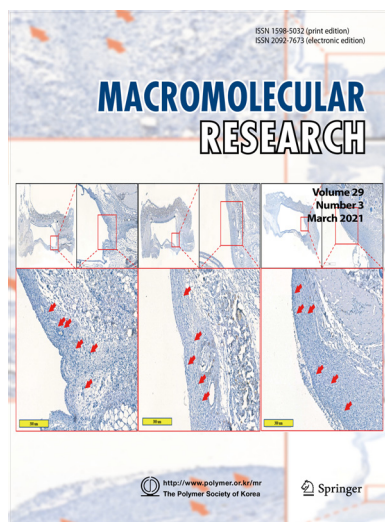


COVER PAPER

In vivo Evaluation of PEEK Copolymer Composites for Prosthetic Spine

Joon Woo Chon, Yang Xin, Seung Mook Lee, Young Jun Kim, In Sung Jeon, Jae Young Jho, and Dong June Chung*

Vol. 29, No. 3, pp 244–251 (2021) | MAR 25, 2021 | DOI 10.1007/s13233-021-9027-2



In this research, biosafety of polyetheretherketone (PEEK) copolymers and their composites for spinal cage applications in the orthopedic field were determined through *in vivo* animal model studies. PEEK copolymer and their composites were previously developed and reported, determining its affordable mechanical properties and *in vitro* toxicity level. The *in vivo* animal model study results for various type of inflammation test showed significant stability and significant bioinertness, which required biosafety for orthopedic field medical application as spine cage. The applicability of the PEEK composites for orthopedic surgery would be promoted based on every results of this work.

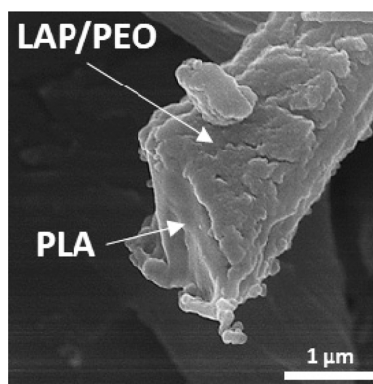
ARTICLES

Coating of Laponite on PLA Nanofibrous for Bone Tissue Engineering Application

Zahra Orafa, Shiva Irani*,
Ali Zamanian, Hadi Bakhshi,
Habib Nikukar,
and Behafarid Ghalandari

Macromol. Res., **29**, 191 (2021)

Poly(lactic acid) (PLA) nanofibers were coated with layers of Laponite (LAP)/poly(ethylene oxide) (PEO) and used as osteoinductive scaffolds for bone tissue engineering. The LAP/PEO layer with a thickness of 45–175 nm improved the surface hydrophilicity (water contact angle of 26°) and thus the cell attachment and proliferation by the scaffolds. The LAP nanoplatelets on the surface of PLA nanofibers could induce osteodifferentiation on human mesenchymal stem cells (hMSCs) without using any external osteogenic inducers.

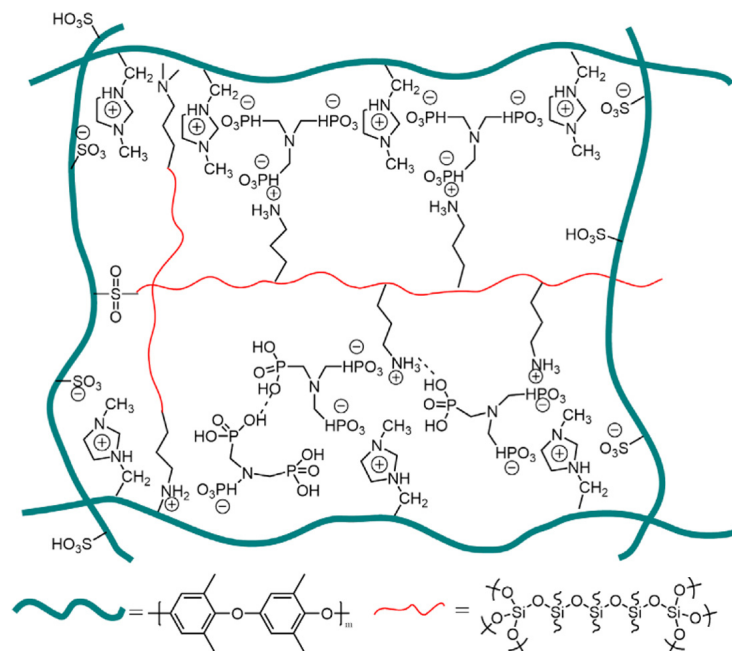


Crosslinked Proton Exchange Membranes with a Wider Working Temperature Based on Phosphonic Acid Functionalized Siloxane and PPO

