Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Hierarchically Structured Photonic Crystals for Integrated Chemical Separation and Colorimetric Detection

*Qianqian Fu, Biting Zhu and Jianping Ge**

Supplementary Figures

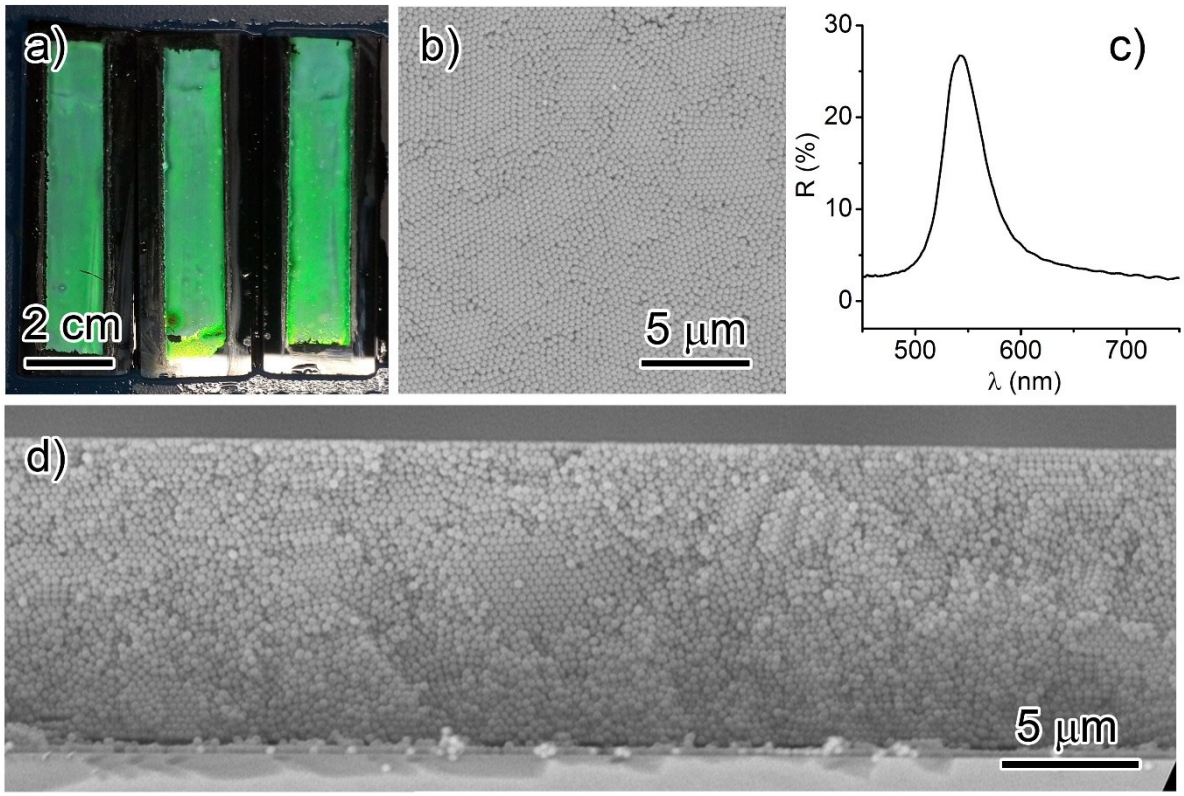

Figure S1. Ordered structure and optical signal of photonic crystal film. A) digital photo, b) top-view and d) cross-section SEM image and c) typical reflection spectrum of a green photonic crystal thin film composed of mesoporous SiO_2 particles. SEM image shows that the thin film is composed of crystalline and amorphous stacking of m-SiO_2 particles due to the microscopic phase separation in its metastable precursor.

