「Macromolecular Research」목차

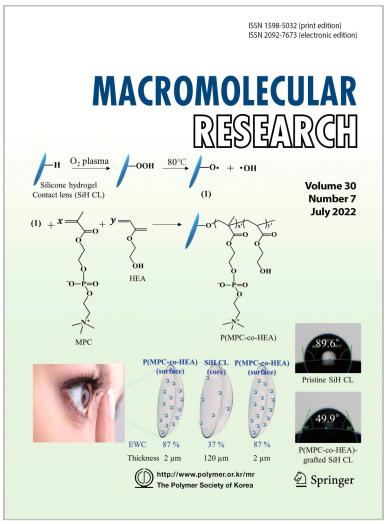
정기간행영문지_ 30권 7호 · 2022년 7월

COVER PAPER

Preparation and Physical Properties of a Silicone Hydrogel Contact Lens Grafted with a Phosphorylcholine-Containing Hydrophilic Copolymer

Jae Ho Bae, Baekseo Choi, Young-Jin Kim, Hyun Mee Lee, Ki Hong Kim, and Yoon Soo Han*

Vol. 30, No. 7, pp 446-453 (2022) | JUL 25, 2022 | DOI 10.1007/s13233-022-0046-4



Silicone hydrogel contact lenses (SiH CLs) grafted with a high-water-content copolymer layer, poly(2-methacryloyloxyethyl phosphorylcholine-co-2-hydroxyethyl acrylate) [P(MPC-co-HEA)], were prepared, and their physical properties were measured. By grafting the high-water-content (87%) P(MPC-co-HEA), the contact angle was decreased to 49.9° from 89.6° for the pristine SiH CL. The optical transmittance, tensile strength, oxygen permeability, and thermal characteristics of the copolymer-grafted SiH CL were maintained from those of the bare SiH CL.

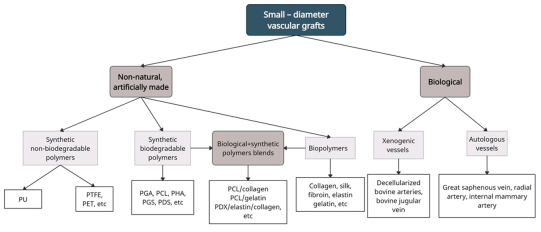
REVIEW

Potential of Biodegradable Synthetic Polymers for Use in Small-diameter Vascular Engineering

Olesia Osipova*, Pavel Laktionov, and Andrey Karpenko

Macromol. Res., **30**, 425 (2022)

Bypass or replacement surgery is required in patients with chronic atherosclerotic artery occlusions. In the absence of an autogenous vein, synthetic polytetrafluoroethylene prostheses can be used. However, these prostheses have shown unsatisfactory bypass grafting results in small- diameter arteries less than 6 mm in diameter. In addition, xenogeneic vessels and vascular prostheses made from biopolymers tend to have poor mechanical strength. The development of vascular prostheses to replace small-diameter vessels is therefore necessary because their hemodynamic properties provoke graft thrombosis. This article provides an overview of the biodegradable synthetic polymers that are used for the experimental fabrication of small-diameter vascular prostheses. Information on the physicochemical properties of various biodegradable synthetic polymers is presented, and there is also a discussion of the methods capable of increasing the hemo- and biocompatibility of the synthetic materials. Currently the most studied polymers in vascular tissue engineering are polyhydroxybutyrate, polyglycolic acid, polycaprolactone, polyurethane and their corresponding copolymers. The use of copolymers and hybrid materials makes it possible to combine the desirable properties of different polymers. Among these polymers, the polyurethanes are the most promising for the development of small-diameter vessel engineering since their structure can provide different rates of biodegradation, strength, and elasticity.



