**Therapeutic Considerations and Conjugated Polymer-Based Photosensitizers for Photodynamic Therapy**

Conjugated polymers have recently attracted a great deal of attention for applications in photodynamic therapy (PDT) because of their light-harvesting capability, efficient energy transfer, and singlet oxygen generation properties. This review describes recent advances in PDT development, including therapeutic mechanisms of PDT in cancer treatments, light excitation methods, and especially recent advances of conjugated polyelectrolytes and conjugated polymer nanoparticles as photosensitizers. The future direction on PDT and further development of conjugated polymer photosensitizers are discussed. The aim of this review is to stimulate innovative ideas to synthesize a new generation of conjugated polymer photosensitizers and promote their translation to clinical applications of PDT. Conjugated polymers show great potential for applications in cancer therapeutics. Their large absorption cross sections and energy transfer properties are unique for the design of efficient photosensitizers. This review summarizes the main therapeutic mechanisms of photodynamic therapy in cancer treatments, especially the recent advances of conjugated polyelectrolytes and conjugated polymer nanoparticles as photosensitizers.

**Water-Stable Nanoporous Polymer Films with Excellent Proton Conductivity**

Achieving high values for proton conductivity in a material critically depends on providing hopping sites arranged in a regular fashion. Record values reported for regular, molecular crystals cannot yet be reached by technologically relevant systems, and the best values measured for polymer membranes suited for integration into devices are almost two orders of magnitude lower. Here, an alternative polymer membrane synthesis strategy based on the chemical modification of surface-mounted, monolithic, crystalline metal–organic framework thin films is demonstrated. Due to chemical crosslinking and subsequent removal of metal ions, these surface-mounted gels (SURGELs) are found to exhibit high proton conductivity (0.1 S cm\(^{-1}\) at 30 °C and 100% RH (relative humidity). These record values are attributed to the highly ordered polymer network structure containing regularly spaced carboxylic acid side groups. These covalently bound organic frameworks outperform conventional, ion-conductive polymers with regard to ion conductivity and water stability. Pronounced water-induced swelling, which causes severe mechanical instabilities in commercial membranes, is not observed. A novel nanoporous polymer thin film is synthesized using an alternative polymer membrane synthesis strategy based on the chemical modification of surface-mounted, monolithic, crystalline metal–organic framework thin films. The polymer film possesses crosslinked, highly ordered polymer network structure containing regularly spaced carboxylic acid side groups, resulting in the high proton conductivity and water stability.

**Synthesis and Biological Evaluation of a Degradable Trehalose Glycopolymer Prepared by RAFT Polymerization**

There is a significant need for new biodegradable protein stabilizing polymers. Herein, the synthesis of a polymer with trehalose side chains and hydrolytically degradable backbone esters and its evaluation for protein stabilization and cytotoxicity are described. Specifically, an alkene-containing parent polymer is synthesized by reversible addition–fragmentation chain transfer polymerization, and thiolated trehalose is installed using a radical-initiated thiol–ene reaction. The stabilizing properties of the polymer are investigated by thermally stressing granulocyte colony-stimulating factor (G-CSF), which is expressed and purified using a custom-designed G-CSF fusion protein with a polyhistidine-tagged maltose binding protein. The degradable polymer is shown to stabilize G-CSF to 66% after heating at 40 °C. Poly(5,6-benzo-2-methylene-1,3-dioxepane (BMDO)-co-butyl methacrylate-trehalose) is degraded and its cellular compatibility is investigated. While the polymer is noncytotoxic, cytotoxic effects are
observed from the degraded products in fibroblasts and murine myeloblasts. These data provide important information for future use of BMDO-containing trehalose glycopolymers for biomedical applications. A novel degradable trehalose polymer containing 5,6-benzo-2-methylene-1,3-dioxepane is prepared using postpolymerization thiol–ene chemistry. The therapeutic protein granulocyte colony-stimulating factor (G-CSF) is expressed and purified, and the degradable trehalose polymer is shown to stabilize G-CSF against heat stress. Although the parent polymer is cytocompatible, the products of hydrolytic degradation demonstrate cytotoxicity at high concentrations providing the working concentrations for the polymer.

