Synthesis and characterization of polymethacrylates functionalized with azocompounds for 3D printing

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Three-Dimensional-Printing (3DP) has been introduced in the late 80s and, nowadays, it is recognized as one of the most promising and revolutionary manufacturing technologies. The exploration of innovative functional materials along with the corresponding 3DP is constantly growing to fulfill the ever-increasing market manufacturing demand [1]. Typical examples of smart polymers deeply investigated in 3DP are temperature-, light- and pH-responsive, and mechanochromic materials. Among many monomers, azo-based scaffolds have been reported to provide well-defined either photohardening or photosoftening 3D devices under laser irradiation[2].

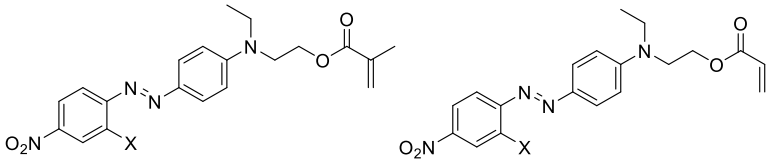

Figure 1: Structure of monomers.

We have designed, synthesized and characterized functional polymers defined by one or more smart properties along with specific Additive Manufacturing (AM) compatibility. In particular, polymers bearing dye-functionalized polyacrylates or polymethacrylates can be developed in a straightforward manner for both Digital Light Processing (DLP) and Stereolithographic Apparatus (SLA). Azobenzene-based monomers used are both suitable candidates, thanks to their high speed of light curing, for the 3DP-light responsive polymers preparation, conferring potential light triggerable-mechanical responses, due to the *trans-cis* isomerization upon UV irradiation. Furthermore, the different ortho group confers various properties due to both steric and electronic effect.

[1] Z.X. Khoo, J.E.M. Teoh, Y. Liu, C.K. Chua, S. Yang, J. An, K.F. Leong and W.Y. Yeong (2015) Virtual and Physical Prototyping, 2015, 10 (3), 103
[2] I. Roppolo, A. Chiappone, A. Angelini, S. Stassi, F. Frascella, C. F. Pirri, C. Ricciardi, and E. Descrovi Mater. Horiz., 2017, 4, 396