Electronic Supplementaly Information (ESI)

Molecular dynamics in azobenzene liquid crystal polymer films measured by time-resolved techniques

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Fig.S1 Pictures of the film bending by irradiation of a UV light at the wavelength of 365 nm at (a) 65 ℃, and (b) 30 ℃, and the returning back to the original position by irradiation of a visible light (>540 nm). The film size was 10 mm×3 mm×16 μm. The light intensities of the UV and the visible lights were 10 and 40 mW/cm^2.

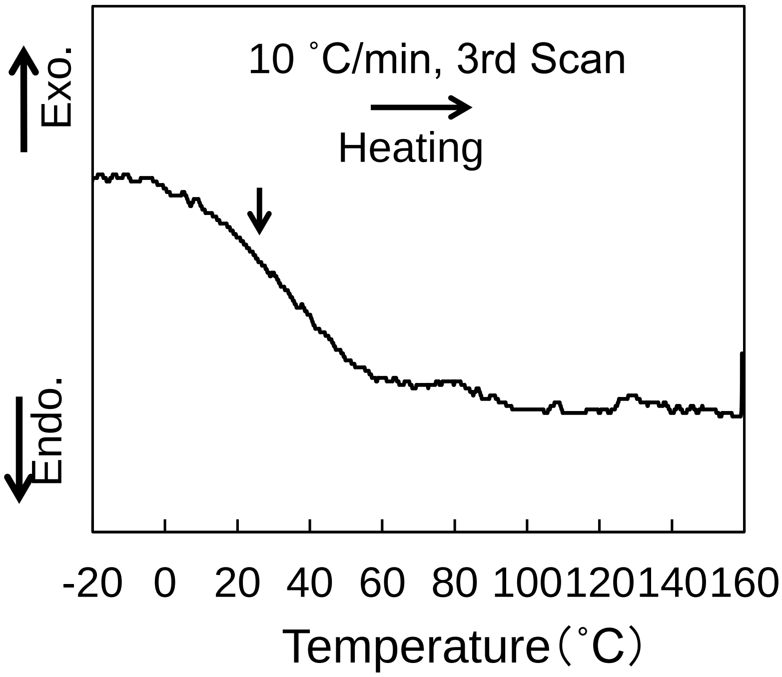

Fig.S2 The result of the DSC scan for the liquid crystal polymer film. The heating and cooling rates were 10 ˚C/min.

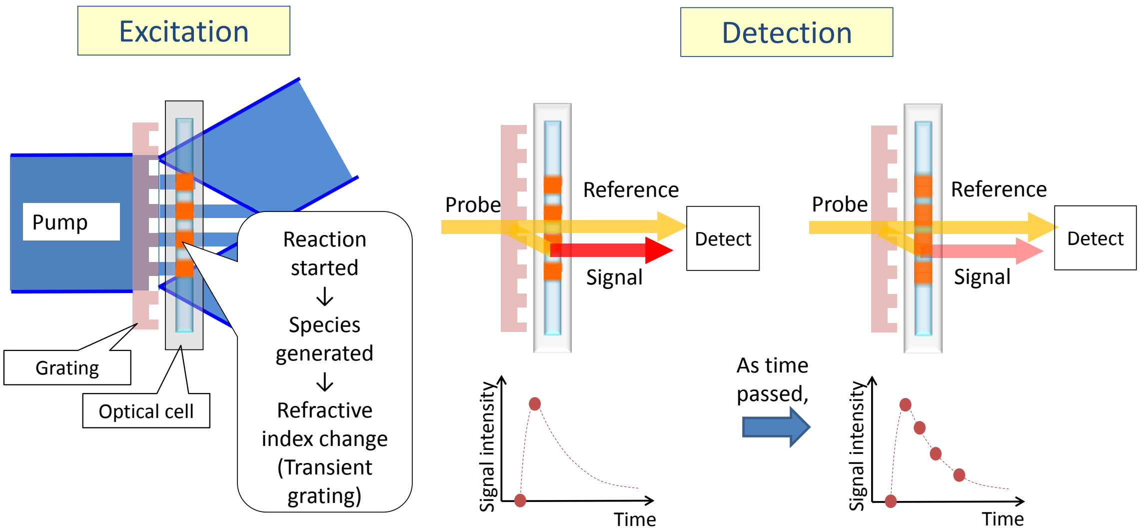

Fig.S3 Schematic diagram of the heterodyne transient grating method.

When a pump beam is incident on a transmission grating; an intensity pattern of an optical fringe is formed close to the grating. When a sample is placed near the transmission grating, it can be excited by the fringe pattern of the pump light. The refractive index of the liquid changes giving the same pattern as the optical fringe because of photochemical or photothermal processes; the pattern of refractive index change is called a transient grating. When another light beam (probe light) is incident on the transient grating, a part of the probe is transmitted (reference), or another part of the probe is once diffracted by the transmission grating and refracted by the transient grating into the same direction with the reference (signal). The intensity of the mixture of the signal and reference (heterodyne signal) was monitored as the time passed. When the transient grating is composed of an intermediate chemical species, the fringe pattern is gradually lost not only by the intrinsic lifetime of the species but also by the diffusion in the perpendicular direction to the fringe. We can recognize the signal decay was due to lifetime or diffusion by checking the dependence on the grating spacing because the decay time due to the diffusion process depends on it.

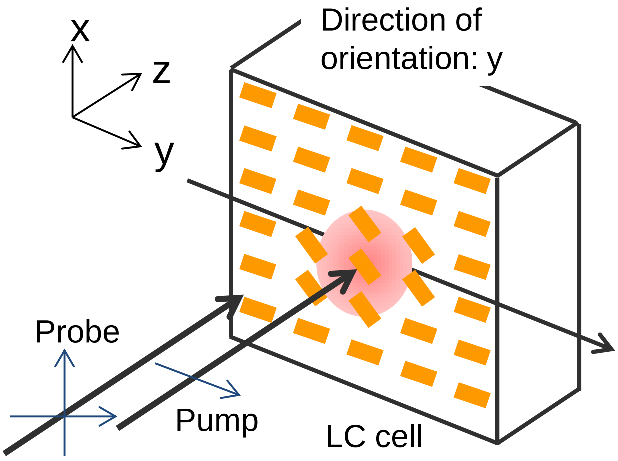

Fig. S4 The sample orientation and optical configuration are shown. The sample was sandwiched by two glasses with oriented films, whose director axis is in the y-direction. The polarizations of the pump and probe beams are shown. The polarization of pump light was parallel to the director axis and the probe polarization direction was controlled to be parallel or perpendicular to the pump and the director direction.