Zhihui Wu, Chunhui Shen*,
Shanjuan Gao, Xi Zhu,
Mingliang Zhang, and Ao Ding

Macromol. Res., **29**, 199 (2021)

A series of cross-linked proton exchange membranes were prepared. The acid-base pairs and cross-linked networks enrich the structure of the membranes, improving their thermal stability, mechanical properties and oxidation resistance. Under the interaction of phosphonic acid and sulfonic acid, the membranes show good proton conductivity at 25 °C–160 °C.

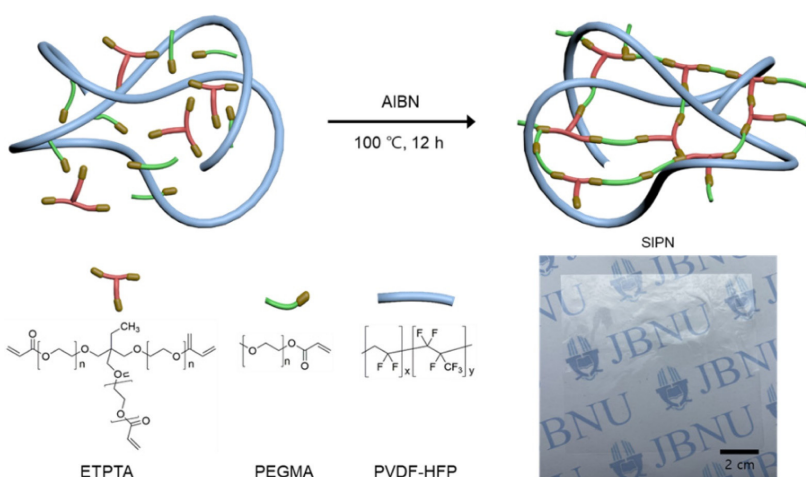


Robust and Highly Ion-Conducting Gel Polymer Electrolytes with Semi-Interpenetrating Polymer Network Structure

Min Guk Gu, Eunseok Song,
and Sung-Kon Kim*

Macromol. Res., **29**, 211 (2021)

A series of gel polymer electrolytes (GPEs) consisting of poly(ethylene glycol) methyl ether methacrylate (PEGMA) and trimethylolpropane ethoxylate triacrylate (ETPTA) in the presence of poly(vinylidene fluoride-*co*-hexafluoropropylene) (PVDF-HFP) were prepared by solution casting, thermal free-radical polymerization, and subsequent liquid electrolyte doping. The GPE having semi-interpenetrating polymer network (SIPN) structure showed large ionic conductivity of $> 10^{-3} \text{ S cm}^{-1}$, mechanical robustness, and high-voltage stability, holding the great promise for energy storages such as lithium ion batteries and supercapacitors.

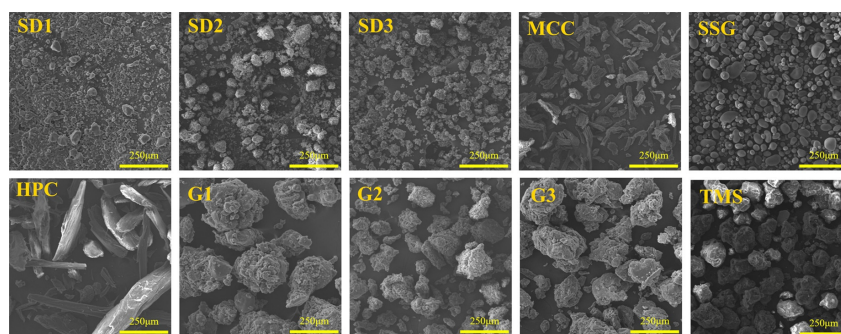


Release Behavior of Telmisartan/ Amlodipine Combination Drug According to Polymer Type

Suyoung Been, Jeongmin Choi,
Pil Yun Kim, Won Kyung Kim,
Alessio Bucciarelli, Jeong Eun Song,
and Gilson Khang*

