoon Choi, Sung-Hee Chung, Jong-Wook Ha, Jong-Min Lim\*, Seung-Kon Lee, Seung-Man Yang, Kyung-Ho Youm, Kwanwoo Shin\*, and Gi-Ra Yi\*

*Macromol. Res.*, **26**, 1160 (2018)

Monodispersed thermally stable aqueous emulsions are controlled in guided channels of microfluidic devices. Aqueous emulsions could stably follow the guide channels and sequentially stored at dead ends of guide channels. By adding pneumatic valve actuators on top of guide channel, they could be stored or released on demand or as programmed. Furthermore, by encapsulating Hela cells in the emulsions, cell-laden emulsions could be manipulated in controlled and programmed manner.

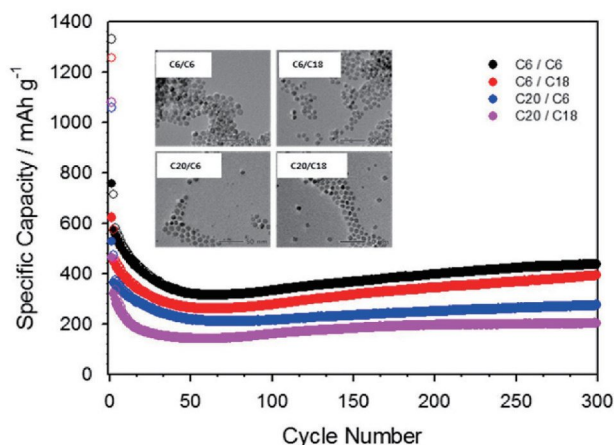


### Studies on the Change of Lithium Ion Battery Performance According to Length and Type of Surfactant on the Surface of Manganese Oxide Nanoparticles Prepared by Reverse Micelle Method

Bumkyo Park, Jaemin Kim, Jae Young Lee, Suk Ho Bhang, Junyoung Mun\*, and Taekyung Yu\*

*Macromol. Res.*, **26**, 1167 (2018)

We present a combination of various surfactants having different lengths for reverse micelle method for the negative electrode in lithium ion battery. Various  $\text{Mn}_3\text{O}_4$  nano-composites are systematically analyzed by XRD, SEM, FT-IR, and TEM. As a result, It is presented that the shorter the surfactant length, the better the battery performance.

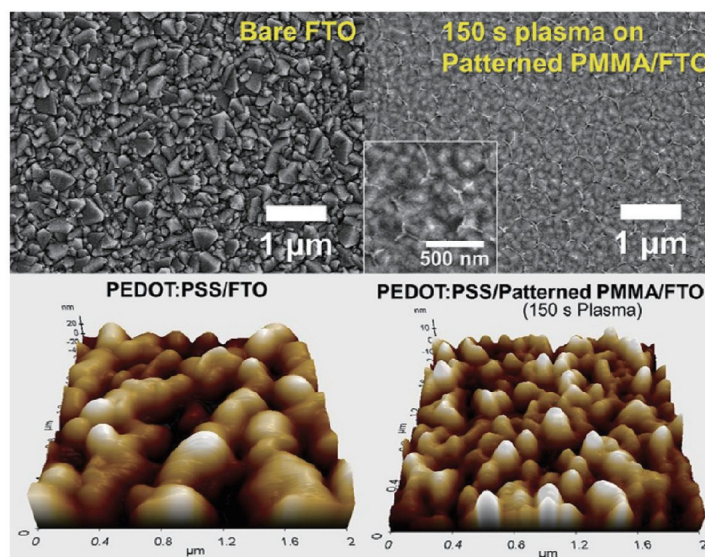


# Hexagonal Array Patterned PMMA Buffer Layer for Efficient Hole Transport and Tailored Interfacial Properties of FTO-Based Organic Solar Cells

Seung Hun Roh and Jung Kyu Kim\*

Macromol. Res., 26, 1173 (2018)

A hexagonal array patterned PMMA buffer layer was introduced between FTO and PEDOT:PSS so as to achieve ITO-free organic solar cells. The rough surface property of FTO was amended by the patterned PMMA layer, of which the surface morphology and film thickness were tailored by the optimized O<sub>2</sub>-plasma treatment. Consequently, the patterned PMMA/FTO ameliorated the morphology and interfacial properties of PEDOT:PSS layer, which contribute to enhancing the device performance and long-term stability.