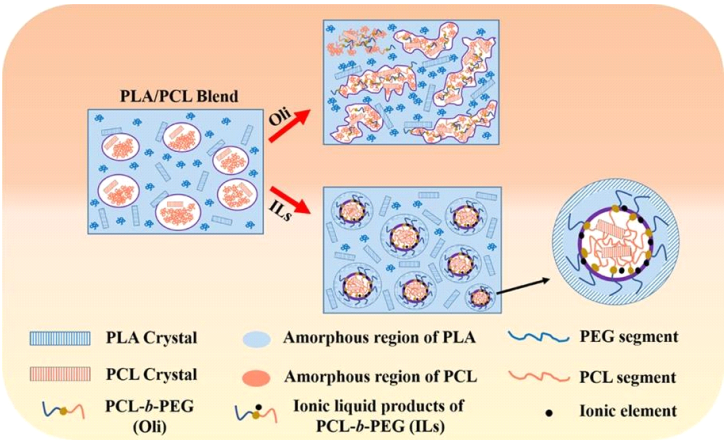
ARTICLES

Effect of PCL-*b*-PEG Oligomer Containing Ionic Elements on Phase Interfacial Properties and Aggregated Structure of PLA/PCL Blends

Ping Wang*, Shang Gao, Xinliang Chen, Li Yang, Tian Cao, Bingyu Fan, Jin Liu, and Xianhai Hu

Macromol. Res., **30**, 438 (2022)

Polylactic acid (PLA)/polycaprolactone (PCL) blends were typical thermodynamically incompatible systems and the poor interaction strength between the two phases deteriorated final properties of the blends. High toughness PLA/PCL blends were prepared by the compatibilization and plasticization of oligomers containing PEG segments. Oli mainly dispersed in the PCL phase and induced PCL aggregation, reducing the specific surface area of PCL, thereby reducing the nucleation density of PLA. Ionic liquids (ILs) were mainly dispersed on the interfacial regions between the PLA and PCL components and the ionic elements in the ionic liquid-containing oligomer endowed the ionic liquid with strong interfacial emulsification ability and improved the two-phase compatibility, and finally the comprehensive properties of PLA blends were improved.



Preparation and Physical Properties of a Silicone Hydrogel Contact Lens Grafted with a Phosphorylcholine-Containing Hydrophilic Copolymer

Jae Ho Bae, Baekseo Choi, Young-Jin Kim, Hyun Mee Lee, Ki Hong Kim, and Yoon Soo Han*

Macromol. Res., **30**, 446 (2022)

Cover Paper

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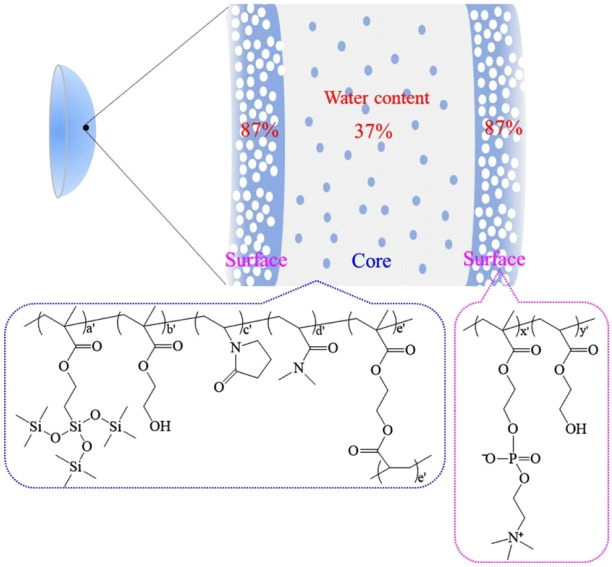
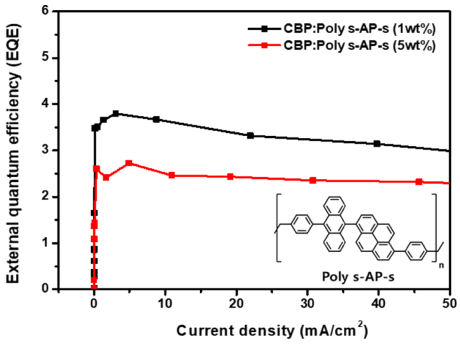