Macromol. Res., **29**, 217 (2021)

Patients at risk for hypertension with comorbidities such as diabetes and metabolic syndrome often require two or more antihypertensive drugs to lower blood pressure. Telmisartan and amlodipine are widely known drugs to treat hypertension. A solid dispersion containing a water-soluble polymer was prepared to make the absorption rate of telmisartan, a poorly soluble drug, similar to that of amlodipine, a soluble drug. Polyvinylpyrrolidone K30, polyethylene glycol 6000, and poloxamer 407 were used. The encapsulation of the solid dispersion was analyzed by differential scanning calorimetry, X-ray diffraction, and high-performance liquid chromatography. The reduced flowability due to the solid dispersion process was improved by a wet granulation and proved by a scanning electron microscope. The improved flowability was confirmed by measuring the angle of repose, bulk density, and tap density, and expressed by Hausner ratio and Carr index. The *in vitro* release behavior was confirmed by dissolution test and high-performance liquid chromatography. As a result, it was confirmed that telmisartan has the highest release rate when encapsulated with PVP K30, and amlodipine and telmisartan could be absorbed at a similar rate in the combined drug.

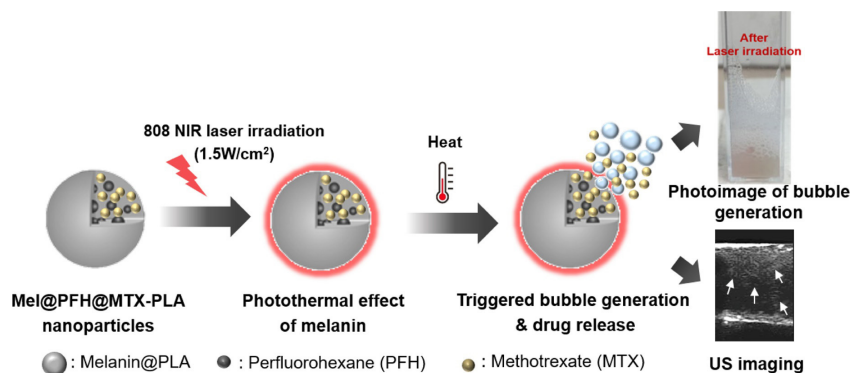


Near-Infrared Laser-Responsive Photothermal Bubble-Generating PLA Nanoparticles for Controlled Drug Release

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

Macromol. Res., **29**, 224 (2021)

Melanin-perfluorohexane-methotrexate-poly(lactic acid) (Mel@PFH@MTX-PLA) nanoparticles generated heat and bubbles effectively with 808 nm NIR laser irradiation. Subsequently, the generated bubbles induced a burst drug release and increased the contrast for ultrasound imaging. Mel@PFH@MTX-PLA nanoparticles can be promising candidates for spatiotemporal treatment of lesions.

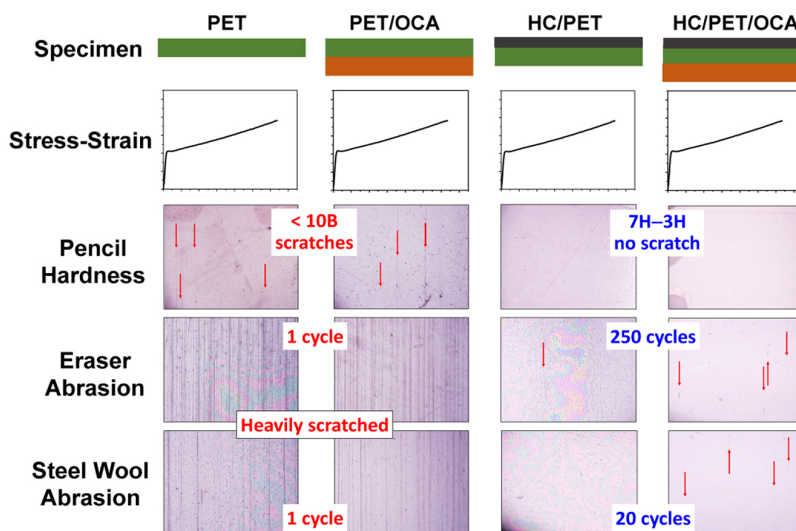


Hardness and Abrasion Resistance Characteristics of Poly(ethylene terephthalate) Films without and with Hard and Adhesive Coatings

