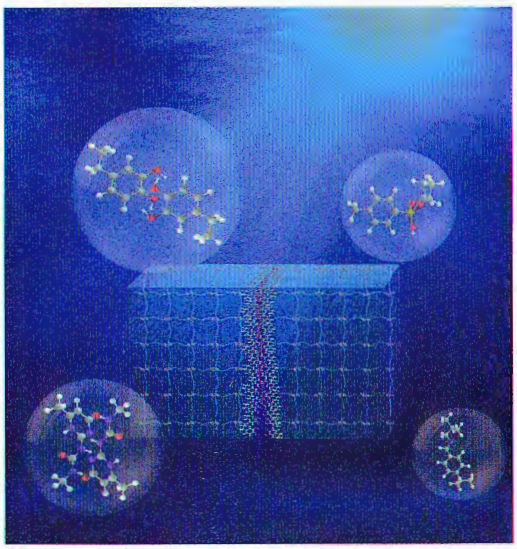
Chinese Journal of Polymer Science Vol. 39, No. 10, October 2021

Cover Image

Self-healing Hydrogels and Underlying Reversible Intermolecular Interactions

Meng Wu, Qiong-Yao Peng, Lin-Bo Han, and Hong-Bo Zeng

Self-healing hydrogels are hydrogel materials that can autonomously heal fractures after damage. Their self-healing behaviors can be achieved through reversible physical interactions such as mussel-inspired molecular bindings and multiple hydrogen-bonding interaction, and dynamic covalent bonds like Schiff bases and boronic ester bonds.



Chinese Journal of Polymer Science, 2021, 39(10), 1246–1261
https://doi.org/10.1007/s10118-021-2631-y

Chinese Journal of Polymer Science Vol. 39, No. 10, October 2021

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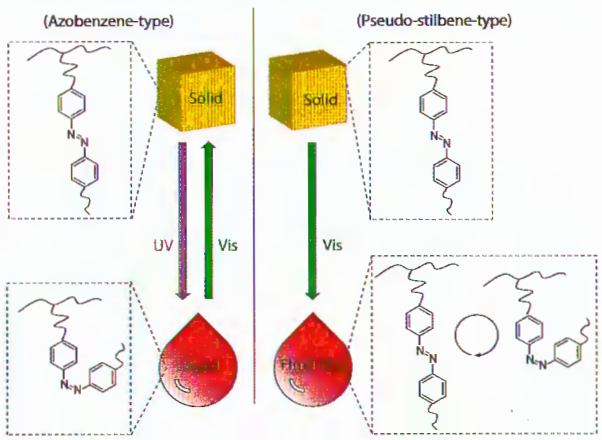
Feature Articles

Photoinduced Reversible Solid-to-Liquid Transitions and Directional Photofluidization of Azobenzene-containing Polymers

Shuo-Feng Liang, Chen Nie, Jie Yan, Qi-Jin Zhang, and Si Wu

Recent studies on photoinduced reversible solid-to-liquid transitions and directional photofluidization of azopolymers are summarized. We discussed the azobenzene types, photoisomerization processes, light wavelengths, flow conditions, liquid presence conditions and mechanisms of the two types of photoliquefaction in detail, and introduced their latest development and applications.



Chinese Journal of Polymer Science, 2021, 39(10), 1225–1234
https://doi.org/10.1007/s10118-021-2519-x

