PHOTOPOLYMERS WITH ENHANCED THERMOMECHANICAL PROPERTIES FOR 3D PRINTING APPLICATIONS

Céline Croutxé-Barghorn, Lucile Halbardier, Emile Goldbach,
Anne-Sophie Schuller, C. Ley, Xavier Allonas

Laboratory of Macromolecular Photochemistry and Engineering,
University of Haute Alsace, 68093 Mulhouse France

Digital light processing (DLP) is one of the most popular 3D printing techniques utilizing a light source for solidifying a liquid resin. High reactivity, limited resolution and thermomechanical properties are still the main obstacles to overcome. Acrylate resins are widely implemented in 3D printing. Despite their important reactivity and commercial availability, they suffer from yielding inhomogeneous and uncontrolled polymer structure and high crosslink density or limited mechanical properties. Different routes have been reported in the literature to tackle these drawbacks. This paper will highlight the potential of the aza-Michael addition or the incorporation of a reversible addition-fragmentation chain transfer (RAFT) agents or to control the polymer network structure and enhance the thermomechanical properties as elongation at break, toughness or SMP properties. In addition, the in- situ generation of an inorganic silicate phase will be discussed as an attractive route for hybrid organic-inorganic materials avoiding multi-step procedure and possible phase separation.

References

1. M. Retailleau, A. Ibrahim, C. Croutxé-Barghorn, X. Allonas, C. Ley, D. Le Nouen, ACS Macro Lett., 4 (12), (2015) 1327–1331.
2. A. Nejadebrahim, M. Ebrahimi, X. Allonas, C. Croutxé-Barghorn, C. Ley and B. Metral, RSC Adv. 9, (2019), 39709-39720.
3. A. Champion, B. Métral, A.S. Schuller, C. Croutxé-Barghorn, C. Ley, L. Halbardier, X. Allonas, ChemPhotoChem, 5, (2021), 839-846
4. L. Halbardier, E. Goldbach, C. Croutxé-Barghorn, A-S. Schuller, X. Allonas, RSC Adv., 12, (2022) 30381-30385.
5. E. Goldbach, X. Allonas, C. Croutxé-Barghorn, C. Ley, L. Halbardier, G. L'Hostis, Eur. Polym. J. 188, (2023) 111947-111954.
6. E. Goldbach, X. Allonas, C. Ley, L. Halbardier, C. Croutxé-Barghorn, Eur. Polym. J. 197, (2023) 112335-112341.
7. L. Halbardier, C. Croutxé-Barghorn, E. Goldbach, A-S. Schuller, X. Allonas, Polym. Chem. 14 (2023) 4048-4056.

8.