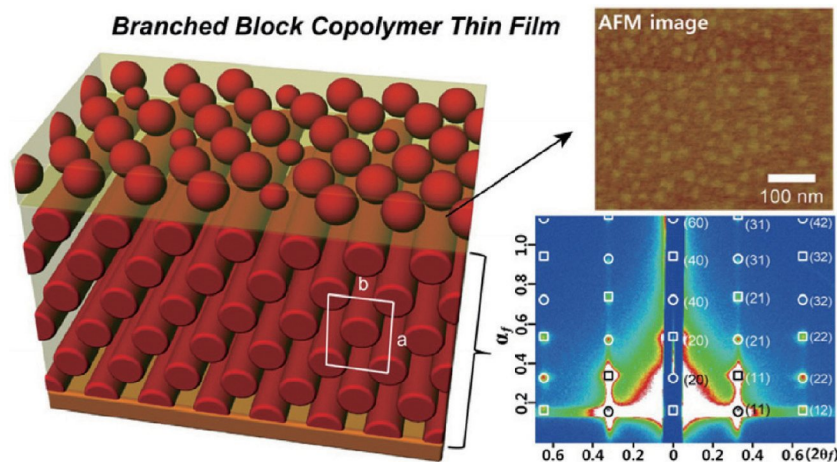


# Formation of a Micellar Pattern on Top of the Cylindrical Morphology in (PS)<sub>4</sub>-*b*-PLA Copolymer Thin Films

Ho-Joong Kim and Byoung-Ki Cho\*

Macromol. Res., 26, 1179 (2018)

In contrast to the bulk cylindrical morphology, the thin films of tetrabranch polystyrene-*block*-linear polylactide showed cylindrical and micellar morphologies in the internal and surface film sites, respectively. The appearance of the micellar phase is attributed to the alleviation of the packing frustration of the multi-branched block copolymer assembly at the surface.

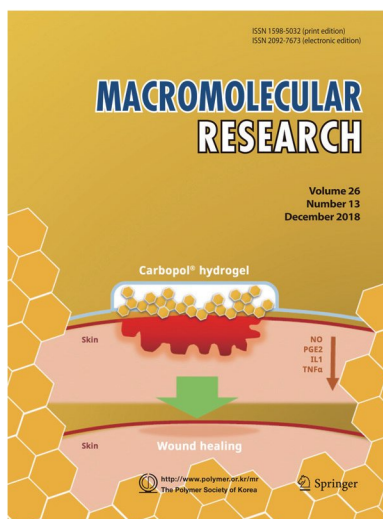


## COVER PAPER

### Transdermal Hydrogel Composed of Polyacrylic Acid Containing Propolis for Wound Healing in a Rat Model

Jin Kim and Chang-Moon Lee\*

Vol. 26, No. 13, pp 1219-1224 (2018) | DEC 25, 2018 | DOI 10.1007/s13233-019-7014-7



Propolis shows good antioxidant, antimicrobial and anti-inflammatory activities. Carbopol® hydrogel containing propolis (CHP) showed a protective effect against inflammatory reaction. CHP accelerated re-epithelialization of the injury site during wound healing. Finally, the covered wounds with CHP showed significantly more rapid contraction and closure. Histological tissue examination confirmed that CHP induced advanced granulation tissue formation and re-epithelialization in the wound. Therefore, it is suggested that CHP has a promising effect on the wound healing process.

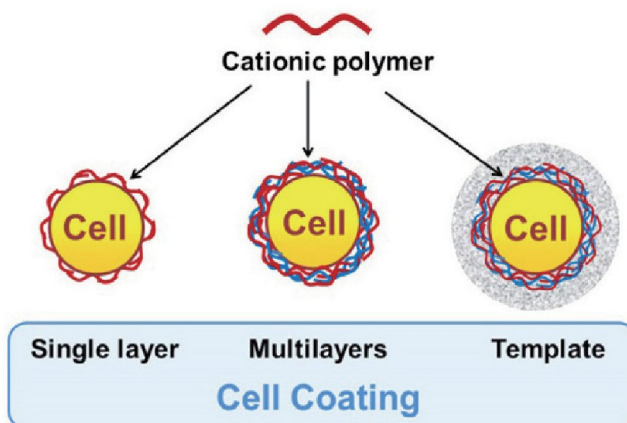
## REVIEW

### Cationic Polymers for Coating Living Cells

Daewha Hong and Sung Ho Yang\*

Macromol. Res., 26, 1185 (2018)

Cytocompatible coating on living cell surfaces have been reported as useful methods for enhancing stability of inner cells under *in vitro* condition, providing chemical functionality on cell surfaces, controlling of proliferation kinetics. In this review, cationic polymers used for coating living cell surfaces are highlighted as a single layered coat, as a component of layer-by-layer (LbL) film with anionic polymer species, or as a catalytic template inducing inorganic materials.





