

Low Shrinkage Networks of Difunctional Cyclopolymerizable Monomers via photo-induced Radical Polymerization

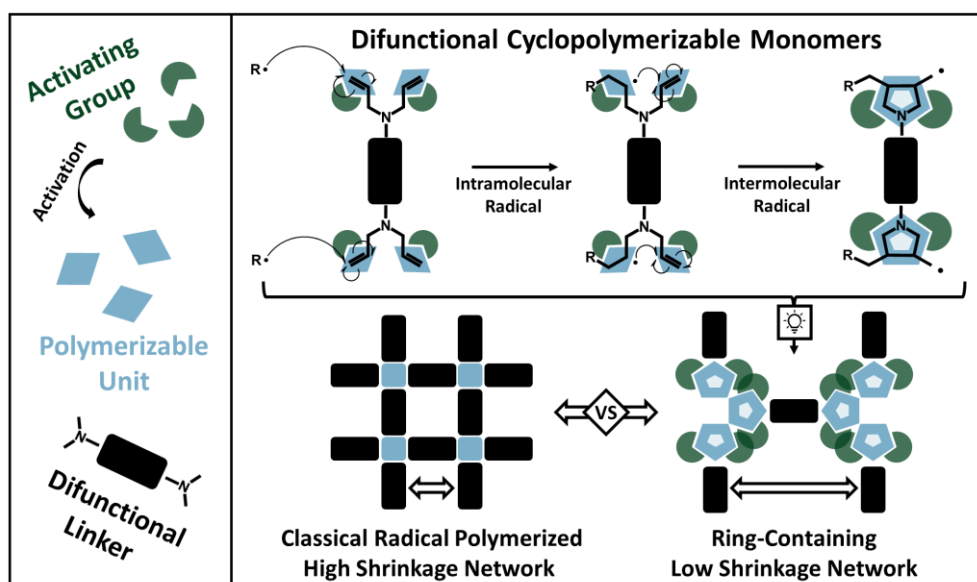
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Cyclopolymerizable monomers (CPM) consisting of non-conjugated dienes can form polymer networks with cyclic structures in their backbones. This cyclization is performed in a two-step mechanism alternating in an intra- and intermolecular way upon light initiation, and it is caused by the lack of homopolymerization behavior of the corresponding monoene monomers.^[1,2] These ring-containing networks may exhibit a reduced shrinkage than those formed during classical radical photo-induced homopolymerization.^[3]



Reduced shrinkage of photopolymerized networks *via* cyclopolymerization of difunctional monomers

This study focuses on difunctional CPMs based on allyl-moieties as a primary motif widely used in state-of-the-art coating applications. The synthetic strategy of novel diamine-linked difunctional 1,6-diene CPMs with various double bond activation (allyl-, methacryloyl-, and ester-activated allyl-moieties) is presented. These novel compounds reveal their enhanced properties during reactivity and mechanical studies *via* photo-DSC, photorheology, DMTA, and tensile testing. Herein, not only improved reactivities (up to 60%) and amplified mechanical properties could be demonstrated but also a significant shrinkage reduction (up to 40%) compared to the corresponding monoene compounds. This enhanced behavior highlights the influence of double bond activation accompanied by the formation of cyclic units in the polymer backbone upon photo-induced cyclopolymerization.

Keywords: shrinkage reduction, radical photo-polymerization, cyclopolymerization, difunctional monomers, mechanical analysis

References

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