Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C

Liquid-Crystalline Elastomer Micropillar Array for Haptic Actuation

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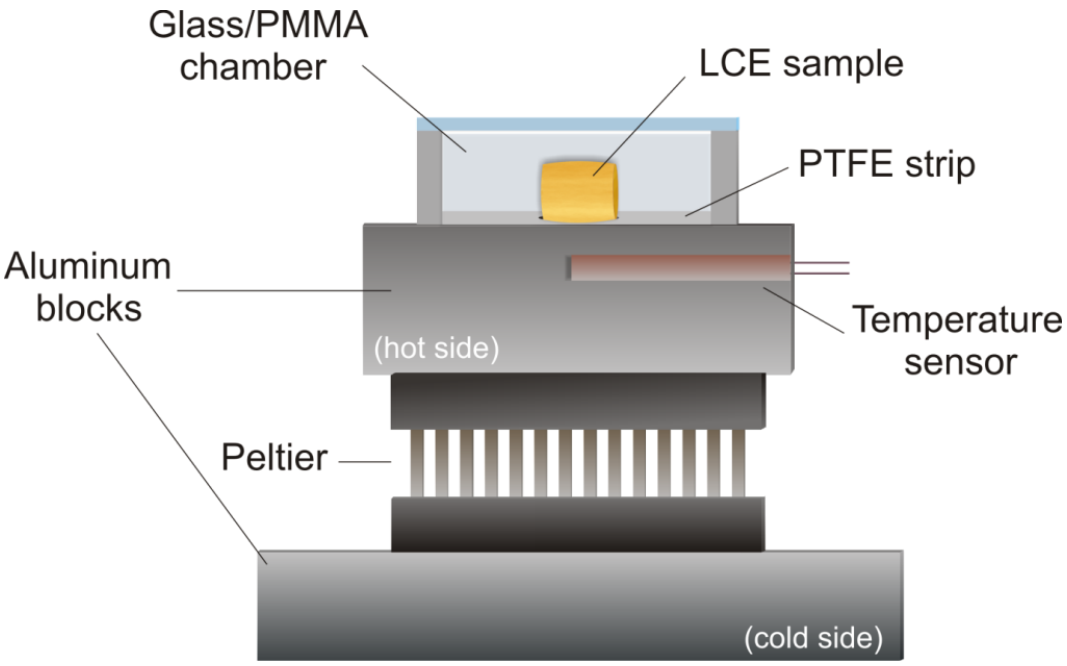

Fig. ESI-1. Setup for the thermoelastic experiment.

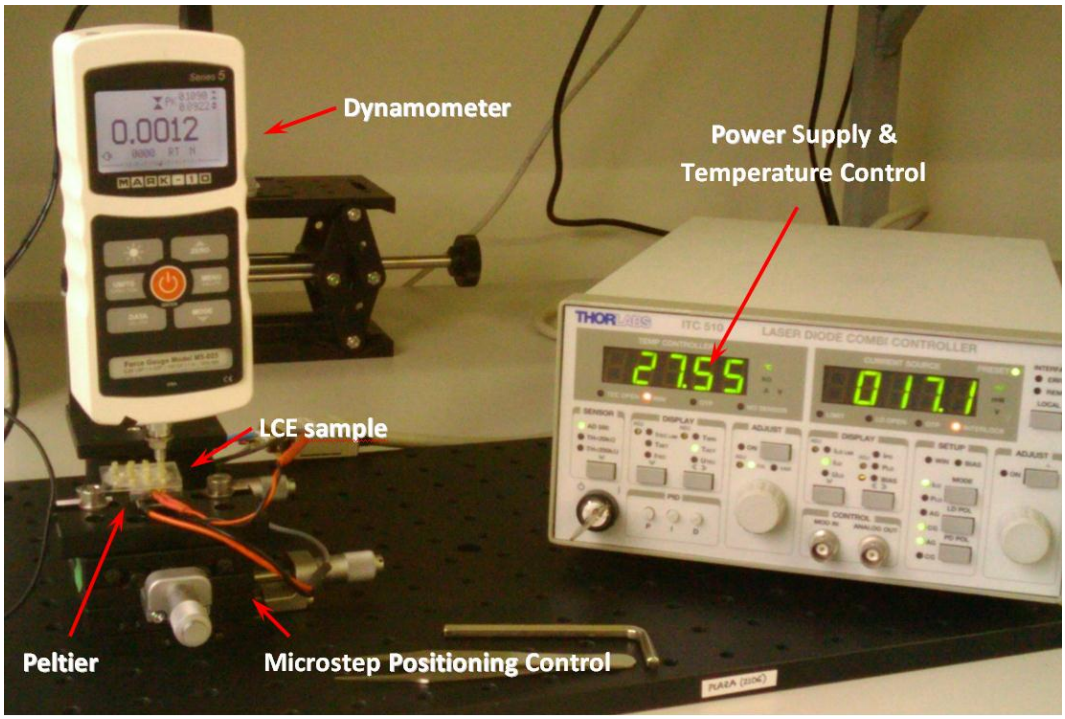

Fig. ESI-2. Setup for the evaluation of the mechanical actuation.