Self-healing Ionic Liquid-based Electronics and Beyond

Shenglong Liao, Xiaodong Lian, and Yapei Wang

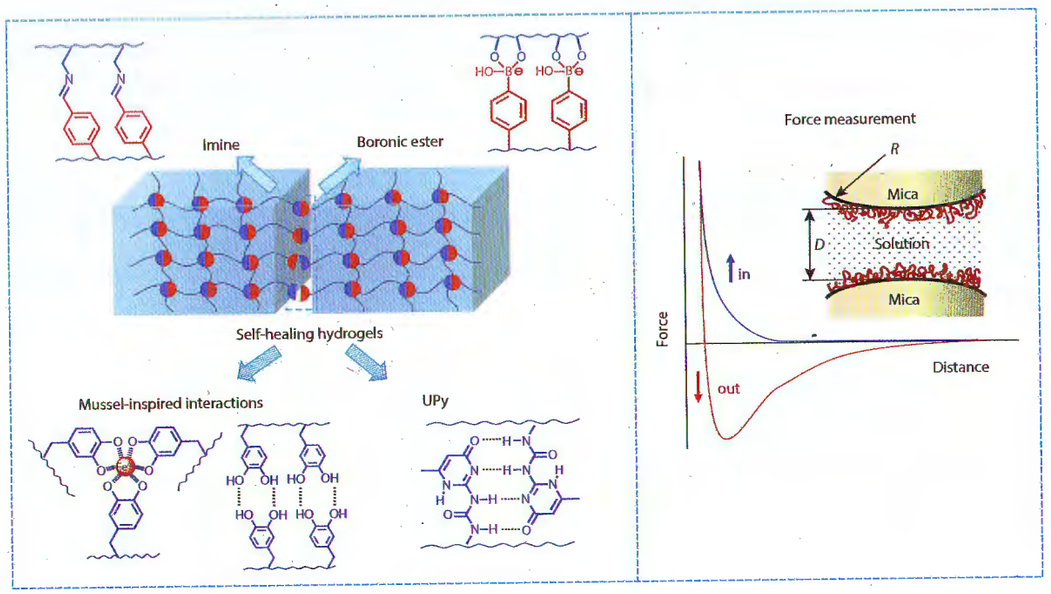
Avoiding the leakage without sacrifice of self-healing ability is one of the major challenges for constructing ionic liquid-based electronic devices. In this feature article, we summarize our recent progresses in developing two types of self-healing electrical devices based on ionic liquids with little risk of leakage.

Chinese Journal of Polymer Science, 2021, 39(10), 1235–1245
https://doi.org/10.1007/s10118-021-2627-7

Self-healing Hydrogels and Underlying Reversible Intermolecular Interactions

Meng Wu, Qiong-Yao Peng, Lin-Bo Han, and Hong-Bo Zeng

This feature article reviews our recent progress on developing self-healing hydrogels cross-linked *via* mussel inspired molecular interactions, UPy moieties, imines and boronic ester bonds. Characterizing these interactions through nanomechanical tools such as SFA and AFM is also discussed.



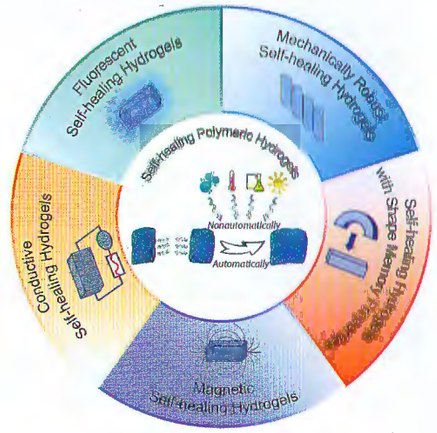
Chinese Journal of Polymer Science, 2021, 39(10), 1246–1261
https://doi.org/10.1007/s10118-021-2631-y

Reviews

Self-healing Polymeric Hydrogels: Toward Multifunctional Soft Smart Materials

Xiao-Ling Zuo, Shao-Fan Wang, Xiao-Xia Le, Wei Lu, and Tao Chen

Driven primarily by the demands for life-like materials and soft smart materials, this review focuses on recent advances on self-healing hydrogels in terms of tunable mechanical properties and diverse functionalities, especially the luminescent, conductive, magnetic and shape memory properties, and thus the development of self-healing hydrogels has continually attracted scientific community.

