

REGULATED PHOTOPOLYMER NETWORKS VIA SILANE-ACRYLATE CHEMISTRY

Johannes Steindl,^a Anastasiya Svirnova,^b Thomas Koch,^c
Martina Marchetti-Deschmann,^b Norbert Moszner^{d,e} and Christian Gorsche^{a,d}

^aInstitute of Applied Synthetic Chemistry, Technische Universität Wien,
1060 Vienna, Austria

^bInstitute of Chemical Technology and Analytics, Technische Universität Wien,
1060 Vienna, Austria

^cInstitute of Materials Science and Technology, Technische Universität Wien,
1060 Vienna, Austria

^dChristian-Doppler-Laboratory for Photopolymers in Digital and Restorative Dentistry,
1060 Vienna, Austria

^eIvoclar Vivadent AG, 9494 Schaan, Liechtenstein

State-of-the-art photopolymer resins (e.g. multifunctional acrylates) are an important class of materials in applications ranging from protective and decorative coatings to more advanced fields such as biomedicine and 3D-printing. During the rapid radical curing reaction high shrinkage stress is formed and resulting polymer networks suffer from brittle material behavior, which represent the most pressing challenges with these materials. The stated drawbacks can be attributed to the radical chain growth mechanism resulting in inhomogeneous network architectures [1]. The implementation of chain transfer agents (CTAs) has been reported as powerful approach for the regulation of final network architecture and material properties.

Aside from thiols (thiol-ene-chemistry) [2], Allonas [3] proposed silanes as possible CTAs. Based on this work different substituted silanes were investigated regarding their reactivity with various enes, whereupon acrylates give the most promising results. MALDI MS and GPC measurements confirmed the chain transfer mechanism during the silane-acrylate photopolymerization [4]. Furthermore, silane-acrylate-based photopolymer networks were produced with reduced shrinkage stress and tunable thermomechanical properties.

[1] S. C. Ligon-Auer, M. Schwentenwein, C. Gorsche, J. Stampfl and R. Liska, *Polym. Chem.* **7**, 257-286 (2016).

[2] C. E. Hoyle and C. N. Bowman, *Angew. Chem. Int. Ed.* **49**, 1540-1573 (2010).

[3] M. El-Roz, J. Lalevee, X. Allonas and J.-P. Fouassier, *Macromol. Rapid Commun.* **29**, 804-808 (2008).

[4] J. Steindl, A. Svirnova, M. Marchetti-Deschmann, N. Moszner and C. Gorsche, *Macromol. Chem. Phys.*, in press (2017).