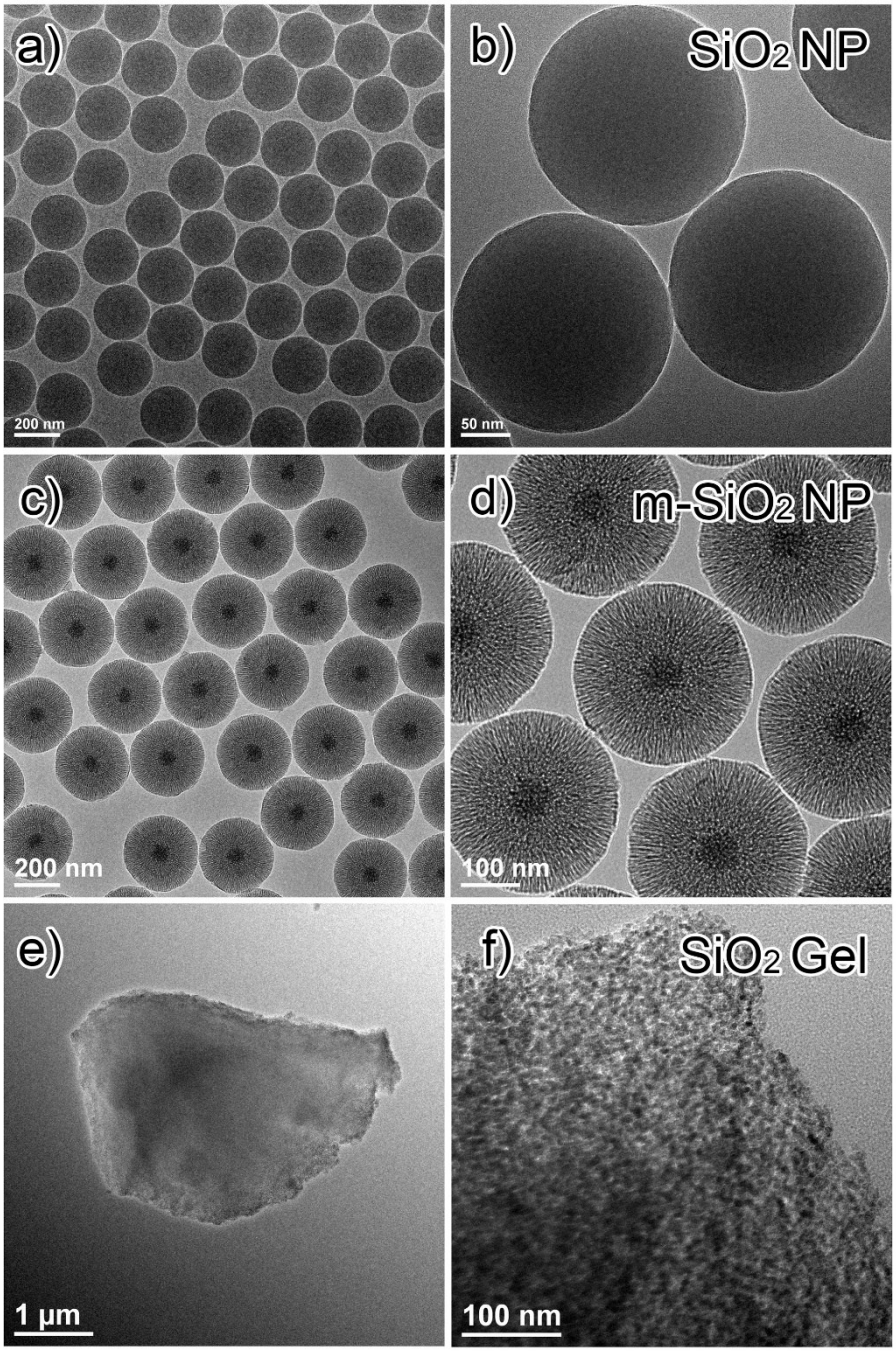

Figure S2. Three kinds of SiO_2 particles for fabrication of TLC plates. TEM image of a, b) dense SiO_2 nanoparticle, c, d) mesoporous SiO_2 nanoparticles and e, f) mesoporous SiO_2 gels for the preparation of TLC plates.