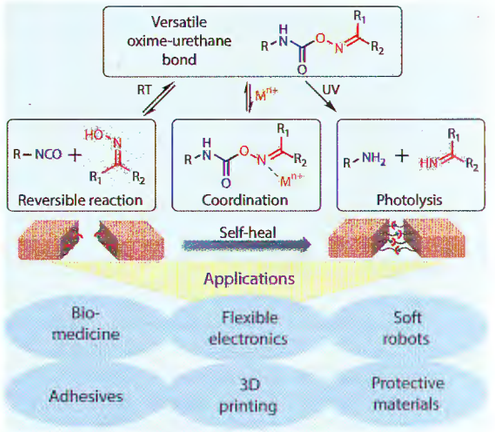


Chinese Journal of Polymer Science, 2021, 39(10), 1262–1280
https://doi.org/10.1007/s10118-021-2612-1

Dynamic Oxime-Urethane Bonds, a Versatile Unit of High Performance Self-healing Polymers for Diverse Applications

Luzhi Zhang and Zhengwei You

Oxime-urethane bonds are one kind of emerging dynamic covalent bonds, and have shown great potential for self-healing polymers. In this review, recent progresses on the oxime-urethane-based self-healing polymers, including their designs and diverse applications are summarized, and outlooks on the future development of this field are discussed.



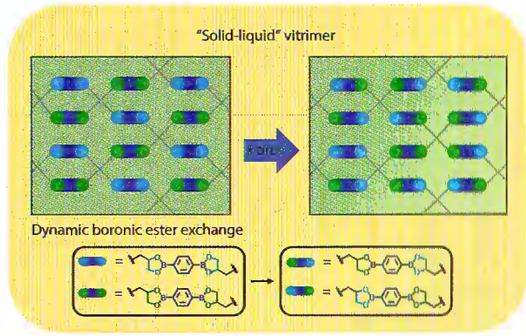
Chinese Journal of Polymer Science, 2021, 39(10), 1281–1291
https://doi.org/10.1007/s10118-021-2625-9

Articles

"Solid-Liquid" Vitrimers Based on Dynamic Boronic Ester Networks

Sheng Wang, Lu-Lu Xue, Xiao-Zhuang Zhou, and Jia-Xi Cui

A series of "solid-liquid" vitrimers bearing various contents of dynamic boronic ester bonds were synthesized. They show a range of intriguing properties including high stretchability, flexible transition from elasticity to plasticity, strong strain rate dependence, solid-liquid performance, and can be shape-programmed into various complex 3D structures just with external force.

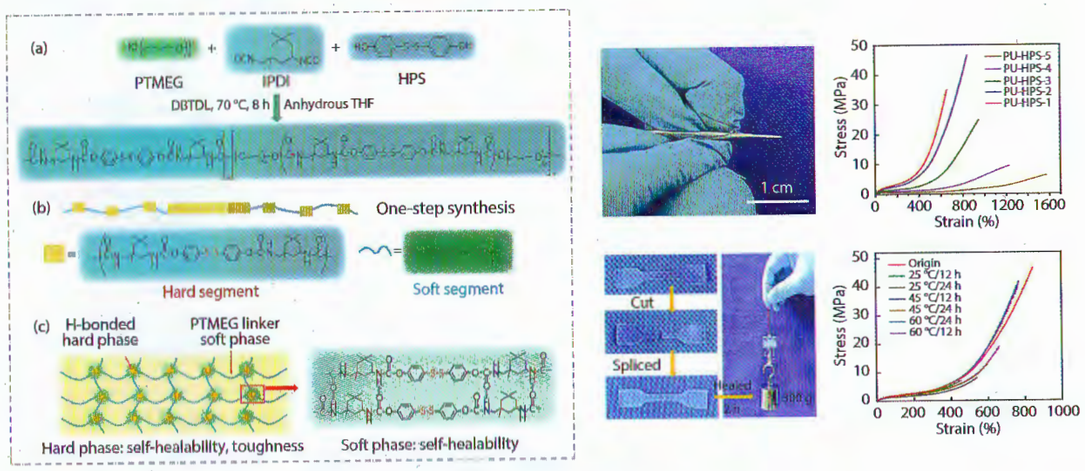


Chinese Journal of Polymer Science, 2021, 39(10), 1292–1298
https://doi.org/10.1007/s10118-021-2592-1

