PRINTING OF METAMATERIALS BY DIGITAL LIGHT PROCESSING 3D PRINTING: MYTH OR REALITY?

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Printing of mechanical metamaterials with heterogeneous properties is still a challenging and unexplored area of current additive manufacturing methods.[1] Our goal is to print the 3D objects with anisotropic mechanical properties using digital light processing additive manufacturing without the need for physical change of the vats. Stiffness and flexibility during the printing process can be controlled by 2 orthogonal photoreactions working at two different wavelengths. The approach is based on chemoselective wavelength and layer-by-layer printing of objects.

Herein, we present a dual photocuring system where radical induced curing (405 nm) of multi-functional acrylates and cationic curing (365 nm) of bi-functional epoxy monomers are used (Figure 1). Dynamic mechanical analysis has shown that by increasing the ratio of the epoxy resin in the system also stiffness increases. By selectively switching on the cationic curing of the epoxy resins, the mechanical properties of metamaterials can be locally tuned and tailored layer-by-layer.

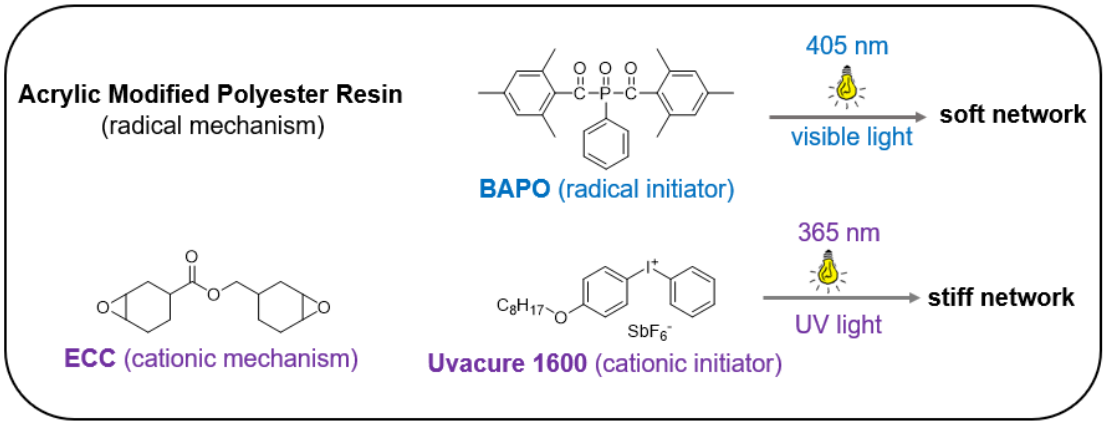

Figure 1 Representation of the developed dual curable acrylate-epoxy system.

[1] Han, Daehoon; Lee, Howon (2020): Recent advances in multi-material additive manufacturing: methods and applications. In *Current Opinion in Chemical Engineering* 28, pp. 158–166.