Swelling experiments on the partially crosslinked non-oriented micropillar (P_{pcno}), on the fully crosslinked non-oriented micropillar (P_{cno}), and on the fully crosslinked oriented micropillar (P_{co}) were performed in toluene at 25 °C in order to obtain information about the crosslinking process and the orientation of the sample. The swelling parameter $q = \alpha_r^2\alpha_z$ for the P_{co} micropillar (q = 4.2 ± 0.3) was similar to the P_{cno} micropillar (q = 4.1 ± 0.3), but lower than for the P_{pcno} micropillar (q = 5.4 ± 0.5). These values confirmed the difference in crosslinking density between the partially crosslinked elastomer, P_{pcno} with high swelling ratio, and the fully crosslinked elastomers, P_{co} and P_{cno} with low swelling ratio. Moreover, the anisotropy of the network could be described from the swelling anisotropy $q_z = \alpha_z/\alpha_r$, which is the ratio between the axial swelling ratio α_z and the radial swelling ratio α_r. The oriented micropillar P_{co} showed a swelling anisotropy of q_z = 1.09 ± 0.04, which differed from the random distribution of nematic domains in the micropillars P_{pcno} and P_{cno} with swelling anisotropy values of q_z = 1.00 ± 0.06 and q_z = 1.00 ± 0.05, respectively (Fig. ESI-3).

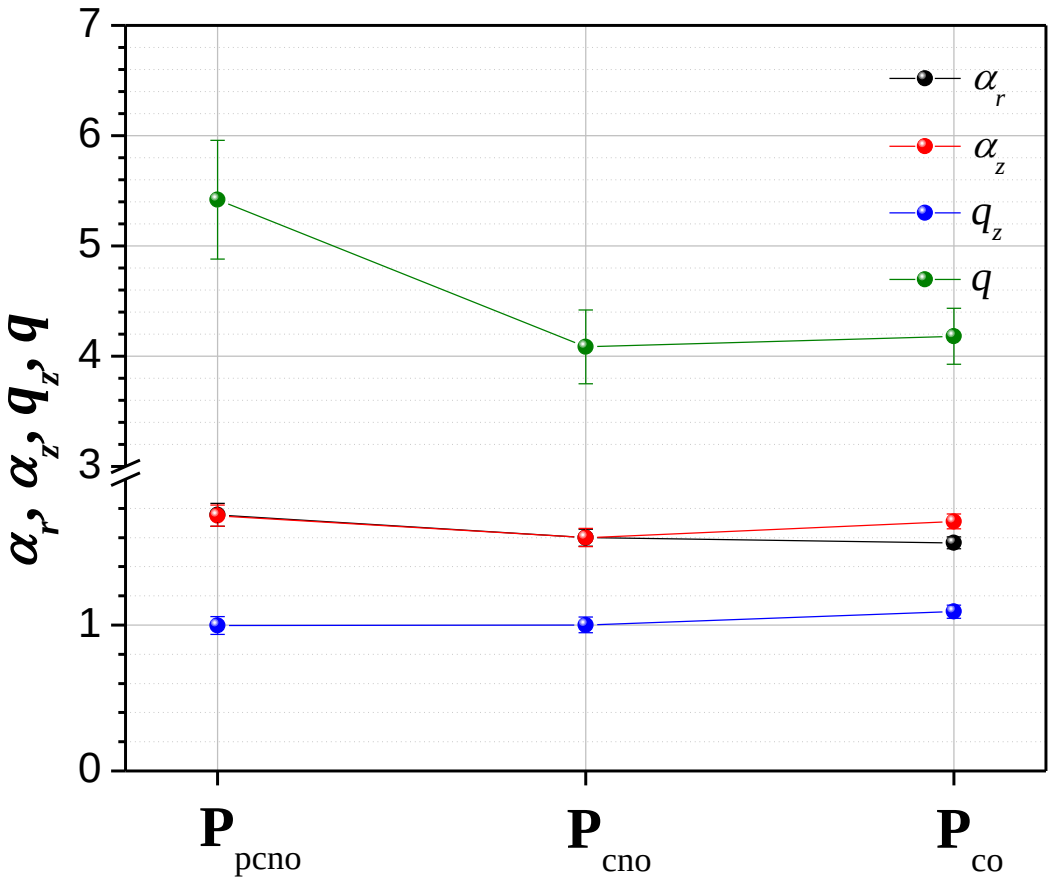

Fig. ESI-3. Swelling ratios α_r and α_z, swelling anisotropy q_z and swelling parameter q for the partially crosslinked non-oriented micropillar (P_{pcno}), the fully crosslinked non-oriented micropillar (P_{cno}), and the fully crosslinked oriented micropillar (P_{co}) in toluene at 25 °C.