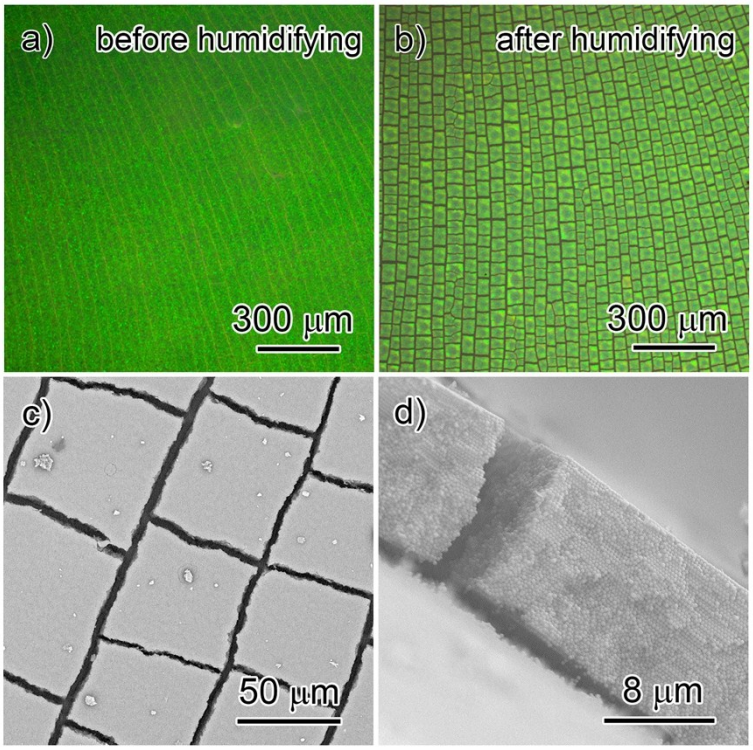

Figure S3. Optical microscope image of photonic crystal film a) before and b) after humidifying process in fabrication of TLC plate. c) top-view and d) cross-section SEM image of photonic crystal thin film prepared by mesoporous SiO2 nanoparticles.

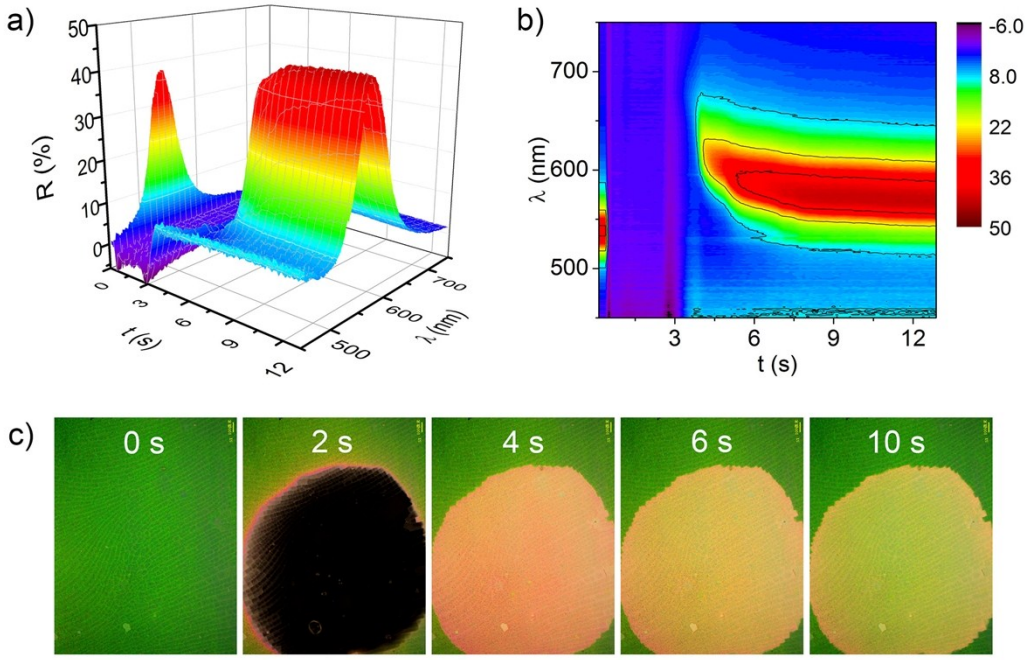

Figure S4. a ,b) Time resolved reflection spectra and c) color change of photonic crystal film during the process of sample loading.