Zi Jia Low, Jia Chyi Wong,
Kuan Hoon Ngoi, Chin Hua Chia*,
Hyun-Joong Kim, Hong-Chul Kim*,
and Moonhor Ree*

Macromol. Res., 29, 230 (2021)

Poly(ethylene terephthalate) (PET) in films was, for the first time, quantified in detail in terms of pencil hardness and eraser and steel wool abrasion resistances. Even though the ductile and tough plastic nature, PET films are found to still exhibit unrealistically very low hardness and poor abrasion resistances, which are not suitable for any advanced applications including smart phones and display devices. The drawbacks are further suffered by pressure-sensitive adhesive coating layers. Such the drawbacks could be solved by thin hard coating of an UV-curable prepolymer resin.



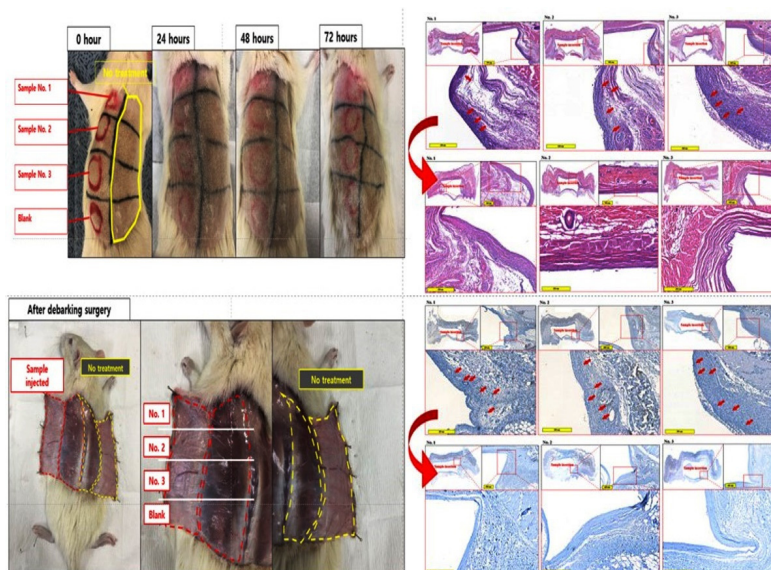
In vivo Evaluation of PEEK Copolymer Composites for Prosthetic Spine

Joon Woo Chon, Yang Xin,
Seung Mook Lee, Young Jun Kim,
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Cover Paper

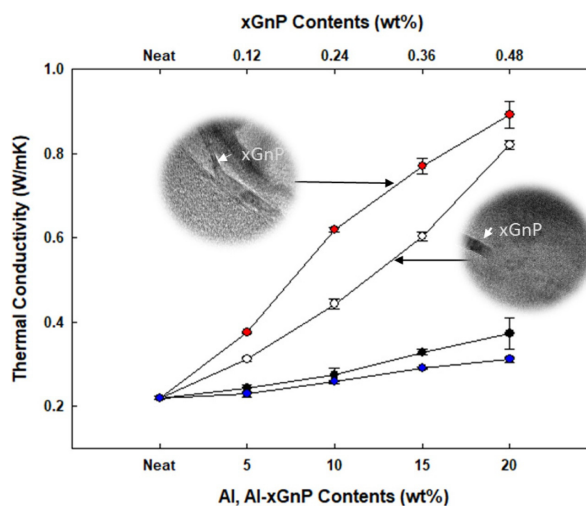


Mechanical Properties and Thermal Conductivity of Epoxy Composites Containing Aluminum-Exfoliated Graphite Nanoplatelets Hybrid Powder

Jin Seob Kim, Kwan Han Yoon*,
Young Sil Lee, and Jong Hun Han*

Macromol. Res., **29**, 252 (2021)

Two types of aluminum-exfoliated graphite nanoplatelet (Al-xGnP) hybrid powder were prepared, one is fully inserted exfoliated graphite nanoplatelet (xGnP) and the other is partially inserted xGnP in Al-flakes. TEM images of hybrid powder showed the partially and fully inserted xGnP in Al-flakes. The thermal conductivities of the epoxy composites increased monotonically with the filler content and the partially and fully inserted epoxy/Al-xGnP composites showed almost 2–3 times higher than those of epoxy/xGnP and epoxy/Al composites.