Synthesis and Electroluminescence Properties of New Blue Emitting Polymer Based on Dual-Core Type for Solution Process OLEDs

Seokwoo Kang, Hyukmin Kwon, Jinwook Jeong, Young-Chul Kim, and Jongwook Park*

Macromol. Res., **30**, 454 (2022)

By applying the dual-core concept, a blue light emitting material in the form of a polymer was newly synthesized. After introducing styrene at the end of the dual-core, the light-emitting polymer was obtained through radical polymerization. Poly 1-(4-vinylphenyl)-6-(10-(4-vinylphenyl)anthracen-9-yl)pyrene (S-AP-S) showed a high photoluminescence quantum yield (PLQY) of 79% with an emission of 443 nm in solution state. When it was applied as a dopant to solution process of organic light-emitting diode (OLED) using the new polymer, the device showed current efficiency (CE) 4.48 cd/A and external quantum efficiency (EQE) 3.62% in 442 nm which is deep-blue region.

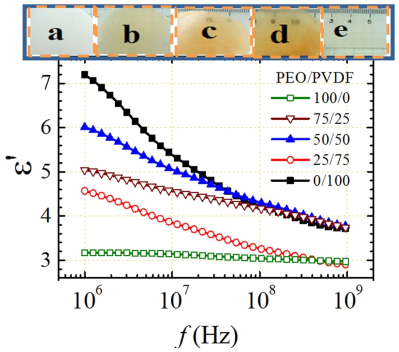


Crystalline Phases Thermal Behaviour, Optical Energy Band Gap, and Broadband Radio Wave Frequency Dielectric Properties of PEO/PVDF Blend Films

Priyanka Dhatarwal and R. J. Sengwa*

Macromol. Res., **30**, 460 (2022)

Crystalline phases melting temperatures and crystallinity of the poly(ethylene oxide) (PEO) and poly(vinylidene fluoride) (PVDF) amounts in the PEO/PVDF blends, along with the optical energy band gap, and the dielectric permittivity from 1 MHz to 1 GHz were documented and explained. The suitability of these polymer blend materials for the flexible-type dielectric substrate/insulator and optical band gap controller/ ultraviolet-visible (UV-Vis) shielder is discussed.

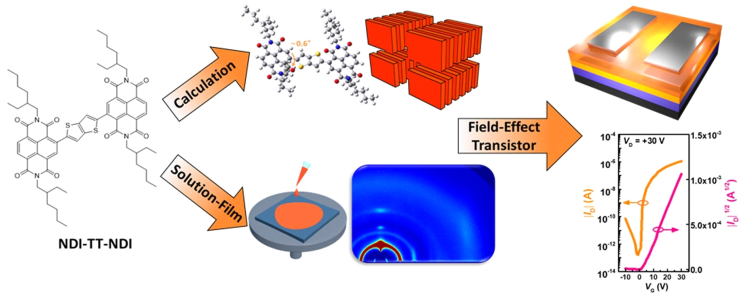


Naphthalene-Diimide-Based Small Molecule Containing a Thienothiophene Linker for n-Type Organic Field-Effect Transistors

Gyeong Seok Lee, Jong Gyu Oh, Eui Hyun Suh, Kyumin Lee, Eun Ae Yu, Tae Kyu An*, Jaeyoung Jang*, and Yun-Hi Kim*

Macromol. Res., **30**, 470 (2022)

Naphthalene-diimide-containing small molecules were synthesized for n-type organic field-effect transistors (OFETs). A thienothiophene linker imparts high backbone planarity to the small molecule. Optimally annealed NDI-TT-NDI film exhibited a well-ordered molecular orientation. OFET fabricated using this film showed electron mobility up to 0.032 $cm^2V^{-1}s^{-1}$.