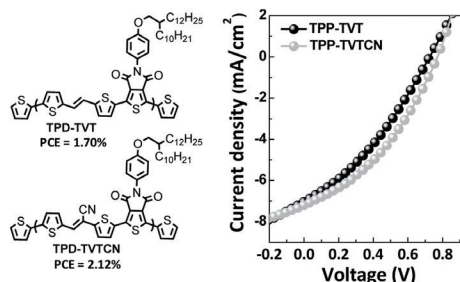
## ARTICLES

### Two TPD-Based Conjugated Polymers: Synthesis and Photovoltaic Applications as Donor Materials

Ji Eun Lee, Yu Jin Kim, Jisu Hong, Xinwei Wu, Moon Chan Hwang, Soon-Ki Kwon\*, Tae Kyu An\*, and Yun-Hi Kim\*

*Macromol. Res.*, **26**, 1193 (2018)

Two thienopyrrolodione-thiophene-vinyl-thiophene (TPD-TVT)-based polymers, with one of them having an additional cyano (CN) group attached to the TVT building block, are synthesized and incorporated in photovoltaic device as electron-donating materials. The stronger intermolecular interactions of TPD-TVTCN, compared to TPD-TVT, lead to enhanced aggregation in blends with PC71BM. The domain sizes within 15-20 nm and improved molecular packing in TPD-TVTCN:PC71BM blend films result in better photovoltaic performance of TPD-TVTCN:PC71BM device compared to the device employing TPD-TVT.

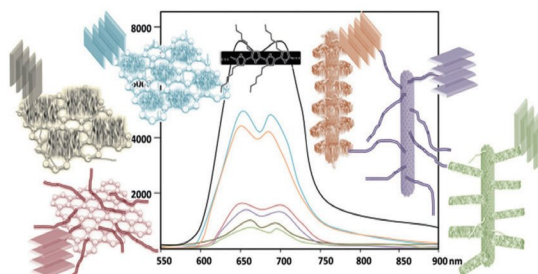


### Purposive Assembling of Poly(3-hexylthiophene) onto Chemically Treated Multi-Wall Carbon Nanotube versus Reduced Graphene Oxide

Somaiyeh Charoughchi, Samira Agbolaghi\*, Raana Sarvari, and Sahar Aghapour

*Macromol. Res.*, **26**, 1200 (2018)

Surface of multi-walled CNTs and reduced graphene oxide (rGO) nanosheets were chemically modified to design distinct donor-acceptor nano-hybrids having different morphologies and orientations. In unmodified CNTs and their functionalized (CNT-*f*-COOH) and grafted (CNT-*g*-PDDT) derivatives, the double-fibrillar, shish-kebab, and stem-leaf nanostructures were decorated, respectively. The rGO functionalized (rGO-*f*-TAA) and grafted (rGO-*g*-PDDT) nanosheets were prepared to study the differences in CNT and rGO supramolecules. Despite the fact that the poly(3-hexylthiophene) (P3HT) orientations was dependent on the surface modification, their morphologies were altered in rolled (CNT) and flat (rGO) carbonic surfaces.

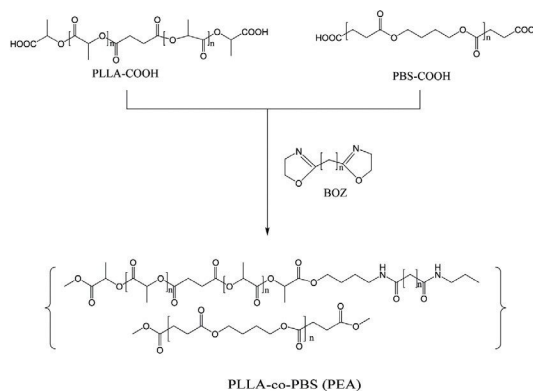


### Synthesis and Characterization of Poly(ester amide)s Consisting of Poly(L-lactic acid) and Poly(butylene succinate) Segments with 2,2'-Bis(2-oxazoline) Chain Extending

Jun Zou\*, Yingzhen Qi, Lele Su, Yun Wei, Zhaolei Li, and Haiqing Xu

*Macromol. Res.*, **26**, 1212 (2018)

A new poly(ester amide) (PEA) was successfully synthesized by coupling PLLA-COOH and PBS-COOH with carboxyl-terminated chain extender 2,2'-bis(2-oxazoline). The molecular weight of the PEA copolymers increased with the PBS segments increased, furthermore, the thermal stabilities of the PEAs improved with the PBS segments introduced. Besides, the crystallization behaviors of the PEAs mainly attributed to the PBS segments.