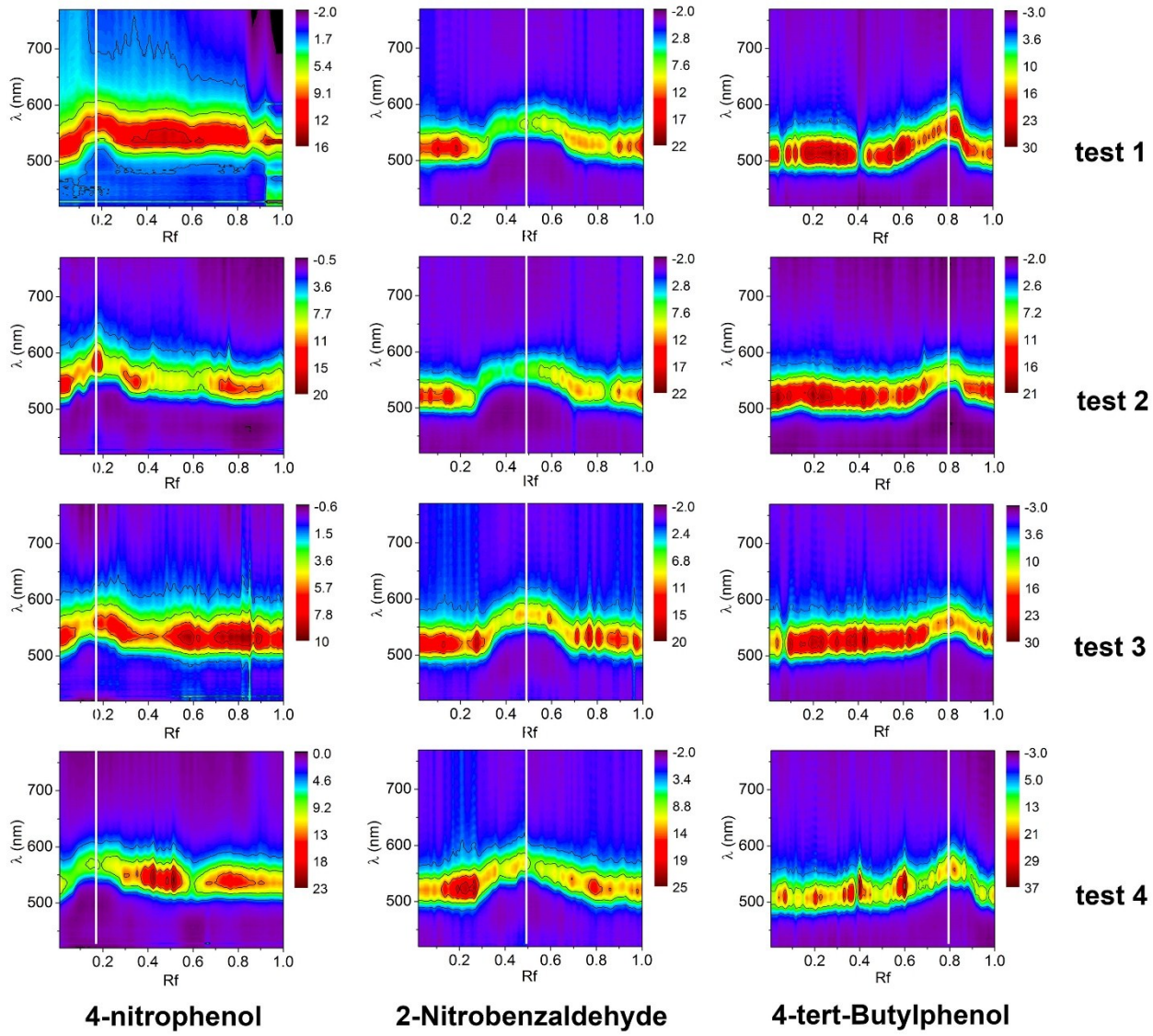

Figure S5. Differential migration of 4-NP, 2-NBA and 4-t-BP. Spatial resolved reflection spectra for the differential migration of 4-nitrophenol, 2-nitrobenzaldehye and 4-tert-butylphenol on photonic crystal TLC plate in 4 repeated test.