Supramolecular Polymers Based on Non-Coplanar AAA-DDD Hydrogen-Bonded Complexes
Non-coplanar triple-hydrogen-bond arrays are connected as telechelic groups to alkyl chains and their properties as AA/BB type supramolecular polymers are examined. Viscosity studies at three temperatures are used to study the ring-chain equilibrium and determine the critical concentrations where polymer chains are formed. It is observed that neither the temperature range studied nor the alkyl chain length of one component significantly affect the polymerization properties in this system. AAA-DDD hydrogen bond arrays that form double-helical complexes are appended at the ends of alkyl chains to form supramolecular polymers. The viscosities of the AA and BB type monomers display sharp upward changes with respect to increasing concentration, indicative of ring-chain equilibria and the formation of polymeric species.

New n-Type Solution Processable All Conjugated Polymer Network: Synthesis, Optoelectronic Characterization, and Application in Organic Solar Cells
The efficient synthesis of a new solution-processable n-type conjugated polymer network (PNT1) is reported through palladium-catalyzed Stille cross-coupling reaction conditions following the A3 + B2 synthetic approach. A benzo[1,2-b:3,4-b?:5,6-b?]trithiophene derivative is used as the A3 knot and an alkyl functionalized naphthalenediimide is utilized as the B2 linker. The thermal, optical, and electrochemical properties are examined in detail, showing high thermal stability, absorbance in the visible part of the solar spectrum, and reversible reduction characteristics similar to those of the fullerene derivative [6,6]-phenyl-C71-butyric acid methyl ester (PC71BM). PNT1 is employed as the electron acceptor in solution-processed bulk heterojunction organic solar cells, demonstrating the potential of this new type of materials for optoelectronic applications. A new solution-processable n-type conjugated polymer network (PNT1) is synthesized through a palladium-catalyzed Stille cross-coupling reaction following the A3 + B2 synthetic approach. PNT1 is employed as electron acceptor in solution processed bulk heterojunction organic solar cells, demonstrating the use of polymer networks in optoelectronic applications.

Multitemperature Responsive Self-Folding Soft Biomimetic Structures
Untethered, millimeter-scale, stimuli-responsive shape change structures are critical to the function of autonomous devices, smart materials, and soft robotics. Temperature in a range compatible with physiological or ambient environmental conditions is an excellent cue to trigger actuation of soft structures for practical biomimetic applications. Previously, a range of thermally responsive self-folding soft structures has been described and utilized in a variety of applications from tissue engineering to minimally invasive surgery. In order to extend these concepts to more complex devices, thermally responsive bilayer structures composed of poly[oligo (ethylene glycol) methyl ether methacrylate] (POEGMA) gels that swell at three different temperatures are described. The lower critical solution temperature and volume transition temperature of POEGMA are tuned by varying the side chain length and the extent of copolymerization. The swelling properties of the POEGMA gels are characterized and a multilayer photopatterning process is described that is used to create soft biomimetic structures that
change shape in a sequential manner while displaying multistate behaviors. Multitemperature responsive soft biomimetic structures composed of hydrogel bilayers of poly[oligo (ethylene glycol) methyl ether methacrylate] with tunable volume transition temperatures are demonstrated. Integrated photopatterned structures, such as soft grippers, frog, and muscle mimetic structures show autonomous multistate and sequential actuation on heating and cooling.

