MODIFICATION OF (METH)ACRYLATE-BASED PHOTOPOLYMER NETWORKS USING ADDITION-FRAGMENTATION CHAIN TRANSFER REAGENTS

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Nowadays, photopolymers based on (meth)acrylates find broad application in industry. Beneficial are the wide selection of monomers, the rapid curing speed, solvent-free curing conditions, and good mechanical properties like high hardness, rigidity, and heat deflection temperature.

However, the uncontrolled free radical photopolymerization of multifunctional monomers yields inhomogeneous networks, which exhibit brittle behavior. Moreover, chain-growth reactions result in long kinetic chain lengths at low double bond conversions (DBCs) leading to early gelation of the resin causing shrinkage stress in the cured photopolymer.

Recently, addition-fragmentation chain transfer (AFCT) has been reported to represent a new strategy for regulating free radical photopolymerization of (meth)acrylates. Especially, β-allyl sulfones [1,2] and vinyl sulfonate esters [3] as AFCT reagents were able to shift the gel point to higher DBCs, significantly decreasing shrinkage stress in the material. The modified, more homogeneous network architecture also improved mechanical properties, in particular impact resistance that can be seen as a measure for toughness.

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