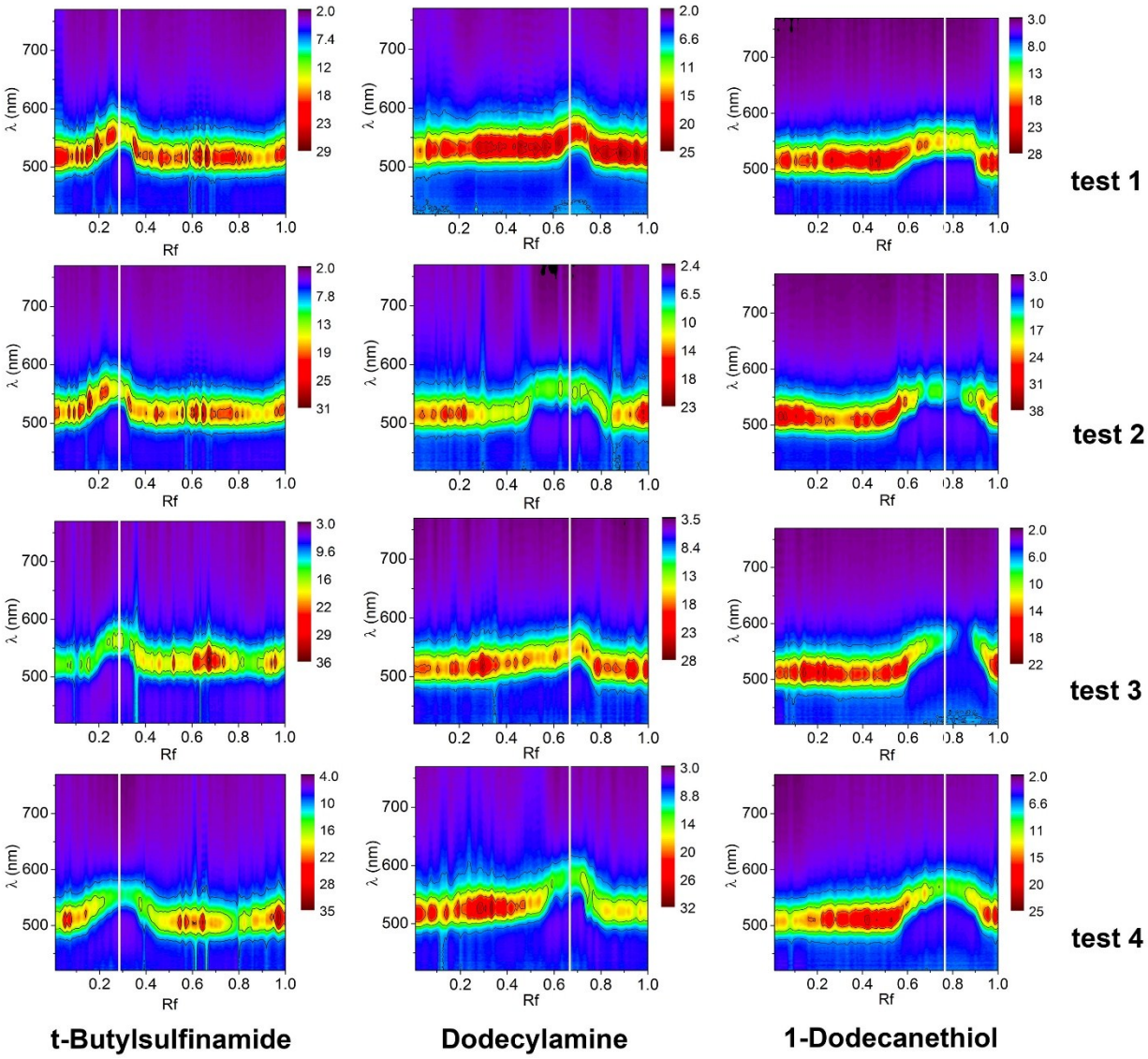

Figure S6. Differential migration of t-BSA, DA and DT. Spatial resolved reflection spectra for the differential migration of t-butylsufinamide, dodecylamide and dodecanethiol on photonic crystal TLC plate in 4 repeated test.

