Parmeggiani C, Chemistry and Biomedicine 2018, Volume 8
DOI: 10.4066/2249-622X-C4-011

The chemistry beyond liquid crystalline elastomeric microdevices

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Smart polymers are artificial materials that can respond to external stimuli. Among these, liquid-crystalline elastomers (LCEs) combine the properties of polymeric elastomers and liquid crystalline orientations, performing dramatic shape change (20-400%) under light/heat stimuli and allow for realization of remotely controlled robots. Moreover, the increasing interest is due to the opportunity to trigger their deformation by irradiation with light, when azobenzene dyes are included in the polymer structure. Important challenges lie in the miniaturization of functional structures. Direct Laser Writing (DLW) has been recently used to fabricate LCE structures with sub-micron resolution, exhibiting deformation under light excitation. The technique was demonstrated to allow for the realization of polymeric microstructures that can be locally controlled both in shape and molecular alignment, with nanometer precision. Implementation of materials to be used with such technique attracted our interest. Acrylate based mesogens, cross-linkers and dye were first studied and used to prepare LCE. Moreover, for the first time, thiol-yne click chemistry was employed to obtain LCEs. This reaction allows for the realization of mixed type "main-chain/side-chain" LCE. The new liquid crystalline networks, which incorporate part of mesogens in the main-chain of the polymer, are able to maximise the coupling between mesogens and the polymer backbone resulting in big deformation under nematic to isotropic transition. In this communication a short excursus on acrylate based mesogens and the new synthetic strategy are presented together with the comparison between the materials obtained.

Speaker Biography

Parmeggiani C has completed her PhD in Chemical Science at the age of 29 years from University of Florence with Prof. A. Goti and she was recently awarded as researcher at the Chemistry Department of the University of Florence. Since 2010 she is associate at the European Laboratory for Non Linear- Spectroscopy and at the National Institute of Optics (CNR). In 2016 she was awarded with the "Organic Chemistry for environment, energy and nanosciences" prize from the Organic Chemistry Division of the SCI and she was a finalists of the European Young Chemist Award. She authored 37 papers, 1 book and 3 patents (h-index 16), on smart materials, stereoselective synthesis of iminosugars and new green oxidation methods that have been cited over 1150 times.

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