**Calix[4]arene-Based Dynamic Covalent Gels: Marriage of Robustness, Responsiveness, and Self-Healing**

Herein, the report on a new class of self-healing and pH/temperature responsive mixed solvent (ethanol and water) gels shows unusual mechanical properties to resist slicing, sustain high compression, and withstand stretching as evidenced by the cutting breaking stress, the fracture compressive stress, and the stretching ratio of one of the gels as obtained can reach or exceed 26.4 MPa, 9.2 MPa, and ≈5 times, respectively. The gels are designed by introducing dynamic covalent bond, acylhydrazone, which is believed to combine the merits of conventional chemical bonds and those of supramolecular interactions. Specifically, a hydrazide-modified calix[4]arene derivative and linear benzaldehyde-terminated poly(ethylene glycol)s are synthesized and used as reactive components to build gel networks. Interestingly, acid-degradable hydrogel can be obtained via natural drying of the mixed solvent gel first and then swelling in pure water. New kinds of self-healing and pH/temperature responsive dynamic covalent gels are synthesized via reaction between a hydrazide-modified calix[4]arene derivative and benzaldehyde-terminated poly(ethylene glycol)s in suitable solvents. Interestingly, the gels show unusual mechanical properties, such as resisting slicing, sustaining compression, and withstanding stretching.

**Hyperbranched Aliphatic Polyester via Cross-Metathesis Polymerization: Synthesis and Postpolymerization Modification**

A novel postpolymerization modification methodology is demonstrated to achieve selective functionalization of hyperbranched polymer (HBP). Terminal and internal acrylates of HBP derived from cross-metathesis polymerization (CMP) are functionalized in a chemoselective fashion using the thiol-Michael chemistries. Model reactions between different thiols (benzyl mercaptan and methyl thioglycolate) and acrylates (n-hexyl acrylate and ethyl trans-2-decenoate) by using dimethylphenylphosphine or amylamine as the catalyst are investigated to optimize the modification protocol for HBP. High-molecular-weight HBP P0 is generated through CMP of AB2 monomer 2, a compound containing one ?-olefin and two acrylate metathetically polymerizable groups. CMP kinetics is monitored by NMR and gel permeation chromatography (GPC). Accordingly, microstructural analysis is conducted in detail, and CMP procedure is optimized. Postpolymerization modification of HBP P0 is performed via two distinguished strategies, namely one-step complete modification and sequential modification, to generate terminally and/or internally functionalized HBPs P1–P3 in a chemoselective fashion by using phosphine-initiated and/or base-catalyzed thiol-Michael chemistries. Finally, thermal stability and glass transition behaviors of HBPs P0–P3 are studied by thermal gravimetric analysis (TGA) and differential scanning calorimetry (DSC), respectively. Postpolymerization modification for selective functionalization of hyperbranched polymer is realized. The terminal and internal acrylate groups of hyperbranched aliphatic polyester that derived from cross-metathesis polymerization are facially functionalized in a chemoselective manner by using the thiol-Michael chemistries.

**Drop-On-Drop Multimaterial 3D Bioprinting Realized by Peroxidase-Mediated Cross-Linking**

A cytocompatible inkjet bioprinting approach that enables the use of a variety of bioinks to produce hydrogels with a wide range of characteristics is developed. Stabilization of bioinks is caused by horseradish peroxidase (HRP)-catalyzed cross-linking consuming hydrogen peroxide (H2O2). 3D cell-
laden hydrogels are fabricated by the sequential dropping of a bioink containing polymer(s) cross-linkable through the enzymatic reaction and H2O2 onto droplets of another bioink containing the polymer, HRP, and cells. The ≈95% viability of enclosed mouse fibroblasts and subsequent elongation of the cells in a bioprinted hydrogel consisting of gelatin and hyaluronic acid derivatives suggest the high cytocompatibility of the developed printing approach. The existence of numerous polymers, including derivatives of polysaccharides, proteins, and synthetic polymers, cross-linkable through the HRP-catalyzed reaction, means the current approach shows great promise for biofabrication of functional and structurally complex tissues. Bioprinting through drop-on-drop inkjetting and horseradish peroxidase-catalyzed cross-linking is cytocompatible and enables the use of a variety of bioinks to develop functional 3D hydrogel constructs tailored for individual applications. This approach opens new avenues for tissue engineering and regenerative medicine based on bioprinting.

