Supporting Information for

"Optical crack detection and assessment using cholesteric liquid crystal elastomers"

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The molecular structures of the monomers employed in the preparation of CLCE films are illustrated in Figure 2a of the main paper. The composition of the CLCE precursor solution used in this study can be seen in Table S1. The diacrylate mesogen, 1,4-bis-]4-(3-acryloyloxypropyloxy)benzoyloxy]-2-methylbenzene (RM257) (Synthon Chemical) and the chiral dopant (3R,3aS,6aS)-hexahydrofuro[3,2-b]furan-3,6-diyl bis(4-(4-((4- (acryloyloxy)but-oxy)carbonyloxy)benzoyloxy)benzoate) (LC756) (Synthon Chemical) were heated to 80°C for 5 minutes and subsequently cooled to room temperature. Following this, a tetra-functional thiol cross-linker pentaerythritol tetrakis(3-mercaptopropionate) (PETMP) (Sigma Aldrich), a dithiol monomer 2,2-(ethylenedioxy) diethanethiol (EDDET) (Sigma Aldrich), a photoinitiator 2,2-dimethoxy-2-phenylacetophenone, Irgacure 651 (Sigma Aldrich) and a dye, Sudan black B, were mixed with the solution. Finally, dipropylamine diluted to 1: 50 ratio with toluene was introduced as a catalyst for the first stage Michael addition reaction. The solution was stirred and was then applied to a substrate such as brick, polystyrene, etc., and left open for 12 hrs. Subsequently, the CLCE film was exposed to UV light at 365 nm with an intensity of 32 mW cm^{-2} for 5 min at 25^{o}C.

Table S1: Composition of CLCE system used for this study. Substance amount is defined as the given mass of a substance devided by its molecular mass.

Name	Mass (g)	Molecular mass (g/mol)	Substance amount (mmol)	CAS Registry nr.
RM257	1.92	588.6	3.26	174063-87-7

LC756*	0.090	966.89	0.09	223572-88-1
EDDET	0.498	182.3	2.7	14970-87-7
PETMP	0.130	488.7	0.27	7575-23-7
Irgacure 651	0.025	256.3	0.09	24650-42-8
Sudan Black	0.003	456.54	0.007	4197-25-5
Dipropylamine**	0.340	101.2	-	142-84-7
Toluene	1.060	92.1	-	108-88-3

* 4.48 wt % of LC756 with respect to RM257 (to obtain a CLCE coating with a red-retroflection ground state)

** 0.340 g of DPA/toluene solution (DPA was diluted in toluene at a ratio of 1:100)

Estimation of the cost of the CLCE precursor solution and the final CLCE coating

We approximate the density of the CLCE to 1 g/m^3, and we approximate mass-% to be equal to volume-%. We assume a suitable thickness of the final CLCE coating to be 25 μm (for the optics already some 5 μm would be enough, but we want the CLCE layer to be reasonably durable also). Thus: the volume of 1 m^2 CLCE can be calculated as 10^4 cm^2 area * 25*10^{-4} cm thickness = 25 cm^3 = 25 mL ≈ 25 g. Since everything in the precursor solution except the toluene remains in the final

CLCE, we can estimate the mass of precursor solution required for covering 1 m^2 of CLCE as 25/0.74 ≈ 34 mL. With the cost of the precursor being about 1.67 €/mL (see Table S2), this means that the current cost of the CLCE coating is about 56 €/m^2. Note that this is based on the current situation, where the mesogens are speciality chemicals. If the chemical industry scales up production of these components, we can expect a significant drop in the cost.

Table S2: Cost of each component in the CLCE precursor.

Component	Mass (g)	Mass %	Price estimate (€/g)	Explanation	Cost of each component in 1 g of mixture
RM257	1.92	0.472	1.5	Ca 1.5 k€ per kg from China	0.708
LC756	0.090	0.022	39	3.9k€ per 100g from Synthon	0.858
EDDET	0.498	0.122	0.39	39€ per 100mL from Sigma	0.048
PETMP	0.130	0.032	0.35	175€ for 500mL at Sigma	0.011

Irgacure 651	0.025	0.006	1.36	68.10€ for 50g at Sigma.	0.008
Sudan Black	0.003	0.00073	4.16	104€ for 25g at Sigma	0.003
Dipropylamine	0.340	0.084	0.0252	504€ _for 20kg at Sigma	0.002
Toluene	1.060	0.260	0.106	92.50 € for 1000mL	0.028
Total	4.066	1			1.666