

Additive Manufacturing of Light-Responsive Liquid Crystal Elastomers: Toward Autonomous Soft Robotic Systems

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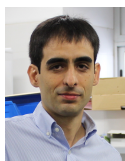
Liquid crystal elastomers (LCEs) are stimuli-responsive materials that combine the orientational order of liquid crystals with the elasticity of polymer networks, enabling large and reversible anisotropic deformations. Light-responsive LCEs are particularly attractive for soft robotics because actuation can be triggered remotely with high spatial and temporal control. Recent advances in additive manufacturing have enabled the fabrication of complex architectures with programmed molecular alignment, providing a route toward predictable and scalable shape transformations. This lecture will present recent work from the Advanced Manufacturing Laboratory on the additive manufacturing of photoresponsive LCEs, including biomimetic locomotion, self-sustained oscillatory motion, and multimodal actuation. The underlying photoresponse mechanisms, as well as their implications for untethered and autonomous soft robotic systems, will be discussed.

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Biography:



Carlos Sánchez-Somolinos PhD in Physics from the University of Zaragoza, Spain, completed a postdoc at Eindhoven University of Technology, The Netherlands, working on photopolymers for display applications. Currently, he is Professor of Research at the Spanish National Research Council (CSIC), where he heads the Advanced Manufacturing Laboratory. His expertise and current scientific objectives are focused on developing materials and their processing through advanced manufacturing techniques in the pursuit of surfaces or functional systems of interest in optics, biomedicine, and soft robotics. In this last field, he has developed innovative material preparation methodologies, among which stands out the 4D printing of liquid crystal elastomers (LCEs), a pioneering technique that introduces smart character into 3D-printed structures, programming the material's response to external stimuli through additive manufacturing. Related to this development, he has been the coordinator of the H2020-FET-OPEN project PRIME, and the Network of Excellence H2020-MSCA-ITN STORM-BOTS in LCE soft robotics. In 2017 he was awarded with the Prize of the Royal Academy of Sciences of Zaragoza (Physics Section).