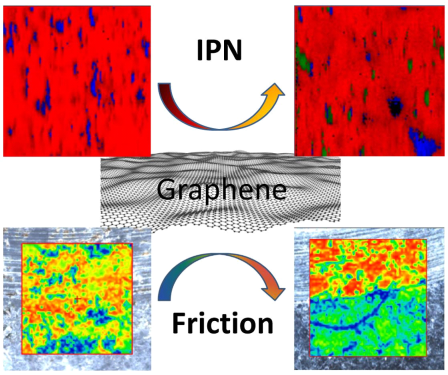


Raman Imaging Evidence for Mechanical/Tribological Quasi-Steady State in GO-Strengthening Polyurethane/Epoxy Interpenetrating Polymer Network

Ruiheng Yue, Yingliang Liu*,
Shaoling Xia, Shengang Xu,
and Shaokui Cao

Macromol. Res., **30**, 477 (2022)

Graphene oxide (GO)-hybrid polyurethane/epoxy interpenetrating polymer network (IPN) is prepared through an *in-situ* polymerization. The mechanical performance is improved due to the formation of chemical bonds between GO nanosheets and polyurethane/epoxy segments. The tribological performance is also enhanced by the graphitization of GO on the tribological surface. The tensile and tribological improvements including their quasi-steady state are proved by the direct Raman imaging.

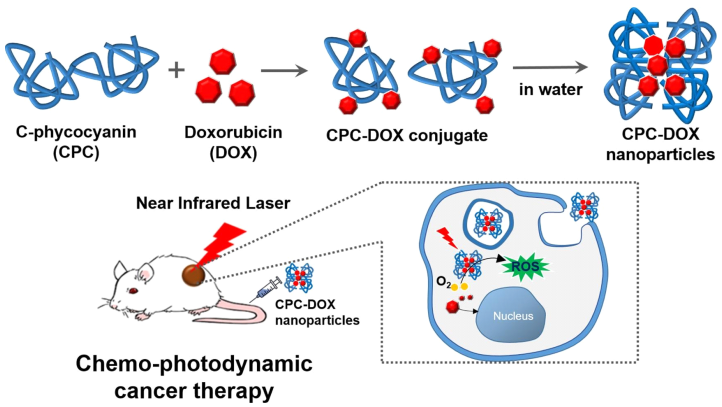


C-Phycoycanin-Doxorubicin Nanoparticles for Chemo-Photodynamic Cancer Therapy

Hojoon Lee, Min Ah Kim,
Jung-Sick Lee*,
and Chang-Moon Lee*

Macromol. Res., **30**, 486 (2022)

C-Phycocyanin-doxorubicin nanoparticles (CPC-DOX NPs) significantly decreased cell viability in CT26 cells in vitro and inhibited cancer growth of CT26 bearing mice in vivo by generation of ROS under 635 nm laser irradiation and anticancer effect of DOX. CPC-DOX NPs can be a promising candidate for chmeo-photodynamic cancer therapy.



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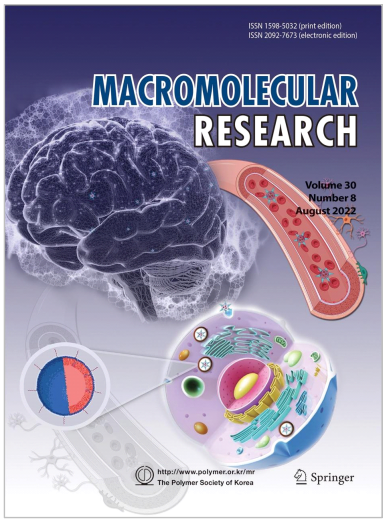
정기간행영문지_ 30권 8호 · 2022년 8월

COVER PAPER

Bi-Functional Aspects of Peptide Decorated PLGA Nanocarriers for Enhanced Translocation Across the Blood-Brain Barrier through Macropinocytosis