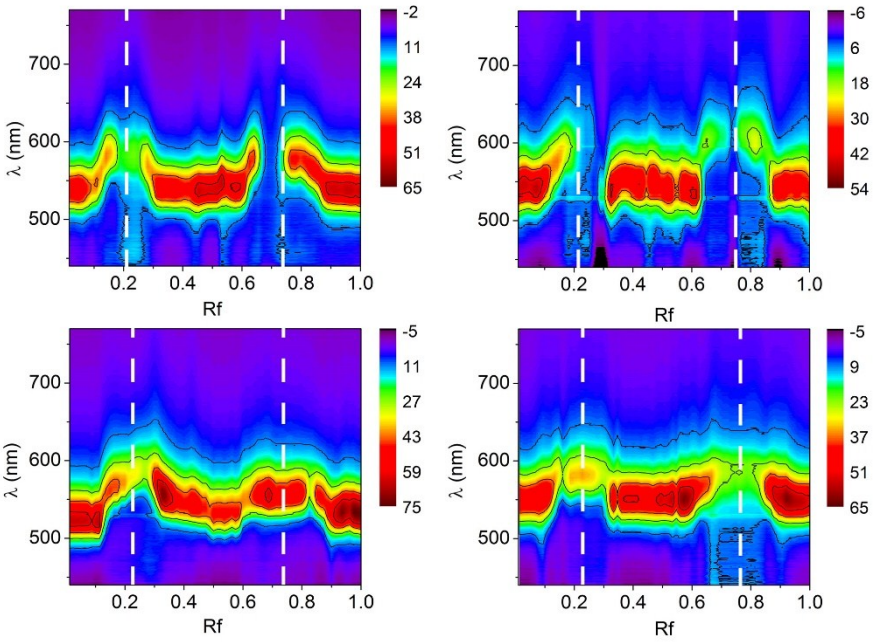

Figure S7. Separation of 4-NP and 4-t-BP. Spatial resolved reflection spectra for the separation of 4-nitrophenol and 4-t-butylphenol on photonic crystal TLC plate in 4 repeated test.

