# Photo-actuation in amorphous matrices embedding azopolymer particles

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A polymer composite concept based on azopolymer nanoparticles embedded within a compliant polymer matrix is presented. The nanoparticles retain polarization-controlled photo-deformation, while the soft polymer network efficiently transduces local nanoscale motion into macroscopic shape changes. Crucially, elastic restoring forces provided by the external matrix enable reversible and overwritable deformations, overcoming the plastic response typical of bulk azopolymers.

Two application scenarios are demonstrated. First, a millimeter-scale soft actuator is driven using solely the polarization of incident light. Second, microstructured hydrogels patterned as micropillars and microwells enable dynamic topographical modulation. In particular, polarization-controlled, fully closable microwells are presented, illustrating how the achieved complex actuation holds potential for applications in biotechnology and microfluidics. For the latter, unexpected polarization-driven flow control is also reported based on dispersed azopolymer micro/nano-particles at water-air interfaces.

## Biography:

**Emiliano Descrovi** is Associate Professor of Physics at the Department of Applied Science and Technology, Politecnico di Torino, Italy. He obtained his master degree in Physics from the University of Torino in 1999 and the PhD in Microtechnique from the Université de Neuchatel, Switzerland, in 2005.

His research interests fall in the domain of dielectric nanophotonics and light-responsive polymer photonics, targeting novel tunable devices controlled by light. He is member of the European Optical Society (EOS) board and presently serves as President since September 2024.