Ane Nishitha Vijayan, Janani Indrakumar, Sankaranarayanan Gomathinayagam, Kodiveri Muthukaliannan Gothandam, and Purna Sai Korrapati*

Vol. 30, No. 8, pp 557-570 (2022) | AUG 25, 2022 | DOI 10.1007/s13233-022-0061-5



TAT conjugated Rhodamine loaded PLGA nanoparticle (Rh-B Cp PNP) shows efficient uptake by the neural cells across the blood brain barrier. The mechanism of uptake was observed to be through macropinocytosis and the image guided tracking of the nanoparticles in rodent model revealed that the Rh-B Cp PNPs reached the brain within two hours.

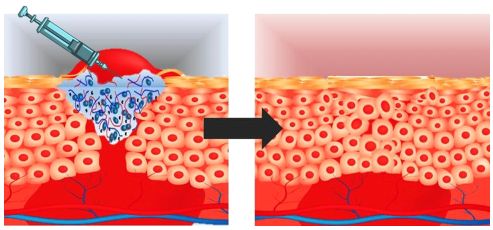
REVIEW

Bioactive Natural and Synthetic Polymers for Wound Repair

Zainab Ahmadian, Hasan Adiban, Marzieh Rashidipour, and Mohammad Reza Eskandari*

Macromol. Res., **30**, 495 (2022)

Wound healing is a dynamic and complicated process that needs a favorable environment to facilitate healing. Although gauze, lint, plasters, bandages (natural or synthetic), and cotton wool used as primary or secondary dressings to protect the wound from contamination, they have several deficiencies. Thus, modern wound dressings have been designed by the use of natural and synthetic polymers that contribute to wound healing rather than merely covering it. These dressings such as hydrogels, films, and foams are designed to prevent dehydration, control infection and inflammation, and enhance wound healing. In this review article, different natural and synthetic polymers for the preparation of these wound dressings, including hydrogel, film, foam, and smart ones have been discussed. Moreover, the use of natural compounds such as honey and oleoresin for wound healing has been investigated. Hopefully, this review will provide a helpful perspective for future research.



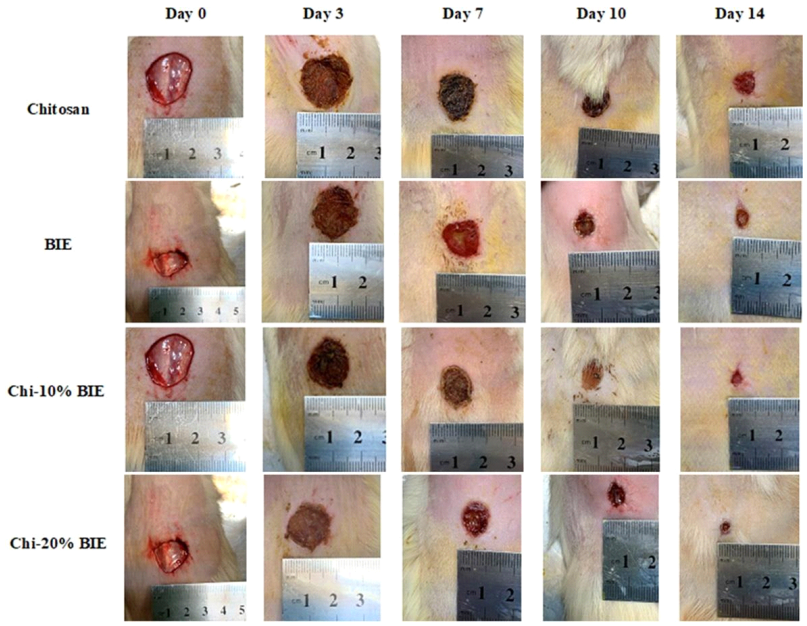
ARTICLES

Evaluation of the Efficiency of Chitosan Hydrogel Containing *Berberis integerrima* Root Extract on a Full-Thickness Skin Wound in a Rat Model

