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**This is a pre print version of the following article:**

*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/1705859> since 2019-07-08T18:06:17Z

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## Smart functional polymers for 3D printing

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Nowadays many industries employ Three-Dimensional-Printing (3DP), one of the most promising and revolutionary innovative manufacturing technologies in the production processes. The greatest advantages of 3D printing are relied on the high versatility of this technique, the progressive printers' price knock off and the considerable saving of raw materials. The exploration of innovative functional materials is one of the most interesting survey field to fulfill the ever-increasing market manufacturing demand [1]. Temperature-, light-, pH-responsive and mechanochromic smart polymers are deeply investigated to this end. Among many monomers, azo-based scaffolds have been reported to provide well-defined either photohardening or photosoftening 3D devices [2].

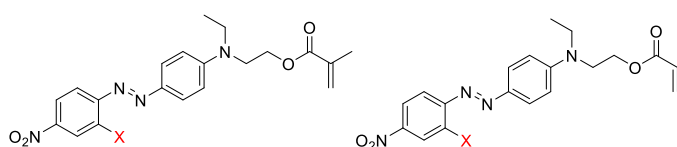


Figure 1: Structure of monomers

-X= H, CH<sub>3</sub>, Cl, NO<sub>2</sub>, OCH<sub>3</sub>, OH

In the present work, we have designed, synthesized and characterized dye-functionalized polyacrylates or polymethacrylates, prepared in a straightforward manner, for Digital Light Processing (DLP). The azo-benzene monomers are used due to the high speed of light curing and the ability to trigger mechanical responses, upon irradiation, due to the *trans-cis* isomerization. Various substituents have been introduced, in *ortho* to the azo moiety, to modulate the monomer/polymer properties both by steric and electronic effects. For instance, the polymers elastic modulus has shown remarkable variations, as a function of the laser power at 532 nm, as depicted in Figure 2

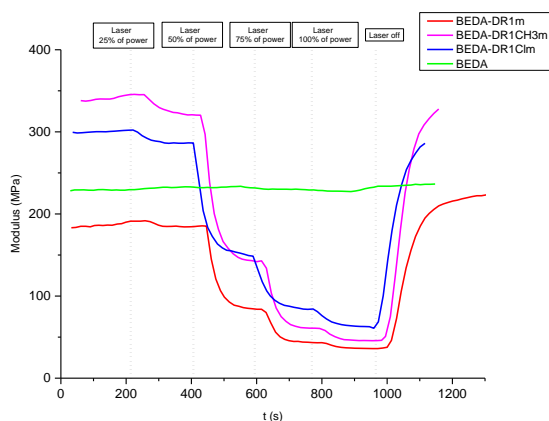


Figure 2: Trend of elastic modulus under increasing power of the laser

- [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