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

Supporting information

The effects of the polarized light on the optical and self-oscillation behaviors of liquid crystal network polymers

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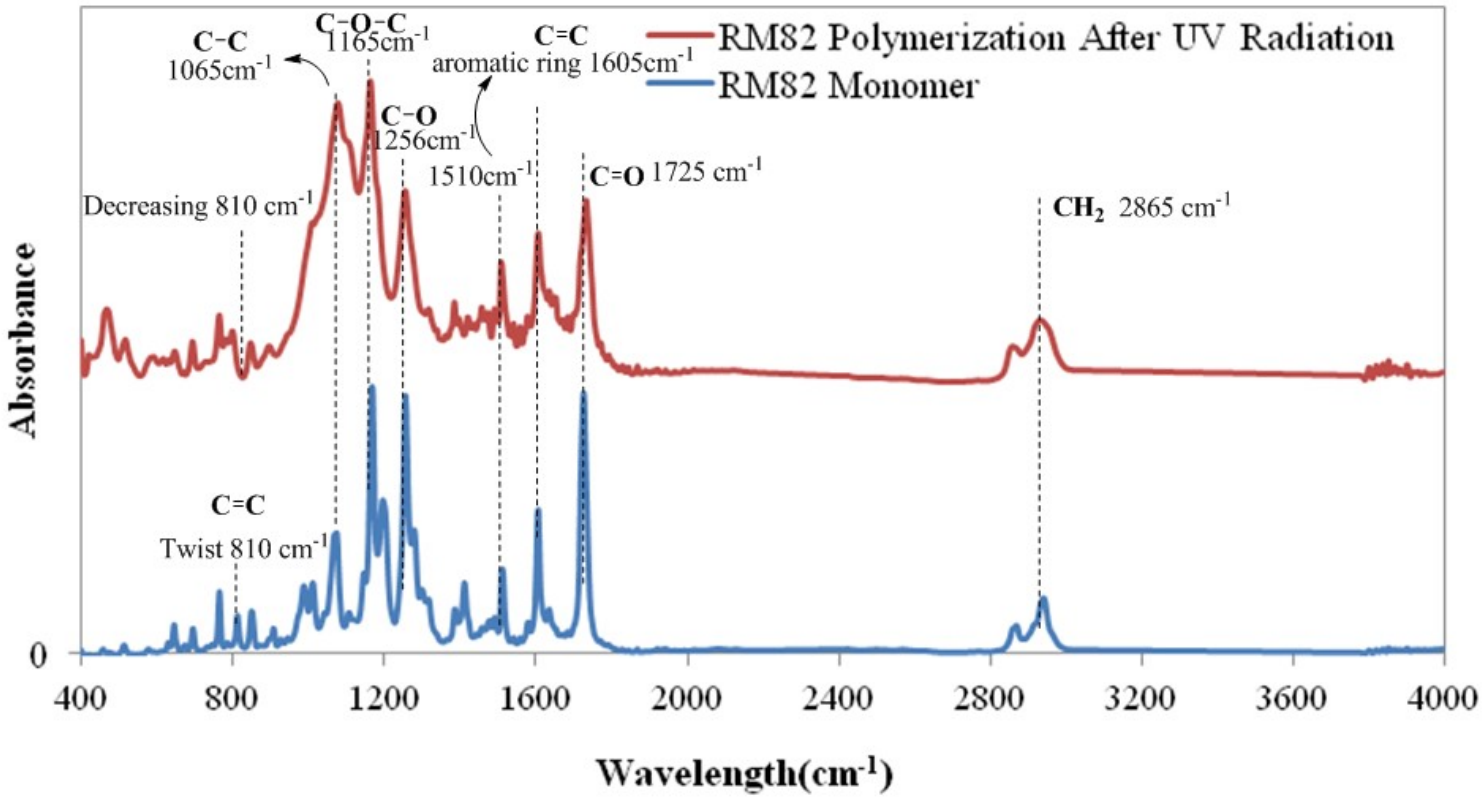
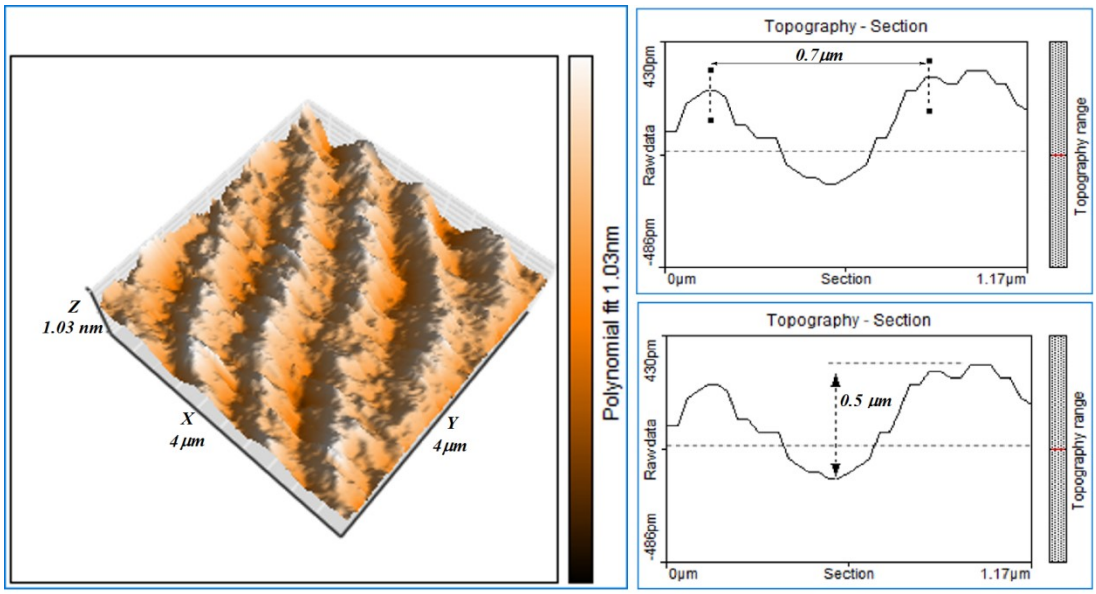
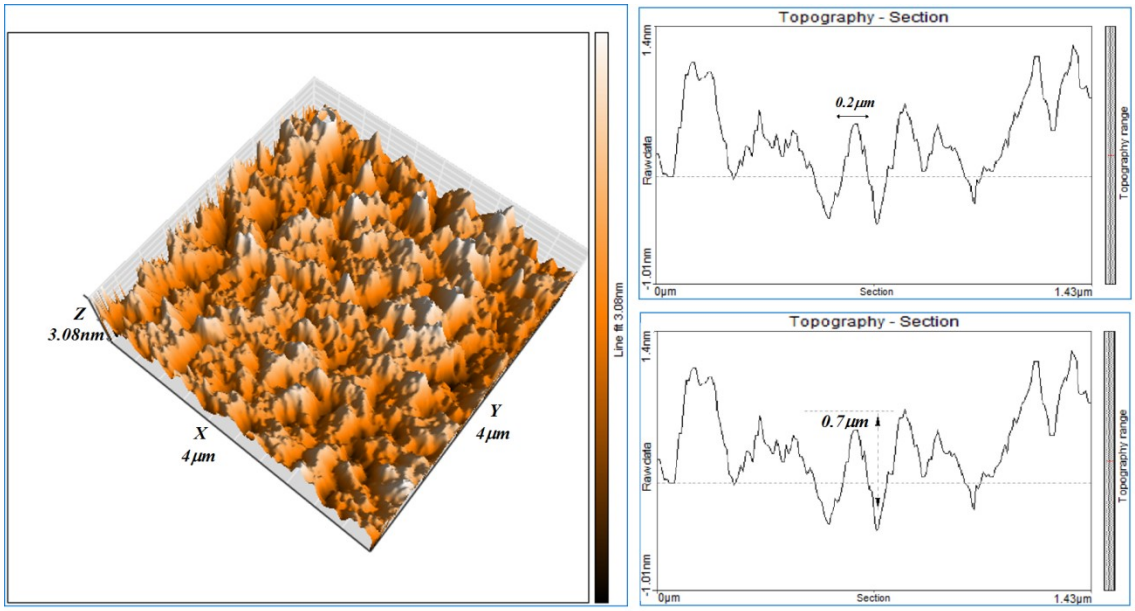