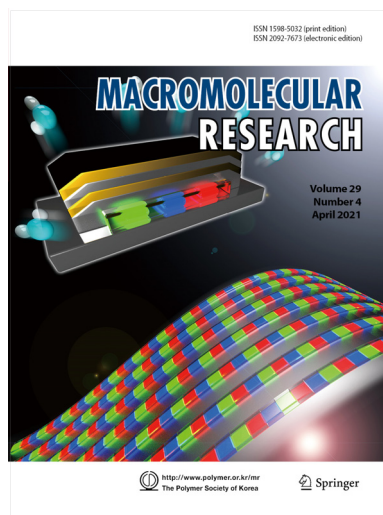


COVER PAPER

Advanced Side-Impermeability Characteristics of Fluorinated Organic-Inorganic Nanohybrid Materials for Thin Film Encapsulation

Hyeok-jin Kwon, Jisu Hong, Hong Nhung Le, Cheolmin Jung, Chan Eon Park, Hong Chul Moon*, Juyoung Kim*, and Se Hyun Kim*

Vol. 29, No. 4, pp 313–320 (2021) | APR 25, 2021 | DOI 10.1007/s13233-021-9035-2



A sol-gel based fluorinated nanohybrid materials named FAGPTi is introduced to fabricate organic-inorganic hybrid thin film encapsulation (TFE) with plasma-enhanced atomic layer deposition (PEALD)-based Al_2O_3 for optoelectronics. The TFE with alternatively stacked Al_2O_3 and FAGPTi shows excellent barrier film performance as low as $6.33 \times 10^{-5} \text{ g m}^{-2} \text{ day}^{-1}$ at accelerated conditions (60 °C and 90% RH) and high visible transmittance above 95 %.

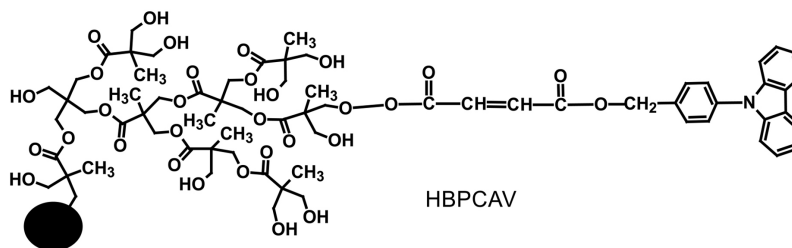
ARTICLES

Carbazole-Based Hyperbranched Polyester Polyol: Structural, Rheological, Thermal and Optical Properties

Edwin A. Murillo*, Margarita Cerón, and M. Judith Percino

Macromol. Res., **29**, 257 (2021)

The hyperbranched polyester polyols are not materials with electroluminescent properties; it restricts their use in these application areas. Therefore, to obtain hyperbranched polyester polyols with this property, these materials have to be modified with other fluorescent units such as carbazole or carbazole derivatives. Thus, the aim of this study is the synthesis of carbazole-based hyperbranched polyester polyols (HBPCAV) and the evaluation of their structural, rheological, thermal, and optics properties.

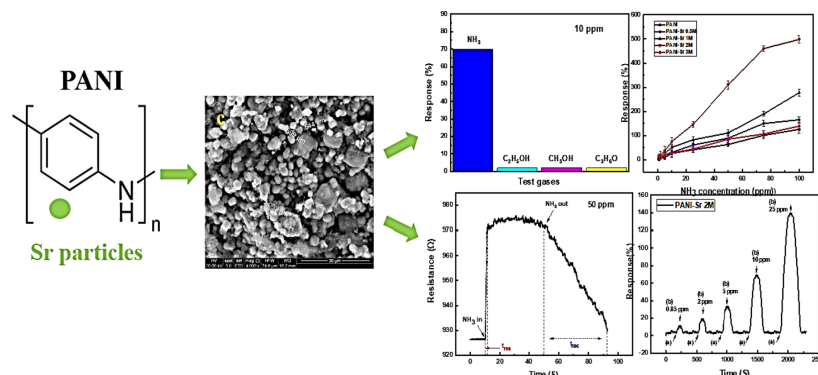


Facile Preparation of PANI–Sr Composite Flexible Thin Film for Ammonia Sensing at Very Low Concentration