Reducing Trap-Assisted Recombination in Small Organic Molecule-Based Photovoltaics by the Addition of a Conjugated Block Copolymer

The performance of organic photovoltaics (OPVs) based on the small-molecule organic semiconductor p-DTS(FBTTh2)2 is greatly improved by the addition of a conjugated block copolymer composed of difluoroquinoxaline and thienopyrrolodione blocks (D130). The power conversion efficiency (PCE) of the p-DTS(FBTTh2)2-based OPV is improved from 5.08% to 6.75% by the addition of 5 wt% D130 to the photoactive layer, which is composed of p-DTS(FBTTh2)2 and a fullerene derivative. Current–voltage and grazing incidence wide-angle X-ray scattering analyses revealed that the addition of D130 significantly reduces the trap density of the device and changes the packing orientation of p-DTS(FBTTh2)2 from mostly edge-on to partially face-on. These changes greatly improve the charge carrier mobility of the OPV, indicating that D130 is highly compatible with p-DTS(FBTTh2)2. Furthermore, the addition of D130 improve the photostability of the OPV by reducing the burn-in loss under a light soaking intensity of 1 sun. The D130-based OPV maintained 34% of its initial PCE after a light soaking test for 858 h. In contrast, the PCE of the OPV without D130 reduced to 14% of its initial efficiency in the same time period. The performance of small-molecule-based organic photovoltaics is greatly improved by the addition of a conjugated block copolymer composed of difluoroquinoxaline and thienopyrrolodione blocks (D130). It is revealed that the addition of D130 significantly reduced the trap density of the device. In addition, the photostability of the device is significantly enhanced by the incorporation of D130.

Synergistic Effects of Selenophene and Extended Ladder-Type Donor Units for Efficient Polymer Solar Cells

Two pairs of polymer donor materials based on indacenodithiophene (IDT) and indacenodithieno[3,2-b]thiophene (IDTT) as the donor units are synthesized. Thiophene or selenophene is introduced as the π-bridge units and electron-deficient fluoride-substituted quinoxaline is used as acceptor unit. Selenophene-containing polymers PIDT-DHQ-Se and PIDTT-DHQ-Se show redshifted absorption and narrower bandgaps. Combined with IDTT donor unit, PIDTT-DHQ-Se shows the highest absorption coefficient. Both the IDTT unit and selenophene unit have positive effects on the hole mobilities, making PIDTT-DHQ-Se the highest one. The best power conversion efficiency of 7.4% is obtained from devices based on PIDTT-DHQ-Se;[6,6]-phenyl C71 butyric acid methyl ester (PC71BM) with a Jsc of 12.6 mA cm−2, a Voc of 0.89 V, and a fill factor (FF) of 0.66. Two pairs of electron donor polymer materials with fused-ring indacenodithiophene (IDT) or indacenodithieno[3,2-b]thiophene (IDTT) as donor units bridged with thiophene or selenophene are synthesized. The best power conversion efficiency of 7.4% is obtained from devices fabricated from PIDTT-DHQ-Se:PC71BM due to the synergistic effect of extended IDTT unit and bridged selenophene, resulting in the higher absorption coefficient and mobilities.
**Understanding the Impact of Film Disorder and Local Surface Potential in Ultraviolet Photoelectron Spectroscopy of PEDOT**

The spectra of conducting polymers obtained using ultraviolet photoelectron spectroscopy (UPS) exhibit a typical broadening of the tail \( \Delta UPS \approx 1 \text{ eV} \), which by an order of magnitude exceeds a commonly accepted value of the broadening of the tail of the density of states \( \Delta DOS \approx 0.1 \text{ eV} \) obtained using transport measurements. In this work, an origin of this anomalous broadening of the tail of the UPS spectra in a doped conducting polymer, PEDOT (poly(3,4-ethylenedioxythiophene)), is discussed. Based on the semiempirical approach and using a realistic morphological model, the density of valence states in PEDOT doped with molecular counterions is computed. It is shown that due to a disordered character of the material with randomly distributed counterions, the localized charge carriers in PEDOT crystallites experience spatially varying electrostatic potential. This leads to spatially varying local vacuum levels and binding energies. Taking this variation into account the UPS spectrum is obtained with the broadening of the tail comparable to the experimentally observed one. The results imply that the observed broadening of the tail of the UPS spectra in PEDOT provides information about a disordered spatially varying potential in the material rather than the broadening of the DOS itself. A pronounced discrepancy of the broadening of the tail of the density of states of a doped conducting polymer, (poly(3,4-ethylenedioxythiophene)), extracted from the respective ultraviolet photoelectron spectroscopy and transport measurements, is discussed and attributed to the effect of spatially varying local vacuum levels and binding energies caused by disorder (randomly distributed counterions).