Maryam Hashemi, Fatemeh Kalalinia, Mobina Razi, Fatemeh Moameri, Bibi Sedigheh Fazly Bazzaz, Mehrdad Iranshahi, and Jebrail Movaffagh*

Macromol. Res., **30**, 527 (2022)

Chitosan hydrogel containing alcoholic extract of *Berberis integerrima* (Chi-BIE) had been prepared and evaluated for the treatment of full-thickness skin wounds in animal model. BIE was successfully loaded into the chitosan hydrogel and showed a burst release followed by a sustained release of berberine. Chi-BIE hydrogel showed higher antimicrobial activity and restorative effect for wound-healing in compare with chitosan and BIE alone.

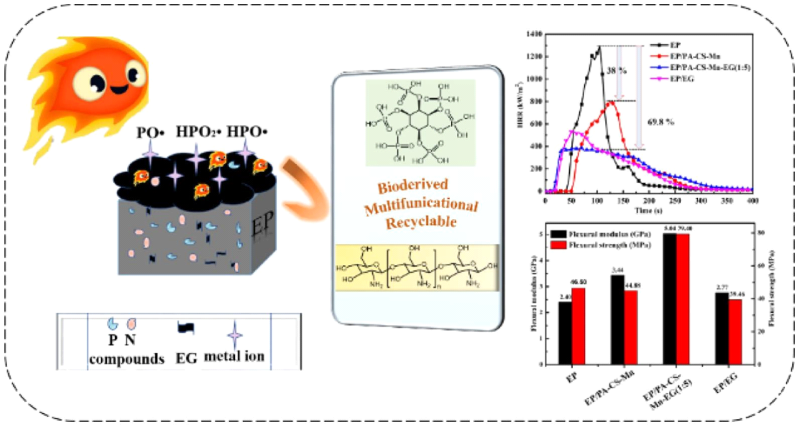


Environmental Friendly Intumescent Flame Retardant Gives Epoxy Resin Excellent Fire Resistance and Mechanical Properties

Huan Wang, Li Li, Yan Kang, Xue Yin, Xuedi Lei, Jing Yang, Hui Xi, Xueqing Xu, Zhiwang Yang*, and Ziqiang Lei*

Macromol. Res., **30**, 536 (2022)

An environmental friendly retardant of PA-CS-Mn (where PA = phytic acid, CS = chitosan, M = Cu^{2+}, Co^{2+}, Al^{3+}, Zn^{2+}, Mn^{2+}) complex derived from phytic acid and chitosan was prepared. It exhibited good flame retardancy and toxic gas inhibition properties for epoxy resin (EP). When combined with expandable graphite (EG) with the optimizing ratio of 1:5 (w/w), the peak heat release rate (pk-HRR) and the smoke production rate (SPR) values decreased by 69.8% and 66.6%, respectively. Meanwhile, the mechanical properties of the EP composites have also been greatly enhanced. The flexural modulus and the flexural strength of the flame retardant EP were improved with an increase of 52.3% and 41.4% comparing to the pure EP, respectively.