Soumia Benhouhou, Ahmed Mekki*,
Maha Ayat, and Nouredine Gabouze

Macromol. Res., 29, 267 (2021)

A flexible polyaniline–strontium (PANI–Sr) composite thin film has successfully been prepared as an efficiency material for ammonia gas sensing at low concentration *via in situ* chemical oxidative polymerization. The interaction between PANI matrix and strontium particles enhance the conductivity. Moreover, this improved character has been exploited to demonstrate the high selectivity, an excellent sensitivity towards the ammonia, a good reproducibility and a fast response/recovery time at room temperature.

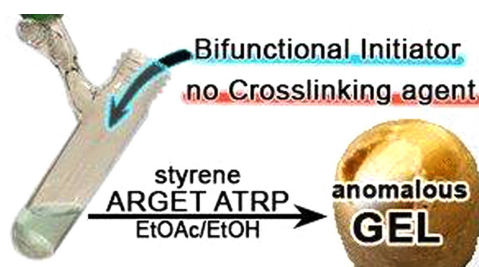


Unusual Cross-Linked Polystyrene by Copper-Catalyzed ARGET ATRP Using a Bifunctional Initiator and No Cross-Linking Agent

Niccolò Braidì, Mirko Buffagni*,
Valentina Buzzoni, Franco Ghelfi*,
Francesca Parenti,
Maria Letizia Focarete,
Chiara Gualandi, Elena Bedogni,
Luisa Bonifaci, Gianfranco Cavalca,
Angelo Ferrando, Aldo Longo*,
Ida Morandini, and Nicolò Pettenuzzo

Macromol. Res., 29, 280 (2021)

An anomalous polystyrene gel was obtained during the Cu-catalyzed “activators regenerated by electron transfer” “atom transfer radical polymerization” (ARGET ATRP) of styrene, using a bifunctional initiator, ascorbic acid/ Na_2CO_3 as reducing system, and EtOAc/EtOH as solvent mixture was carried out at 60–70 °C. Experimental results disproved any “classical” method of cross-linking, suggesting that gelation may be due to the generation of a polycatenane network via intramolecular coupling of the living polystyrene chains.

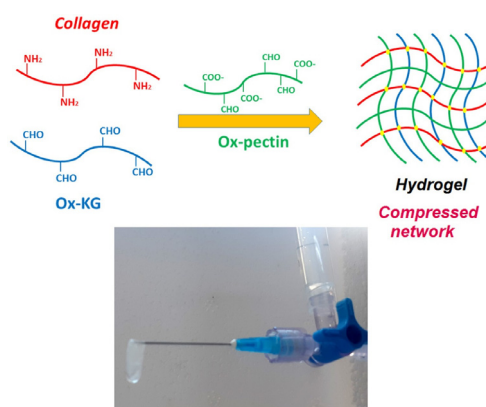


Incorporation of Oxidized Pectin to Reinforce Collagen/Konjac Glucomannan Hydrogels Designed for Tissue Engineering Applications

Marjan Ghorbani*,
Parinaz Nezhad-Mokhtari,
and Farideh Mahmoodzadeh

Macromol. Res., 29, 289 (2021)

Injectable hydrogels are getting wider appreciation among the researchers, as they can be used in minimally invasive surgical procedures. In this work, the oxidation reaction was carried out to produce dialdehyde polysaccharides by cleaving the carbon-carbon bond of the hydroxyl groups. Pectin and konjac glucomannan were oxidized in the presence of sodium periodate to yield the corresponding C2/C3 dialdehyde product.

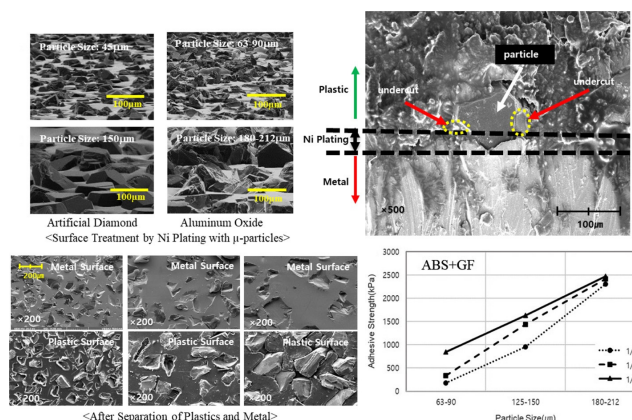


Adhesive Strength Between Metal Sheet Plated Using Micro Particles and ABS Resin

In Young Woo and Min-Young Lyu*

Macromol. Res., **29**, 297 (2021)