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**Enhanced Fluorescence Properties of Stilbene-Containing Alternating Copolymers**

In recent years, nonconjugated, fluorophore-free organic polymers have emerged as potentially useful light-emitting materials. The fluorescence properties of a novel class of nonconjugated, tert-butyl carboxylate functionalized stilbene-containing alternating copolymers are investigated in this work. These sterically crowded, semi-rigid copolymers exhibit very strong blue fluorescence in organic solvents upon irradiation. The origin of the fluorescent band with high quantum yield is attributed to the “through space” \( \pi-\pi \) interactions between the phenyl rings from the stilbene and CO groups from the anhydride groups. To the best of our knowledge, the di-tert-butyl group-containing stilbene and maleic anhydride alternating copolymer showed one of the highest fluorescent intensities among all fluorophore-free polymers. The excellent linearity of the luminescence property of this copolymer is an important attribute for future potential quantitative applications. The fluorescence is maintained when the tert-butyl groups are removed and the resulting carboxylic acid-functionalized copolymer is dissolved in water at neutral pH, which can render these copolymers as attractive candidates for diagnostic and therapeutic applications. Nonconjugated, tert-butyl carboxylate functionalized stilbene-containing alternating copolymers exhibit strong fluorescence with excellent linearity. The origin of the fluorescence is attributed to the “through space” \( \pi-\pi \) interactions between the phenyl rings from the stilbene and CO groups from the anhydride. The fluorescence is maintained when the tert-butyl groups are removed and the resulting carboxylic-acid-functionalized copolymer is dissolved in water at neutral pH.

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**Thermally Labile Self-Healable Branched Gel Networks Fabricated by New Macromolecular Engineering Approach Utilizing Thermoreversibility**

A new approach based on macromolecular engineering through thermoreversibility is reported to fabricate the engineered gel networks of thermally labile branched polymers exhibiting robust self-healing. This approach centers on the synthesis of linear polymers having Diels–Alder cycloadducts in the backbones (DALPs) through A2 + B2 step-growth polymerization of a difunctional furan and a difunctional maleimide. Reactive mixtures of the resulting DALP with a polyfuran at elevated temperature allow for the formation of engineered gel networks through random dissociation of
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backbone DA linkages of the DALPs by retro-Diels–Alder reaction, followed by their reconstruction in the presence of polyfuran (with functionality > 2) by Diels–Alder reaction. Optimizing the ratio of furan to DA linkages in the reactive mixtures yields thermally labile networks exhibiting excellent thermoreversibility. Effective self-healing demonstrated with reconstruction from two separate pieces and complete void filling on surface cuts as well as recovery of healing viscoelasticity suggest that the new macromolecular engineering approach offers versatility toward the development of thermally mendable thermosets. A new approach is designed based on macromolecular engineering through thermoreversibility of linear polymers having Diels–Alder cycloadducts reacting with polyfurans at elevated temperature. This enables the fabrication of engineered gel networks of thermally labile branched polymers exhibiting robust self-healing, thus offering the versatility toward the development of thermally mendable thermosets.

