Supplementary Material (ESI) for Journal of Materials Chemistry

Supplementary Information

Fabrication of Two-Dimensional Dimple and Conical Microlens Arrays from a Highly Periodic Toroidal-Shaped Liquid Crystal Defect Array

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S1. POM images of the TFCD array at room temperature

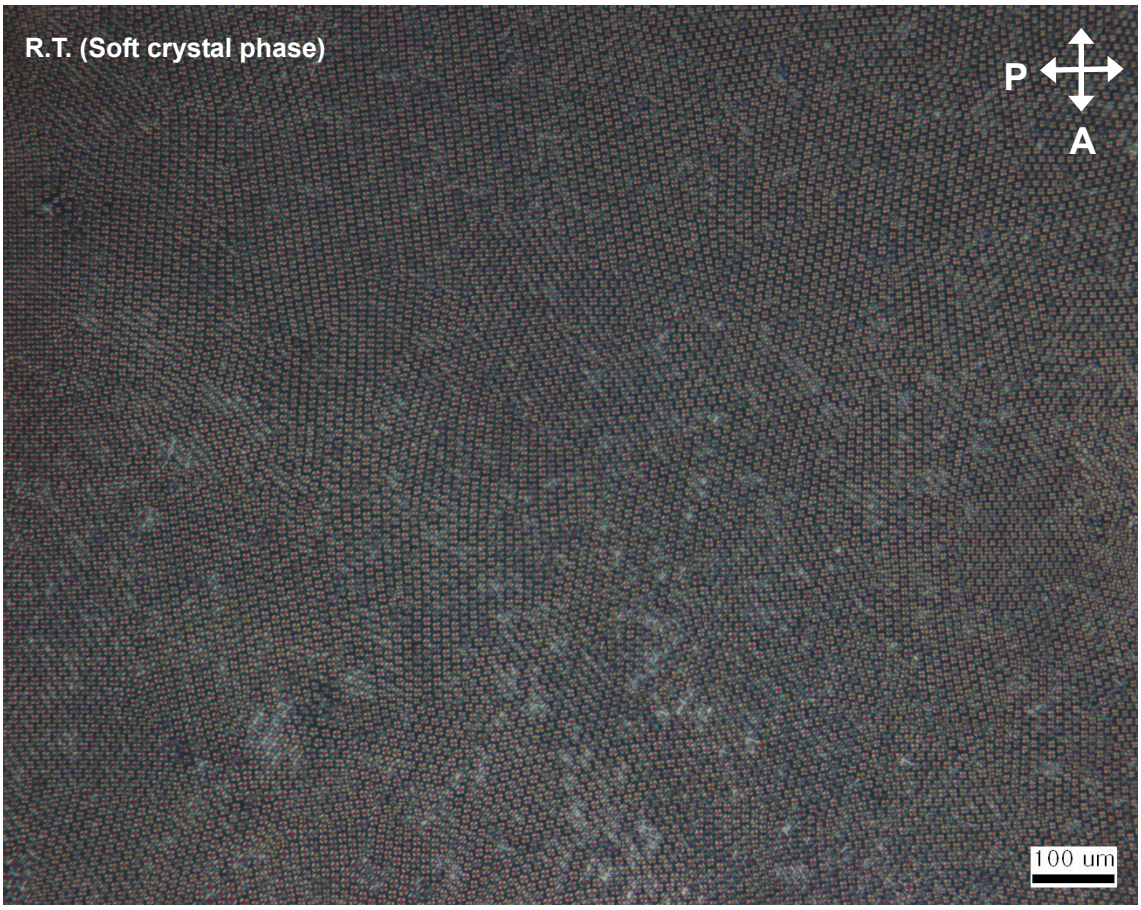

Figure S1. A polarized optical microscopy image of LC material at room temperature, 25^{o}C. The original dimple morphology of the TFCD produced within the S_mA regime can be preserved at room temperature by a quenching process. The milky white regions in the background indicate that the molecules are somewhat packed and tilted at the S_mA - S_mX transition during the cooling process.

S2. The conical structure of NOA63 mold (MLA-2)