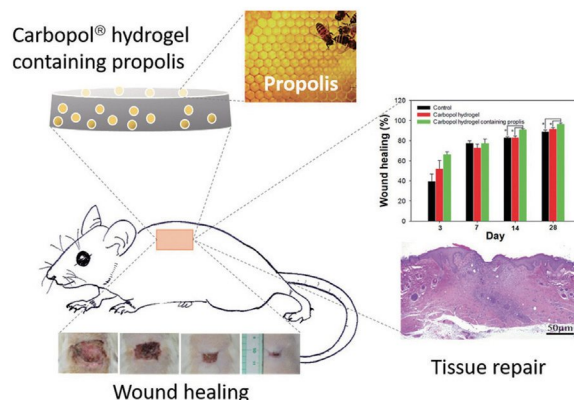
### Transdermal Hydrogel Composed of Polyacrylic Acid Containing Propolis for Wound Healing in a Rat Model

Jin Kim and Chang-Moon Lee\*

Macromol. Res., 26, 1219 (2018)

Cover Paper

Propolis shows good antioxidant, antimicrobial and anti-inflammatory activities. Carbopol® hydrogels containing propolis (CHP) defense from inflammatory reaction. CHP accelerated re-epithelialization during wound healing in a rat model. CHP has a promising effect on the wound healing process.

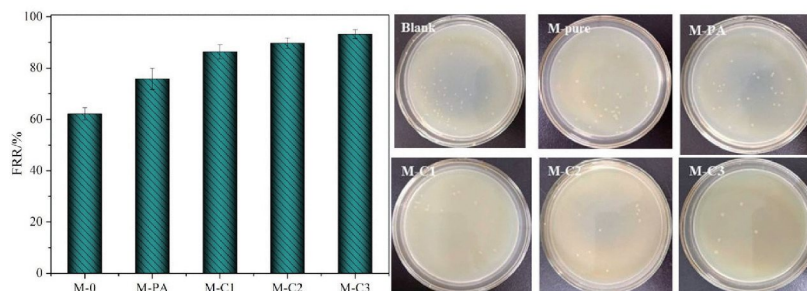


### Surface Modification of Poly(vinylidene fluoride) Ultrafiltration Membranes with Chitosan for Anti-Fouling and Antibacterial Performance

Weiwei Xia, Manman Xie, Xia Feng\*, Li Chen, and Yiping Zhao\*

Macromol. Res., 26, 1225 (2018)

The PVDF membranes were modified with chitosan to obtain more hydrophilic and antibacterial properties of the ultrafiltration membrane. The water contact angle of modified membrane decrease to  $52.2^\circ$  and the water flux increased from  $37.74 \text{ Lm}^{-2}\text{h}^{-1}$  for pure PVDF membrane to  $119.43 \text{ Lm}^{-2}\text{h}^{-1}$ . The modified membrane has better antifouling properties than pure PVDF membrane due to the increase of surface hydrophilicity, and the highest water flux recovery ratio can achieve 93.2%. Furthermore, the maximum antibacterial (*E. coli*) ratio of the modified membrane was 89.6%.

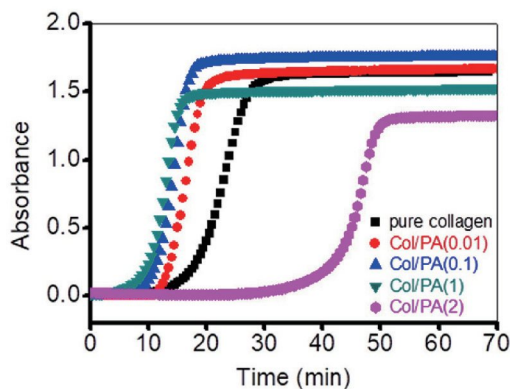


### Modulation of the Self-Assembly of Collagen by Phytic Acid: An *In Vitro* Study

Xiao Tu, Xincheng Chen, Ying Peng, Jie Nan, Benmei Wei, Lang He, Chengzhi Xu, Yuling Xu, Dong Xie, Juntao Zhang\*, and Haibo Wang\*