Custom 3D Printable Silicones with Tunable Stiffness

Silicone elastomers have broad versatility within a variety of potential advanced materials applications, such as soft robotics, biomedical devices, and metamaterials. A series of custom 3D printable silicone inks with tunable stiffness is developed, formulated, and characterized. The silicone inks exhibit excellent rheological behavior for 3D printing, as observed from the printing of porous structures with controlled architectures. Herein, the capability to tune the stiffness of printable silicone materials via careful control over the chemistry, network formation, and crosslink density of the ink formulations in order to overcome the challenging interplay between ink development, post-processing, material properties, and performance is demonstrated. The capability to tune the stiffness of 3D printable silicone materials via careful control over the chemistry, network formation, and crosslink density of our ink formulations is demonstrated in order to overcome the challenging balance between ink development, post-processing, material properties, and performance. Material applications include high-performance foams and cellular solids, soft robots, biomedical devices and biological scaffolds, and flexible and stretchable electronics.

Ultrahigh Flux Composite Hollow Fiber Membrane via Highly Crosslinked PDMS for Recovery of Hydrocarbons: Propane and Propene

In order to make membrane separation technologies more cost-competitive with the well-established processes that are energy intensive for gas/vapor separation, a defect-free membrane with a high gas permeance is necessary. However, it remains challenging to meet these needs because of the difficulties in developing a suitable material and process that are economical and practical. Herein, a novel and straightforward strategy is presented to produce a defect-free hollow fiber composite membrane using a highly crosslinked polydimethylsiloxane (PDMS) synthesized by using a postcrosslinking method. The PDMS can be directly coated on a polyacrylonitrile (PAN) membrane substrate, and the resultant PDMS/PAN composite membrane has ultrahigh C3H8 and C3H6 permeances that are higher than 10 000 and 11 000 GPU, respectively, and the corresponding permselectivity of C3H8/N2 and C3H6/N2 are about 21 and 24, respectively. The newly developed methods and materials may open up a new cost-effective method to fabricate next-generation composite membranes for the recovery of hydrocarbons, organic vapors, and gases. A highly crosslinked polydimethylsiloxane (PDMS) can be synthesized via a thermal-crosslinking method followed by a postcrosslinking process. The PDMS (Mn = 577 kg mol−1) can be directly coated on a polyacrylonitrile (PAN) membrane substrate, and the resultant PDMS/PAN composite membrane is defect-free and has ultrahigh C3H8 and C3H6 permeances that are higher than 10 000 and 11 000 GPU, respectively.

Multicompartment Vesicles Formation by Emulsification-Induced Assembly of Poly(ethylene oxide)-block-poly(?-caprolactone) and Their Dual-Loading Capability
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Emulsification-induced assembly is employed to allow structural diversity in nanoaggregates of a biocompatible amphiphilic polymer, poly(ethylene oxide)-block-poly(ε-caprolactone). Onion-like vesicles are efficiently produced by tuning the interfacial instability of the oil-in-water emulsion. The increase in the polymer concentration and use of the organic solvents with a low interfacial tension between water and the oil phase lead to a strong tendency of emulsion droplets to generate the onion-like vesicles. The vesicular networks and fibers are also obtained by controlling the concentration and type of the surfactant, respectively. Interestingly, the onion-like vesicles composed of alternating walls and water channels and the vesicular networks originated from a string of vesicles show dual-loading ability for hydrophobic and hydrophilic dyes but slightly different loading capacities. This result indicates that the development of a methodology to fabricate well-defined, unique nanostructures, such as multivesicular and multilamellar nanostructures, and subsequent elucidation of their structure–property relationships can provide useful guidance in the design of novel biomedical materials. Multicompartment vesicles, including onion-like vesicles and vesicular networks, are constructed by tuning the interfacial instability of an oil-in-water emulsion of a single-polymer molecular scaffold. The dual-loading ability for hydrophobic and hydrophilic dyes is demonstrated with different loading capacities due to the spatial organization of each compartment constituting the onion-like vesicles and vesicular networks.