A Robust Self-healing Polyurethane Elastomer Enabled by Tuning the Molecular Mobility and Phase Morphology through Disulfide Bonds

Hai-Tao Wu, Bi-Qiang Jin, Hao Wang, Wen-Qiang Wu, Zhen-Xing Cao, Zhao-Yang Yuan, Yue Huang, Wei-Hang Li, Guang-Su Huang, Lu-Sheng Liao, and Jin-Rong Wu

In this work, an asymmetric alicyclic structure adjacent to aromatic disulfide was tactfully introduced into polyurethane (PU) elastomer. Such elastomer (PU-HPS) manifests outstanding tensile strength (46.4 MPa), high toughness (109.1 MJ·m^{-3}), high self-healing efficiency of fractured samples (90.3%), complete scratch recovery (100%) and good puncture resistance.

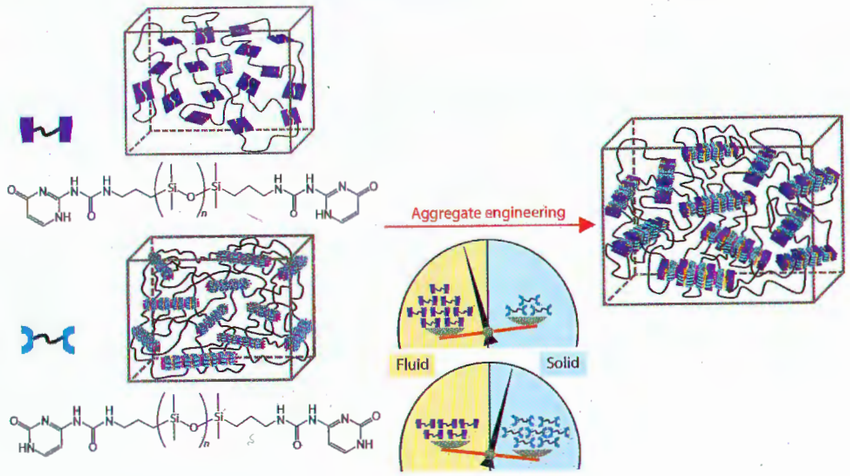


Chinese Journal of Polymer Science, 2021, 39(10), 1299–1309
https://doi.org/10.1007/s10118-021-2607-y

Aggregate Engineering in Supramolecular Polymers *via* Extensive Non-covalent Networks

Xin Huang, Dong Lv, Li-Qing Ai, Shuk Han Cheng, and Xi Yao

In this study, an aggregate engineering strategy is proposed to improve the vulnerability of non-covalent networks at elevated temperatures. Programming and stabilizing non-covalent networks can be realized in supramolecular polymers. Such aggregate engineering strategy offers prospects for the on-demand tunability in thermo-mechanical responsiveness.

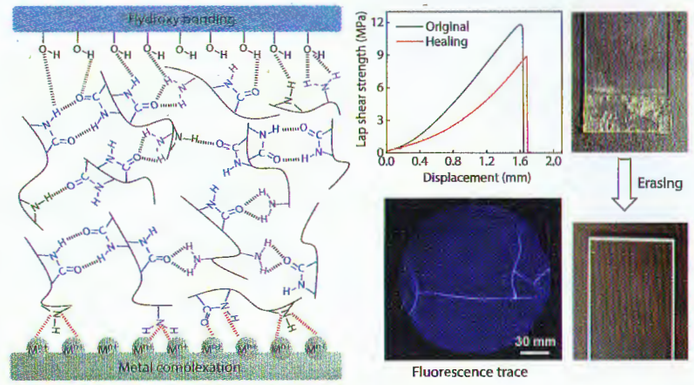


Chinese Journal of Polymer Science, 2021, 39(10), 1310–1318
https://doi.org/10.1007/s10118-021-2608-x