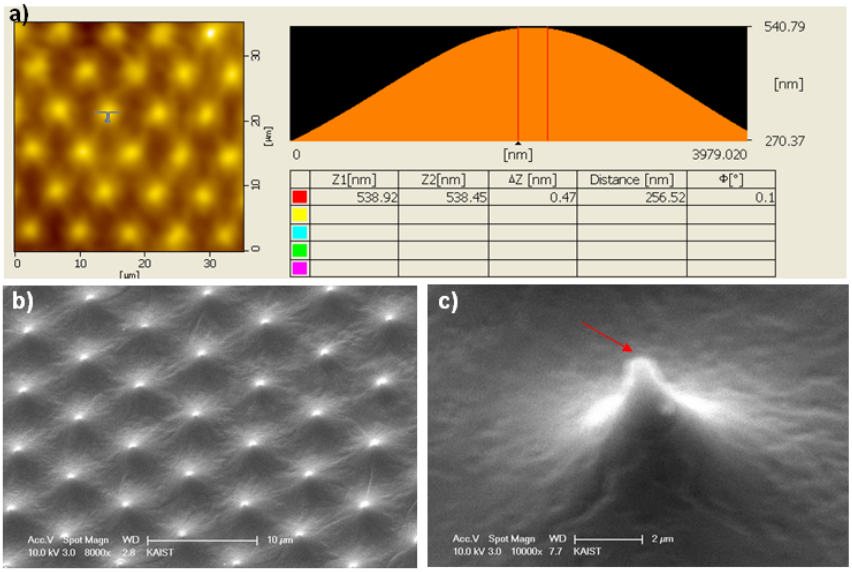

Figure S2. AFM data and SEM micrographs of the nano-tip structure of the NOA63 polymer MLA (MLA-2). (a) AFM height profile shows that the size of the nano-tip is ~250 nm. The nano-tip diameter is defined by the highest region having the same height. (b) Direct SEM examination of the polymer MLA shows ordered conical structures with hexagonal symmetry that are the inverse of the TFCD array's dimple structures. (c) High resolution SEM examination of a single conical structure on the polymer MLA reveals a well-defined morphology. The red arrow indicates a single nano-tip at the apex of the conical structure. (Scales: b, 10 μm; c, 2 μm)

S3. The measurement of focal length of MLAs

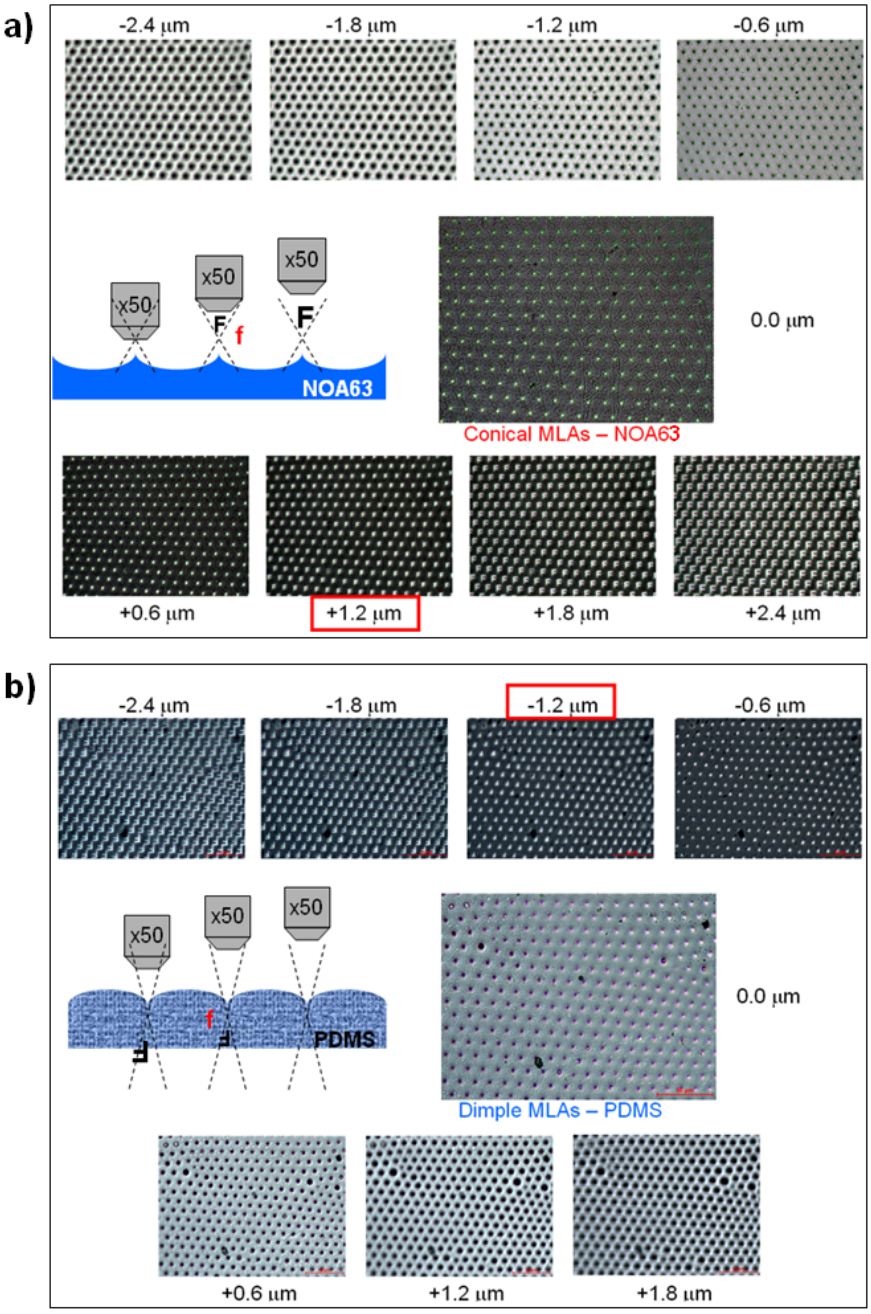

Figure S3. Images captured by microscope system at different positions along the z-axis for two MLA systems (a) The focal plan of conical microlens fabricated by NOA63 (MLA-2) exist at the positive z-position (z = + 1.2 µm) with straight "F" (b) The focal plan of dimple shaped microlens fabricated by PDMS (MLA-3) exist at the negative z-position (z = - 1.2 µm) with inverted "F" due to geometrical property of dimple structure.