4D Printed Actuators with Soft-Robotic Functions

Soft matter elements undergoing programmed, reversible shape change can contribute to fundamental advance in areas such as optics, medicine, microfluidics, and robotics. Crosslinked liquid crystalline polymers have demonstrated huge potential to implement soft responsive elements; however, the complexity and size of the actuators are limited by the current dominant thin-film geometry processing toolbox. Using 3D printing, stimuli-responsive liquid crystalline elastomeric structures are created here. The printing process prescribes a reversible shape-morphing behavior, offering a new paradigm for active polymer system preparation. The additive character of this technology also leads to unprecedented geometries, complex functions, and sizes beyond those of typical thin-films. The fundamental concepts and devices presented therefore overcome the current limitations of actuation energy available from thin-films, thereby narrowing the gap between materials and practical applications. 3D printing is used to create stimuli-responsive liquid crystalline elastomeric structures. Printing prescribes the reversible shape-morphing behavior of the structures, leading to intricate geometries, complex functions, and sizes beyond those fabricated using the current dominant thin-film geometry processing toolbox. This technology opens new avenues for the development of new shape-morphing architectures for medicine, microfluidics, adaptive optics, haptics, or soft robotics.

Supramolecular “Step Polymerization” of Preassembled Micelles: A Study of “Polymerization” Kinetics

In nature, sophisticated functional materials are created through hierarchical self-assembly of nanoscale motifs, which has inspired the fabrication of man-made materials with complex architectures for a variety of applications. Herein, a kinetic study on the self-assembly of spindle-like micelles preassembled from polypeptide graft copolymers is reported. The addition of dimethylformamide and, subsequently, a selective solvent (water) can generate a “reactive point” at both ends of the spindles as a result of the existence of structural defects, which induces the “polymerization” of the spindles into nanowires. Experimental results combined with dissipative particle dynamics simulations show that the polymerization of the micellar subunits follows a step-growth polymerization mechanism with a second-order reaction characteristic. The assembly rate of the micelles is dependent on the subunit concentration and on the activity of the reactive points. The present work reveals a law governing the self-assembly kinetics of micelles with structural defects and opens the door for the construction of...
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Hierarchical structures with a controllable size through supramolecular step polymerization. Preassembled micelles are found to be able to end-to-end “polymerize” into 1D hierarchical nanowires. Experimental results combined with dissipative particle dynamics simulations show that the polymerization kinetics follow a step-growth polymerization mechanism with a second-order reaction characteristic. The assembly rate of the micelles can be adjusted by the subunit concentration and the solvent condition.

Stretchable Fluorescent Polyfluorene/Acrylonitrile Butadiene Rubber Blend Electrospun Fibers through Physical Interaction and Geometrical Confinement

Stretchable light-emitting polymers are important for wearable electronics; however, the development of intrinsic stretchable light-emitting materials with great performance under large applied strain is the most critical challenge. Herein, this study demonstrates the fabrication of stretchable fluorescent poly[(9,9-bis(3\(^\text{-}(N,N\text{-dimethylamino})\text{propyl})-2,7-fluorene)-alt-2,7-(9,9-dioctyl-fluorene)]/acrylonitrile butadiene rubber (PFN/NBR) blend nanofibers using the uniaxial electrospinning technique. The physical interaction of PFN with NBR and the geometrical confinement of nanofibers are employed to reduce PFN aggregation, leading to the high photoluminescence quantum yield of 35.7%. Such fiber mat film shows stable blue emission at the 50% strain for 200 stretching/release cycles, which has potential applications in smart textiles. Stretchable fluorescent materials are highly desired for wearable electronics. Herein, the fabrication of fluorescent poly[(9,9-bis(3\(^\text{-}(N,N\text{-dimethylamino})\text{propyl})-2,7-fluorene)-alt-2,7-(9,9-dioctyl-fluorene)]/acrylonitrile butadiene rubber (PFN/NBR) electrospun nanofibers under stretching is demonstrated. The physical interaction of PFN with NBR and the geometric confinement of nanofibers effectively reduced PFN aggregation, leading to the high photoluminescence quantum yield of 35.7% and stable blue-emission under 50% strain.