UNIVERSITÄT DUISBURG ESSEN

PHYSIK E=

Physikalisches Kolloquium

Mittwoch, 25.06.2025
13:00 Uhr
MC 122 und Zoom

https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (gilt für alle Vorträge)

Light manipulation by light in reactive polymer photonics

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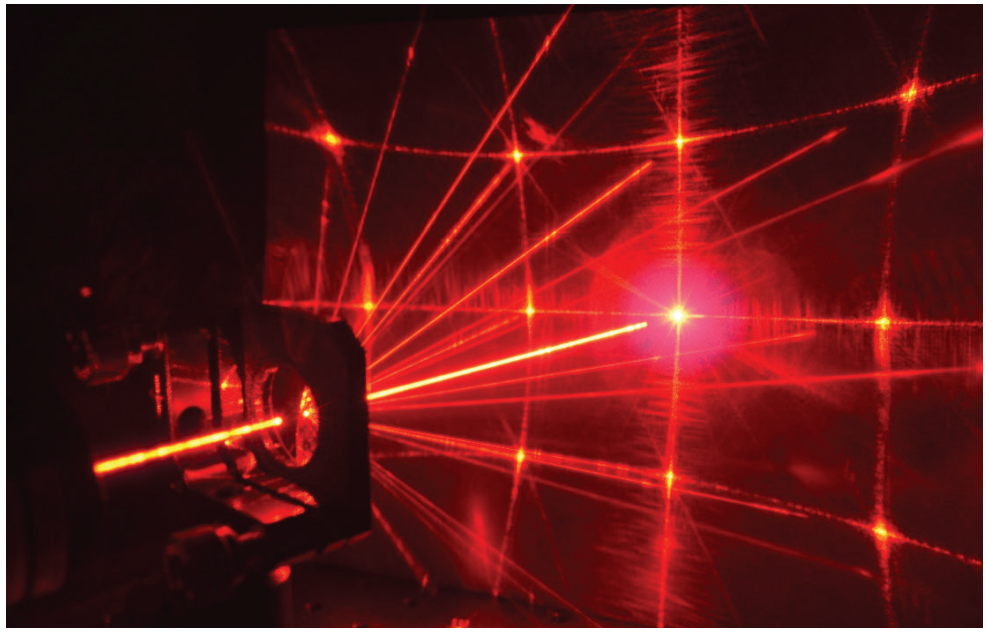

Polymer photonics leverages the low cost, versatility and easy processing of polymeric materials to create photonic structures with tailored optical properties for light manipulation at the microscale. Advances in lithographic techniques now enable the 3D printing of nanostructures in innovative materials [1], thus opening to the integration of advanced, stimuli-responsive materials for reconfigurable photonic and cryptographic elements. The concept of 4D printing, utilizing programmable polymers capable of time-dependent shape changes in response to pre-defined external or environmental cues, has revolutionized various fields such as robotics [2] for actuator control, microfluidics, biomedical applications, programmable photonics and anti-counterfeiting.
By precisely controlling shape and refractive index through external stimuli, encompassing both linear and nonlinear optical properties, light becomes not just a signal carrier, but also a tool for active manipulation.
This presentation will showcase our work on shaping responsive polymers, specifically liquid crystalline networks, into 3D-printed nanostructures for tunable linear and nonlinear photonics. By harnessing their significant anisotropic shape variations in response to light or temperature, we achieve remote and reversible control over the optical properties of micro-lasers [3], beam steerers [4], micro-cavities [5], and photonic crystals [6].

REFERENCES
[1] I De Bellis, S Nocentini, et al., Laser & Photonics Reviews 15 (2021), 2100090.
[2] Martella, D., Nocentini, et al., Adv. Mater. 29 (2018), 1704047.
[3] AM Flatae, M Burresi, et al., Light: Science & Applications 4 (2014), e282-e282.
[4] Nocentini, S., Parmeggiani, et al., Adv. Opt. Mater. 6 (2018),1800207.
[5] S Nocentini, F Riboli, et al., ACS Photonics 5 (2018), 3222-3230.
[6] De Bellis, I., Martella, D., et al., Adv Funct Mater (2023), 2213162.
[7] Donato, S., Nocentini, S., et al., Small (2023), 2306802.
[8] Nocentini, S., Rührmair, et al., Nature Materials (2024), 1.