Macromol. Res., 26, 1233 (2018)

The effect of phytic acid on self-assembly of collagen was systematically revealed. Phytic acid could improve the self-assembly kinetics and degree of collagen; slim the diameter of collagen fibrils; improve the thermal stability of collagen fibrils and the viscoelasticity of collagen hydrogels. The effect of phytic acid on self-assembly of collagen was concentration-dependent and the optimal ratio of phytic acid/collagen was 1/1 (w/w).



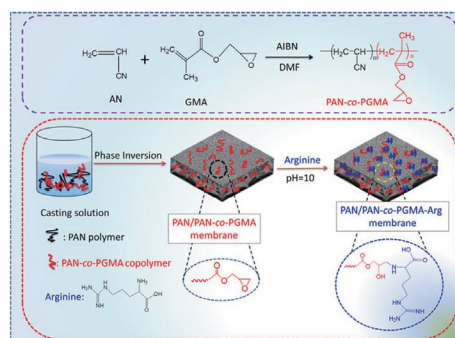


# Covalent Immobilization of Arginine onto Polyacrylonitrile-Based Membrane for the Effective Separation of Oil/Water Emulsion

Xiang Shen\*, Peng Liu, Jiao Xu, Teng Liu, Jianjun Liu, Xianfu Shen, Shubiao Xia, and Fan Wang

Macromol. Res., 26, 1241 (2018)

Membrane technology has been accepted as one of the most effective approaches to purify oily wastewater. To improve the anti-fouling property and oil/water separation efficiency of membrane, this work reports on the covalent immobilization of short-chain arginine (Arg) molecules onto polyacrylonitrile/polyacrylonitrile-co-poly (glycidyl methacrylate) blend membrane surface *via* ring-opening reaction between epoxy groups and amine groups. When the grafted amount of Arg was 157.3  $\mu\text{g}/\text{cm}^2$ , the oil rejection ratio of Arg-immobilized membrane was as high as 99.2%.

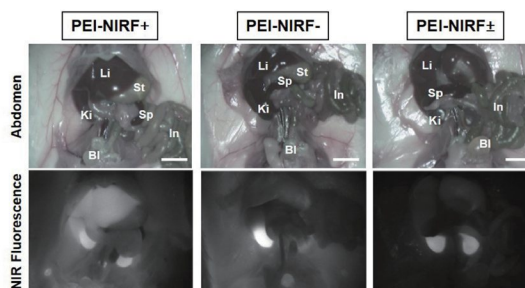


# Surface Charge Modification of Polyethyleneimine for Enhanced Renal Clearance and Bioimaging

Sungsu Lee, Wonbong Lim, Jin Seok Jung, Danbi Jo, Gayoung Jo, Min Ho Park\*, and Hoon Hyun\*

Macromol. Res., 26, 1251 (2018)

To overcome the cytotoxicity of polyethyleneimine (PEI) *in vivo*, the biodistribution and clearance of PEI conjugated with near-infrared fluorophores (NIRF) were imaged in mice. PEI was conjugated with three different types of NIRF (NIRF+, NIRF-, and NIRF $\pm$ ) to confirm the effect of the surface charge of PEI for enhanced renal clearance. The zwitterionic PEI-NIRF $\pm$  conjugate was found to be rapidly cleared, primarily through the kidneys of the mice, within 24 h postinjection.

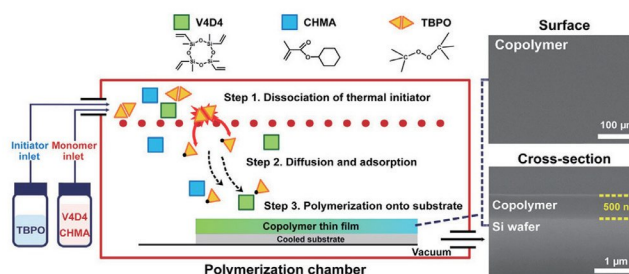


# Crosslinked Organosilicon-Acrylate Copolymer Moisture Barrier Thin Film Fabricated by Initiated Chemical Vapor Deposition (iCVD)