Figure S1. FT-IR spectra before and after photo-polymerization of RM 82



a



b

Figure S2. AFM images analysis in,a) the planar orientate side (front) ,b) the homeotropic oriented side

Third order nonlinear absorption

In open-aperture z-scan the normalized transmission of a nonlinear media is a function of nonlinear absorption (β) and is given by: [1]

$$T_{norm}(z) = \frac{Ln(1+q_0(z,t))}{q_0(z,t)} \quad (1)$$

Where,

$$q_0(z,t) = \beta I_0 L_{eff} \,/\, (1+z^2/z_0^2) \quad (2)$$

In eq 2, the diffraction length of the beam, the effective length of sample and the intensity of the laser beam at the focus point symbolized by Z_o , L_{eff} and I_o ,respectively. L_{eff} is the effective thickness of the sample and is obtained from the following equation: [2]

$$L_{eff} = \frac{1 - e^{-\alpha L}}{\alpha} \quad (3)$$

$$\alpha = \frac{1}{t} Ln \frac{1}{T} \quad (4)$$

Where, t is the sample thickness, α is the linear absorption and L is the thickness obtained from linear absorption spectra and Bear-Lambert law.

Table S1. Linear absorption and nonlinear absorption coefficients in LCN

Polarized light(405 nm)160 mWcm^{-2}	α (1/cm)	β (cm/W)	$L_{\text{eff(cm)}}$
45° to the planer side (E45°)	69.09	0.070	0.0018
Parallel to the planer side (E ∥ x)	97.8775	0.062	0.0011
Perpendicular to the planer side (E ⊥ x)	86.36	0.081	0.0008

References

1 E. W. Van Stryland ,M. Sheik-Bahae, Z-scan Measurements of Optical Nonlinearities, in: M. G. Kuzyk , C. W.Dirk (Eds.),Characterization Techniques and Tabulations for Organic Nonlinear Materials, Marcel Dekker, Inc. New York, 1998, 655-692.

2 M. Sheik-Bahae, A.A. Said, V. Stryland, Opt. Lett. 1989, 14, 955.