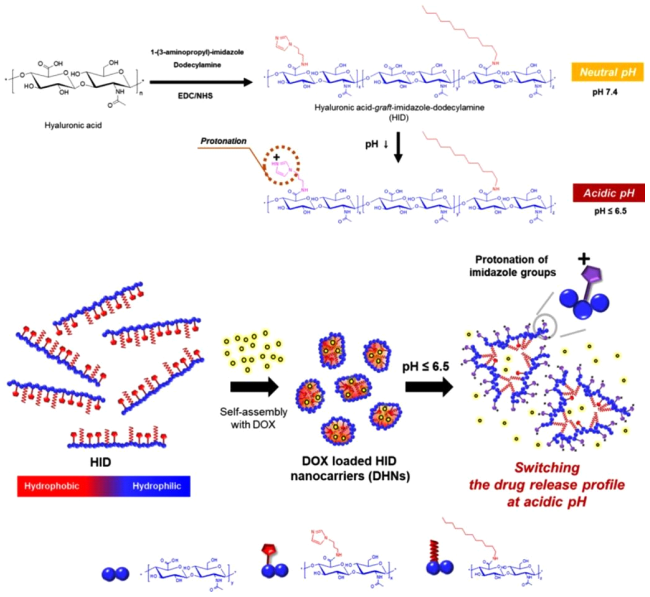


Development of a pH-Responsive Polymer Based on Hyaluronic Acid Conjugated with Imidazole and Dodecylamine for Nanomedicine Delivery

Sang Myung Han, Jae Chang Kim, Yuseon Shin, Dayoon Lee, Taehoon Sim, Chaemin Lim, Kioh Kang, Eun Seong Lee, Yu Seok Youn, and Kyung Taek Oh*

Macromol. Res., **30**, 547 (2022)

Hyaluronic acid-*graft*-imidazole-dodecylamine (HID) was produced to prepare a pH-sensitive nanocarrier. The low critical association concentration of HID at physiological pH and the pH-dependent drug release properties of doxorubicin loaded HID nanocarriers (DHNs) would present high stability and prevent drug loss during systemic circulation. It might reduce the toxicity to normal tissue. Therefore, HID could be a biocompatible pH-sensitive drug carrier that can be utilized for cancer chemotherapy.



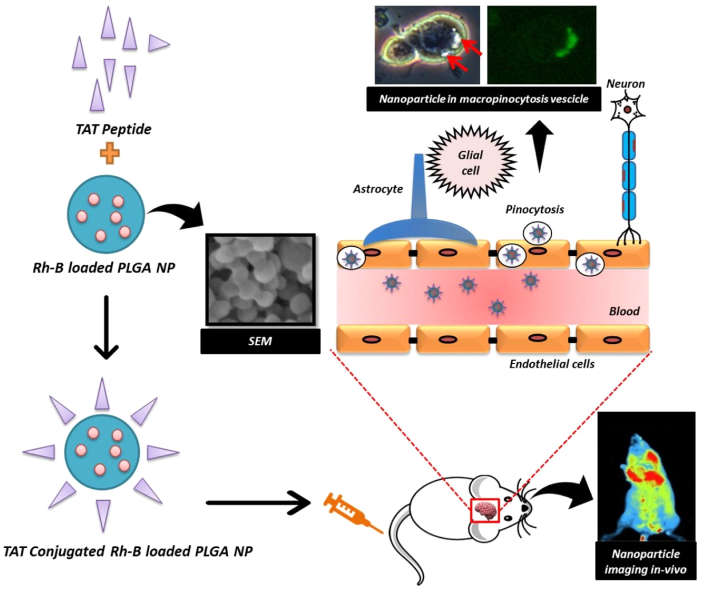
Bi-Functional Aspects of Peptide Decorated PLGA Nanocarriers for Enhanced Translocation Across the Blood-Brain Barrier through Macropinocytosis

Ane Nishitha Vijayan, Janani Indrakumar, Sankaranarayanan Gomathinayagam, Kodiveri Muthukaliannan Gothandam, and Purna Sai Korrapati*

Macromol. Res., **30**, 557 (2022)

Cover Paper

Rhodamine-B loaded polylactic-*co*-glycolic acid (PLGA) nanocarriers were synthesized with optimal size and surface functionalized with trans-activating transcriptor (TAT) peptide for optimal delivery across the blood-brain barrier. The functionalized nanoparticles were stable in the biological medium, cytocompatible and showed enhanced uptake compared to the blank nanoparticles. Moreover, the uptake mechanism was found to be through macropinocytosis and in vivo imaging revealed that the peptide conjugated nanoparticles reached the brain within two hours when injected intravenously.

