

Holographic vectorial photomorphing of azomaterial surfaces

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Light-induced structuring of azobenzene-containing films (azomaterials) enables micro- and nanoscale patterns through direct, non-destructive, and reprogrammable morphing of the surface. The phenomenon is driven by a light-induced material transport, initiated by the cyclic trans–cis isomerization of azobenzene molecule. The geometry of the surface reliefs is governed by both the polarization and intensity of the incident light, offering a unique vectorial framework for a new lithography. Holography, especially via Computer Generated Holography (CGH) and digital polarization rotator schemes using a liquid crystal Spatial Light Modulator (SLM), provides versatile control over the vectorial light field to exploit this response.

Here, we combine CGH and spatially-resolved polarization control to fabricate high-aspect-ratio and anisotropic surface structures that reflect the vectorial nature of light. Using this method, we demonstrate reprogrammable diffractive optical elements—including gratings, Fourier surfaces, lenses, and holographic projectors—pointing to a new photolithographic paradigm where fully structured light defines functional surface geometries.



Short Bio:

Stefano L. Oscurato is Associate Professor at the Physics department of University of Naples Federico II (Italy). He received his PhD in Physics from University of Naples in 2018. Prof. Oscurato received the ERC Starting Grant in 2024 and is currently leading the Holographic Lithography research group, focusing on the development of holo-photolithographic techniques for all-optical fabrication and tuning of reconfigurable flat diffractive components and functional structured surfaces.