Ji-Hoo Seok, Sung Hee Kim, Sung Min Cho, Gi-Ra Yi, and Jun Young Lee\*

Macromol. Res., 26, 1257 (2018)

Crosslinked organosilicon-acrylate copolymer thin film with desired chemical composition, smooth surface and high transmittance was successfully fabricated by a simply modified initiated chemical vapor deposition (iCVD) process. Unlike the conventional iCVD copolymerization process, comonomers were injected together as one gas phase into the polymerization chamber from miscible liquid comonomer mixture in our novel process. It was clearly confirmed that the crosslinked copolymer thin film with desired chemical composition could be obtained by controlling only the mixing ratio of liquid comonomers. Water vapor transmission rate value of poly(ethylene naphthalate) (PEN) film coated with copolymer layer was lower than that of bare PEN film, implying potential application of the crosslinked organosilicon-acrylate copolymer thin film as flexible polymer buffer layer in organic/inorganic or metal oxide hybrid moisture barrier for flexible display or electronic devices.



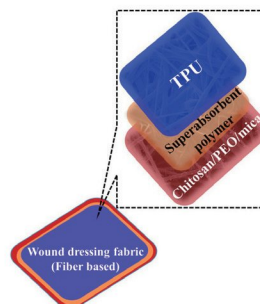


### A Facile Approach towards Fabrication of Electrospun Nanofibrous Mats based Multicompartment Wound Dressing Fabric

Qi Chen, Tridib K. Sinha, Huan Li, Wenbo Li, and Jin Kuk Kim\*

*Macromol. Res.*, **26**, 1265 (2018)

Multicompartment wound dressing fabrics have been designed by attaching three electrospun fiber mats, namely, thermoplastic polyurethane (TPU) based outer layer, superabsorbent polymeric materials (SPM) based middle layer, and blend of chitosan with polyethylene oxide (PEO) and mica for inner layer. Two kinds of SPM 1) pullan/polyvinyl alcohol (PVA) and 2) poly(acrylic acid-co-acrylamide)/PVA composites, have been formulated and compared. Wound dressing containing the second kind of SPM performs better than that containing the 1<sup>st</sup> one.



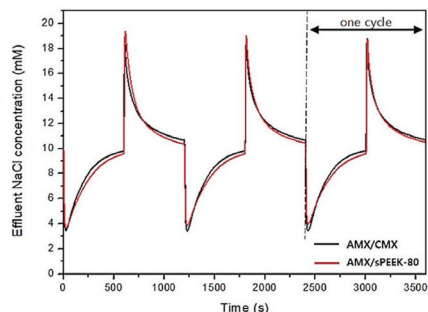
## NOTES

### Sulfonated Poly(ether ether ketone) Ion-Exchange Membrane for Membrane Capacitive Deionization Applications

Ji-Hoon Cha, Oneeb ul Haq, Jae-Hwan Choi\*, and Youn-Sik Lee\*

*Macromol. Res.*, **26**, 1273 (2018)

The ion exchange capacity (IEC) and dimensional stability of sulfonated poly(ether ether ketone) (sPEEK)-80 are much better than those of the commercial cation-exchange membrane (CMX) membrane, but its electrical resistance is much lower. Compared to the CMX-based membrane capacitive deionization (MCDI) cell, the sPEEK-based membrane exhibits a higher adsorption capacity, a higher salt removal efficiency, and a higher current efficiency, owing to the membrane's high IEC and low electrical resistance.



### New 2D-Conjugated Polymer for Non-Halogenated and Halogenated Solvents Processed Organic Solar Cells

Um Kanta Aryal, Ho-Yeol Park, Woosum Cho, Sung-Ho Jin, Yoon-Hwae Hwang, and Hyung-Kook Kim\*

*Macromol. Res.*, **26**, 1276 (2018)

In a comparative study on halogenated solvent, chlorobenzene (CB) and non-halogenated solvent, o-xylene (o-XY) in photoactive material processing solvents, the photovoltaic performance of non-halogenated and environment friendly, o-XY obtained a PCE of 5.01%, whereas that of with halogenated solvent, CB as 5.29%. This nearby and comparable photovoltaic performance of the non-halogenated solvent are more interesting for further study. Moreover, as similar trend improvement in morphology and mobility with o-XY solvent obtained that demonstrates the performance of environmental friendly non-halogenated solvents have great avenues for the development of environmental friendly organic solar cells (OSCs).