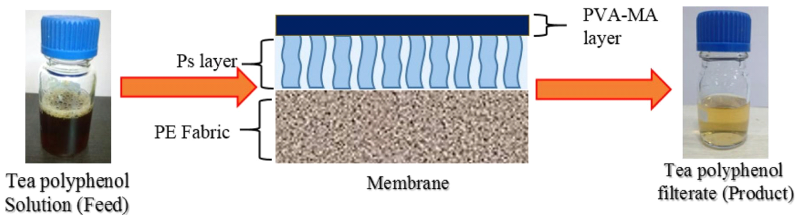


Composite Membranes Prepared by Polyvinyl Alcohol-Maleic Acid onto Polysulfone: Separation Performance of Tea Polyphenol

Mayank Saxena, P. S. Singh, and A. Bhattacharya*

Macromol. Res., **30**, 571 (2022)

Poly(vinyl alcohol) (PVA)-coated membranes on polysulfone (PS) were cross-linked using maleic acid. The membrane properties (viz. hydrophilicity) were tailored for the ester linkage due to PVA and maleic acid cross-linking. Cross-linked PVA coated on two different molecular weight cut-off (MWCO) PS membrane systems was prepared for the separation of tea polyphenol. It follows the trend PS-PVA-IV > PS-PVA-III > PS-PVA-II > PS-PVA-I. The separation performances time dependence also follows the same order.

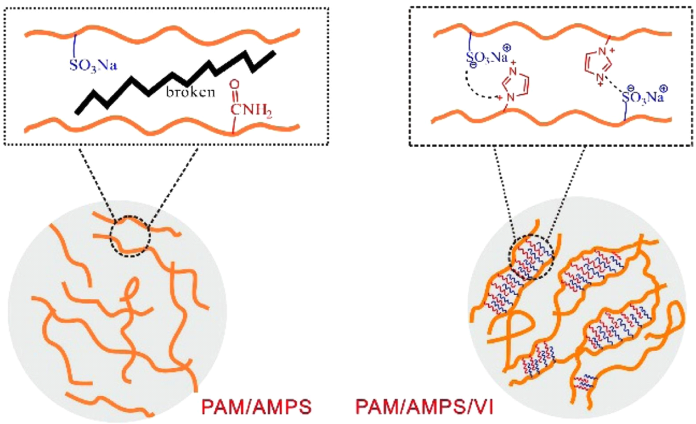


A Weakly Cationic Temperature Tolerant and Salt Resistant Polymer: Synthesis and Properties

Bo Deng, Xueqin Luo, Feng Jiang*, Wei Liu*, Jianwei Gu, Chao Liu, and Yanan Song

Macromol. Res., **30**, 579 (2022)

A weakly cationic polymer with large side groups (PAM/AMPS/VI) was prepared by copolymerizing acrylamide (AM) with 2-acrylamido-2-methylpropane sulfonic acid (AMPS) and 1-vinylimidazole (VI). The protonated tertiary amine in the imidazole ring electrostatically interacts with the sulfonic group, increasing the viscosity and salt resistance of the polymer.



Improved Photovoltaic Performance of Ternary All-Polymer Solar Cells by Incorporating a New Y6-based Polymer Acceptor and $PC_{61}BM$

Hong Diem Chau, Meenal Kataria, Na Yeon Kwon, Su Hong Park, Youngseo Kim, Hungu Kang, Amit Kumar Harit, Han Young Woo, Hyo Jae Yoon, Sungnam Park, Min Ju Cho*, and Dong Hoon Choi*

Macromol. Res., **30**, 587 (2022)

A new acceptor polymer structure has been synthesized by polymerization of an Y6-deriavtive monomer. $PC_{61}BM$ was incorporated into the polymer donor:polymer acceptor blend as an additive to enhance the efficiency from 7.24% to 8.03%.