Strong, Removable, and Photoluminescent Hyperbranched Polyamide-amine Hot Melt Adhesive

Si-Jia Zhang, Xing-Xing Chen, Chen-Hui Cui, Li Ma, Qian-Yun Zhong, Kai-Xiang Shen, Jing Yu, Zhen Li, You-Shen Wu, Qiang Zhang, Yi-Long Cheng, Ling He, and Yan-Feng Zhang

ODA-RHP HMA exhibited robust lap shear strength to different substrates. Due to the hydrogen bonds, the HMA demonstrated intrinsic self-healing ability. It can be easily removed and exhibit aggregation-induced luminescence, which can be used in the field of cultural relics restoration.

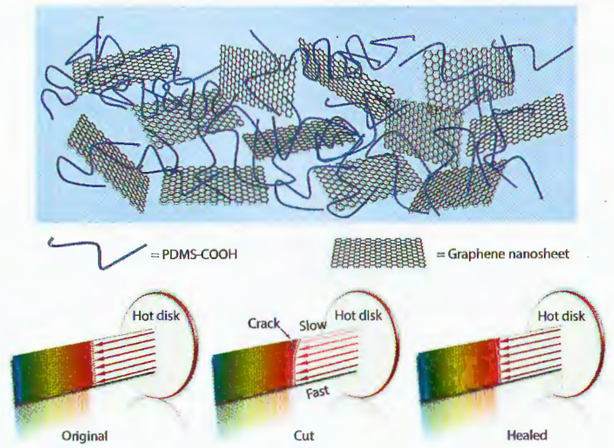


Chinese Journal of Polymer Science, 2021, 39(10), 1319–1327
https://doi.org/10.1007/s10118-021-2630-z

A Fast and Room-temperature Self-healing Thermal Conductive Polymer Composite

De-Wei Yue, Hong-Qin Wang, Han-Qing Tao, Peng Zheng, Cheng-Hui Li, and Jing-Lin Zuo

We successfully prepared a thermally conductive polymer composite by mixing bulk polymer PDMS-COOH with graphene. The as-prepared composite film exhibits almost full recovery of thermal conductivity as observed by infrared thermal imaging camera.

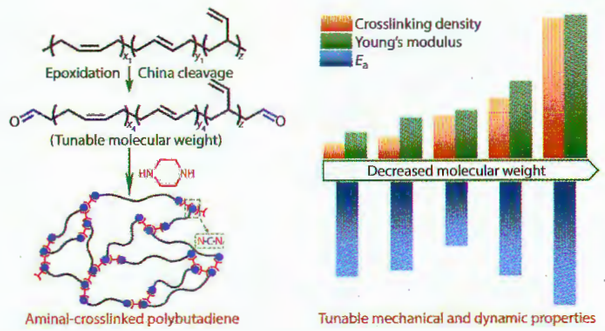


Chinese Journal of Polymer Science, 2021, 39(10), 1328–1336
https://doi.org/10.1007/s10118-021-2620-1

Structural Manipulation of Aminal-crosslinked Polybutadiene for Recyclable and Healable Elastomers

Zheng-Hai Tang, Hui Zeng, Si-Qi Wei, Si-Wu Wu, and Bao-Chun Guo

Dynamic aminal crosslinked polybutadiene rubber with tunable mechanical characteristics and dynamic properties are prepared by varying precursor molecular weight and network crosslinking density.



Chinese Journal of Polymer Science, 2021, 39(10), 1337–1344
https://doi.org/10.1007/s10118-021-2626-8