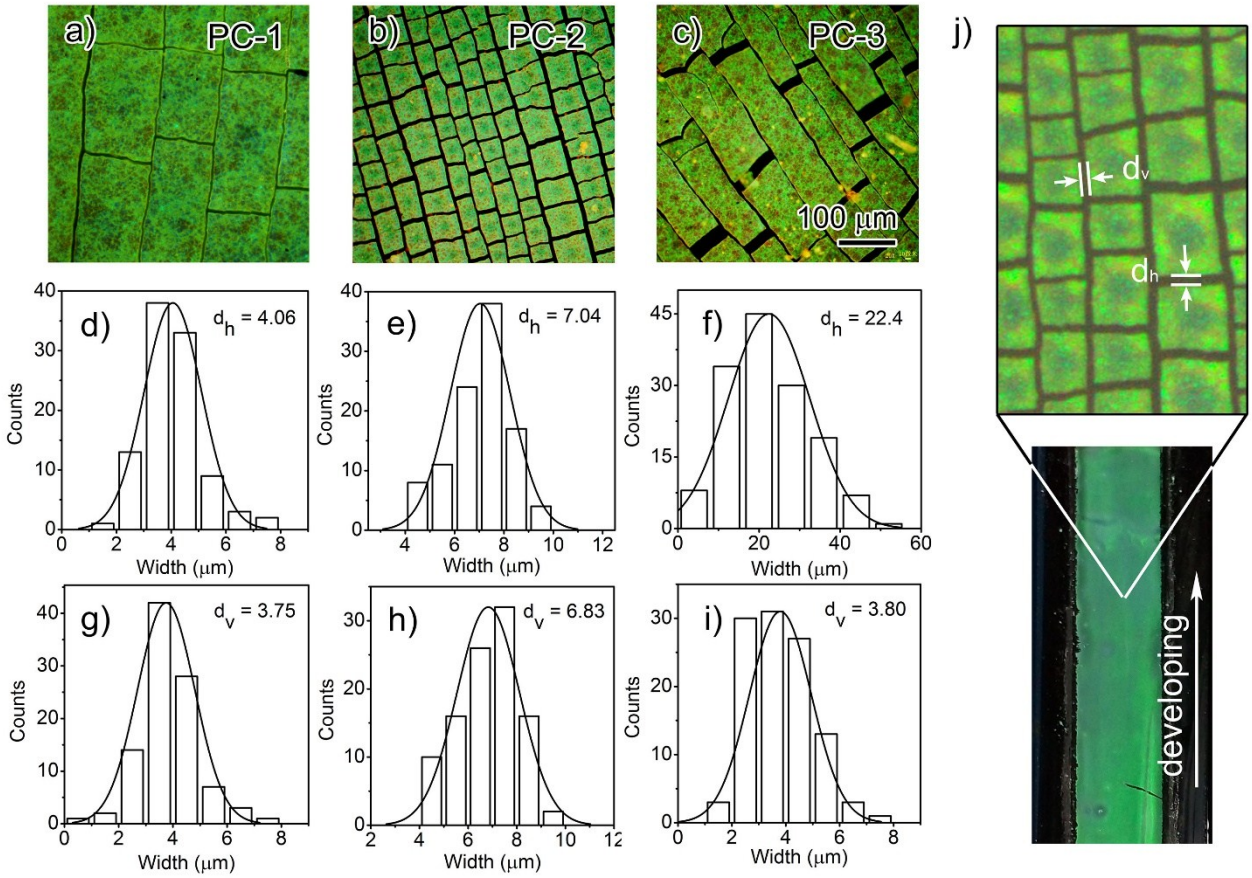

Figure S8. Distribution of cracks width in three PC plates. The cracks approximately perpendicular or parallel to the developing direction are defined as horizontal or vertical crack. a-c) Optical microscope images show that the crack enlarges as the humidity in humidifying step increases. d-i) Distributions of crack width suggest that d_h and d_v are close for PC-1 and PC-2, which have been treated in a relatively dry environment. (PC-1, RH = 30-40%; PC-2, RH = 50-60%). For PC-3, which is treated in a high humidity environment (PC-3, RH = 70-80%), the horizontal cracks become very large while the vertical cracks do not change too much.

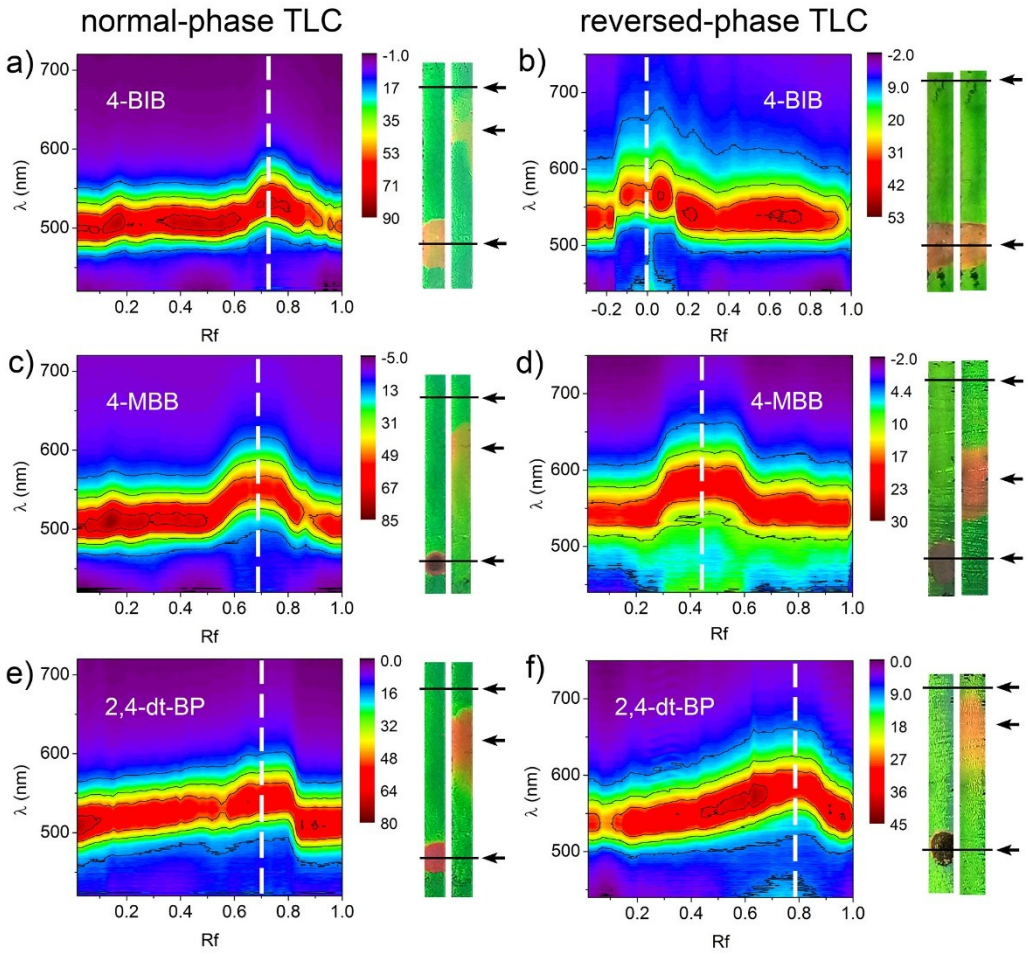

Figure S9. Similar migration in normal phase TLC but differential migration in reversed phase TLC. Spatial resolved reflection spectra and digital photos for the similar migration of 4-bromoiodobenzene, p-methylbenzyl bromide and 2, 4-di-tert-butylphenol on normal phase PC TLC plate, but differential migration of these three compounds on reversed phase PC TLC plate.