The irregular embossing of the metal surface was completed by nickel plating using micro particles of artificial diamond and aluminum oxide to improve the adhesive strength between metal and acrylonitrile butadiene styrene (ABS) resin. During insert molding, the resin solidified in the undercut area, which increased the adhesive force. As the undercut size was different depending on the plating height and particle size, the adhesive strength varied, and as the particle size increased, the adhesive strength increased.

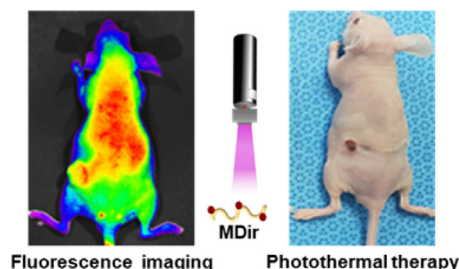


NIR Dye-Conjugated Maltodextrin for Photothermal Therapy of Cancer

Dileep Reddy Rampa, Changgon Ko, Yujin Lee, and Dongwon Lee*

Macromol. Res., **29**, 306 (2021)

Photodynamic therapy (PDT) is one of recently emerging anticancer treatment modalities that involve the use of laser and photosensitizers. It is critical to deliver photosensitizers to the tumor site specifically to fully realize the therapeutic effects. We developed MDir as a tumor targeting photosensitizer, in which photoabsorbing IR820 was conjugated to maltodextrin. Combined with near infrared laser irradiation, MDir could induce almost complete thermal ablation of tumors without noticeable side effects.



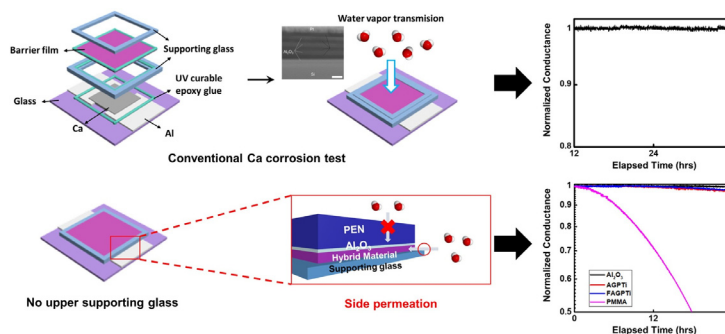
Advanced Side-Impermeability Characteristics of Fluorinated Organic-Inorganic Nanohybrid Materials for Thin Film Encapsulation

Hyeok-jin Kwon, Jisu Hong, Hong Nhung Le, Cheolmin Jung, Chan Eon Park, Hong Chul Moon*, Juyoung Kim*, and Se Hyun Kim*

Macromol. Res., **29**, 313 (2021)

Cover Paper

Fluorinated organic inorganic nanohybrid materials named FAGPTi were applied to fabricate organic-inorganic hybrid thin film encapsulation (TFE) for optoelectronics. The 4 pair of TFE with plasma-enhanced atomic layer deposition-based Al_2O_3 and sol-gel-based FAGPTi resulted on $6.33 \times 10^{-5} \text{ g m}^{-2} \text{ day}^{-1}$ of water vapor transmission rate value at 60 °C 90% room humidity (RH). Especially, side permeation characteristics of FAGPTi were yielded as $8.26 \times 10^{-4} \text{ g m}^{-2} \text{ day}^{-1}$ at 38 °C 90% RH which value are comparable to those of the oxide layer.



Synthesis, CO₂ Adsorption and Catalytic Properties of Porphyrin-Pyromellitic Dianhydride Based Porous Polymers

Maher Fathalla*

Macromol. Res., **29**, 321 (2021)

A facile synthetic approach for imide-based porous porphyrin polymers (POPs) is disclosed. The polymer structures were characterized by various spectroscopic and microscopic techniques. The reported POPs showed good CO₂ uptake capabilities and Mn^{III}-POP was found to be an effective catalyst for the selective epoxidation of styrene.

