NEW POLYMERIZABLE β-ALLYL SULFONES AS REVERSIBLE ADDTION FRAGMENTATION CHAIN TRANSFER REAGENTS FOR THE CROSSLINKING PHOTOPOLYMERIZATION OF DIMETHACRYLATES

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Currently used dental restorative materials are visible-light curing hybrid materials consisting of a resin matrix, which is a mixture of various free radical cross-linking dimethacrylates, like Bis-GMA (2,2-bis[4-(2-hydroxy-3-methacryloyloxypropyl)phenyl]propane), diluting monomers, like D_3MA (decane-1,10-diol dimethacrylate) and inorganic fillers, such as milled glasses or highly dispersed silica.[1] Dimethacrylates are known to have a good photoreactivity, but their radical polymerization usually leads to irregular, highly crosslinked, and brittle polymer networks with broad thermal polymer phase transition. In this context, it was shown that β-allyl sulfones, such as ethyl 2-(tosylmethyl)acrylate (ETMA), can be used as addition fragmentation chain transfer (AFCT) reagents to adjust thermal and mechanical properties of dimethacrylate polymer networks.[2]

In order to improve the incorporation of the AFCT reagents in the formed polymer network, we synthesized the β-allyl sulfones **1**-**4** (Figure 1), which contain an additional polymerizable methacrylate group:

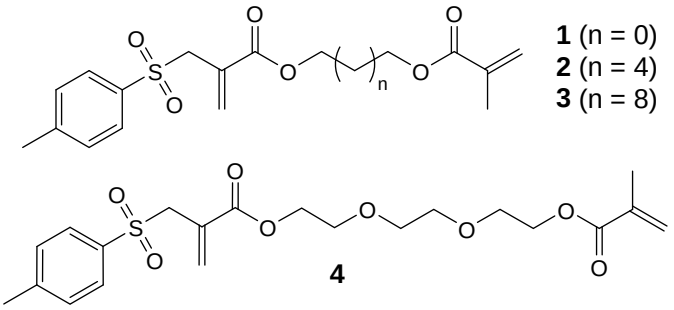

Figure 1

The polymerizable β-allyl sulfones **1**-**3** were synthesized by esterification of the corresponding hydroxyalkyl methacrylates and 2-(tosylmethyl)acrylic acid (TMAA) in good yields. Monomer **4** was synthesized by the reaction of triethylene glycol monomethacrylate with TMAA. The chemical structure of the synthesized monomers **1**-**4** was investigated by ^{1}H-NMR and IR spectroscopy. Theire polymerization behavior was determined by photo-DSC experiments of selected monomer mixtures. Furthermore, selected mechanical properties (flexural strength and modulus of elasticity) of dimethacrylate resins were determined. In addition, the soluble part of the AFCT reagents in cured model composites was determined. Finally, the toxicological properties of the synthesized AFCT reagents were investigated.

1. Moszner, N.; Hirt, T. *J. Polym. Sci. Part A: Polym. Chem.* **2012**, *50*, 4369.
2. Gorsche, C.; Griesser, M.; Gescheidt, G.; Moszner, N.; Liska, R. *Macromolecules* **2014**, *47*, 7327.

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