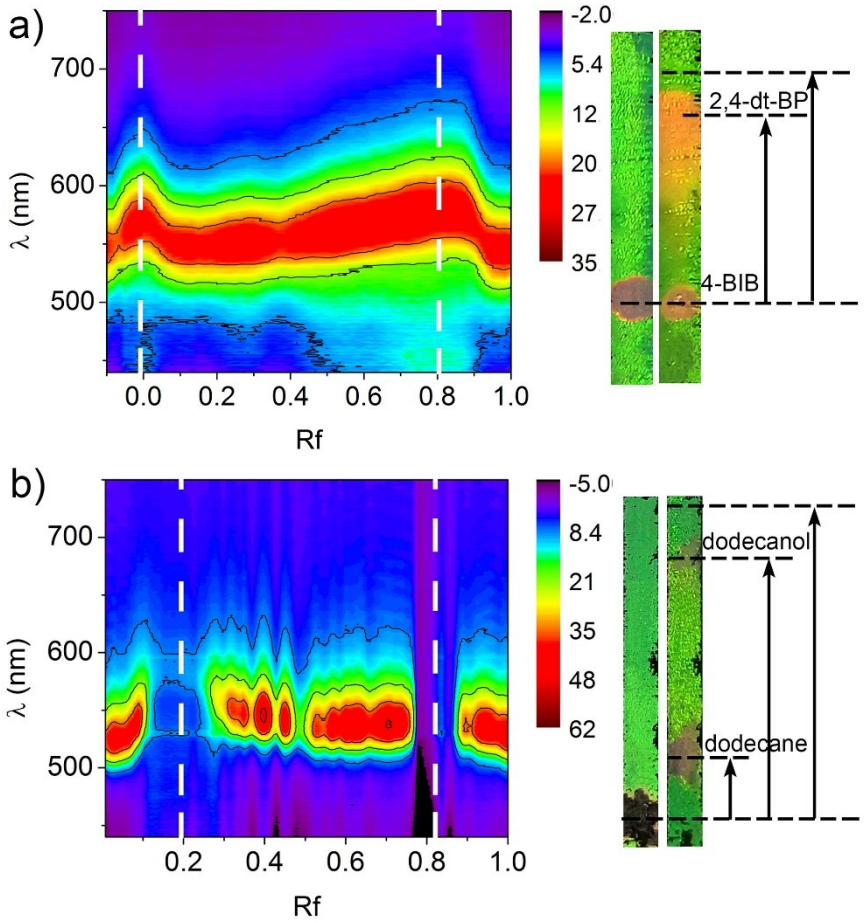

Figure S10. Separation of 4-BIB and 2, 4-dt-BP as well as dodecane and dodecanol by reversed phase PC-TLC. Spatial resolved reflection spectra and digital photos for the separation of 4-bromoiodobenzene and 2, 4-di-tert-butylphenol as well as dodecane and dodecanol on reversed phase PC TLC plate.

Supplementary Tables

Table S1. Quantitative results for the separation of 4-NP and 4-t-BP on PC plates with different crack widths.

	PC-1	PC-2	PC-3
Crack Width (h)	4.06 μm	7.04 μm	22.4 μm
Crack Width (v)	3.75 μm	6.83 μm	3.80 μm
Thickness	12.7 μm	11.5 μm	11.7 μm
$R_{f\ (NP)}$	0.2	0.34	0.45
$R_{f\ (t\text{-}BP)}$	0.73	0.78	0.84
$R_{f\ (t\text{-}BP)} - R_{f\ (NP)}$	0.53	0.44	0.39
Peak Width $_{(NP)}$	0.35	0.29	0.38
Peak Width $_{(t\text{-}BP)}$	0.45	0.26	0.33
Peak Height $_{(NP)}$	46 nm	30 nm	18 nm
Peak Height $_{(t\text{-}BP)}$	40 nm	29 nm	38 nm