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

Electronic Supplementary Information (ESI) for

Control over microphase separation and dielectric properties via para-fluoro thiol click reaction

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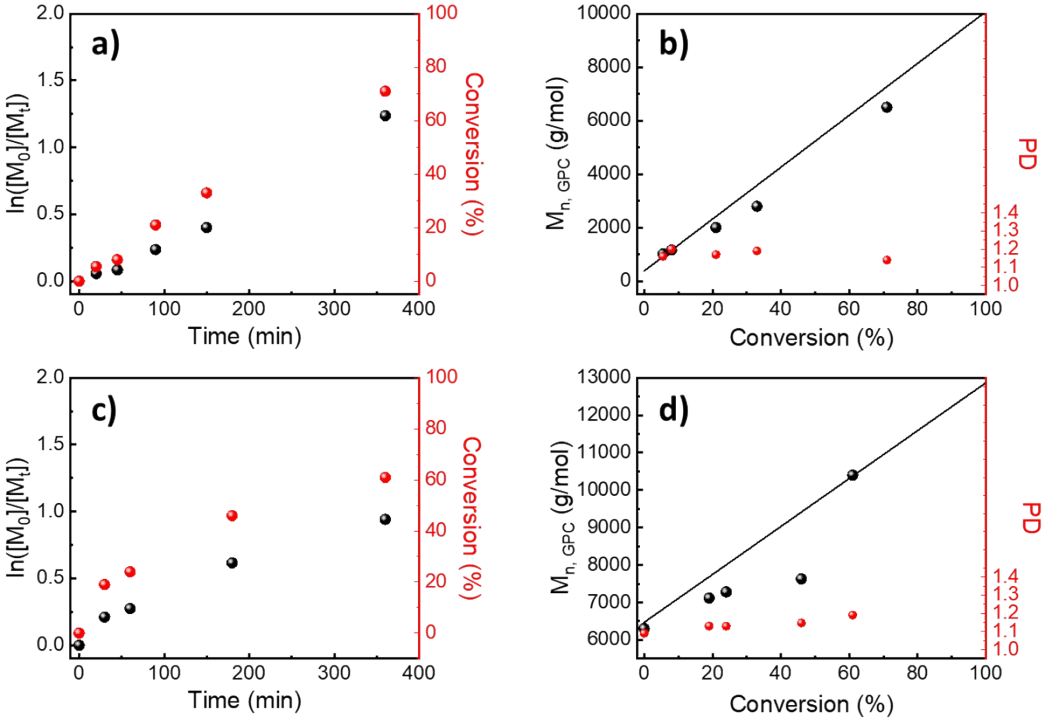

Fig. S1. (a, c) Semi-logarithmic kinetic plot and monomer conversion versus time data for polymerisation of 1st block (PFS) and 2nd block (tBA). (b, d) $M_{n,\,GPC}$ and PD values versus monomer conversion for each block.

$$f_{PAA} = \frac{\frac{N_{PAA} \times m_{PAA}}{\rho_{AA}}}{\left(\frac{N_{PAA} \times m_{PAA}}{\rho_{AA}}\right) + \left(\frac{N_{PFS} \times (m_{PFS} + CR \times m_{thiol})}{[\rho_{PFS} \times (1 - CR)] + [\rho_{clicked} \times CR]}\right)} \quad (1)$$

The volume fraction of blocks were calculated above formulation. N_{PAA} and N_{PFS} are the degrees of polymerisation of the AA and PFS blocks. m_{AA}, m_{PFS}, and m_{thiol} are the molar masses of acrylic acid (72 g/mol), pentafluoro styrene (194 g/mol), and 1-dodecanethiol (202 g/mol). ρ_{PAA} and ρ_{PFS} are the densities of PAA and PFS blocks which are taken as 1.41 and 1.55 g/mL, respectively. $\rho_{clicked}$ is the density of clicked part of PFS block and is assumed as 1.19 g/ml. *CR* is click ratio and varies between 0 and 0.86.

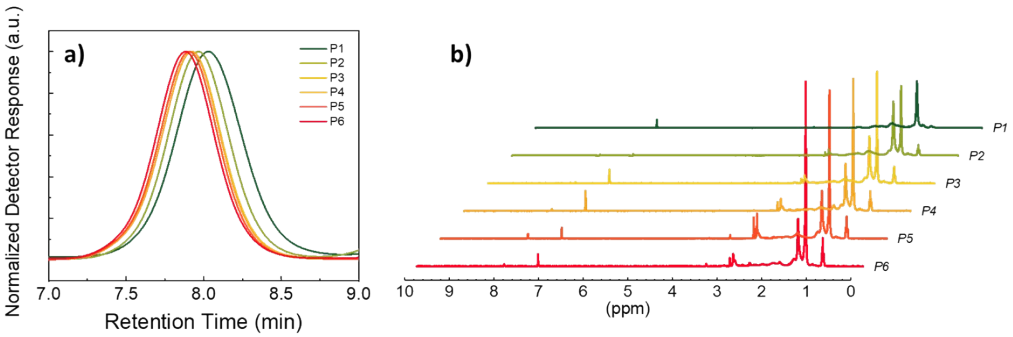

Fig. S2. (a) GPC traces and ^{1}H NMR spectra of P(PFS-b-tBA) for different click ratio

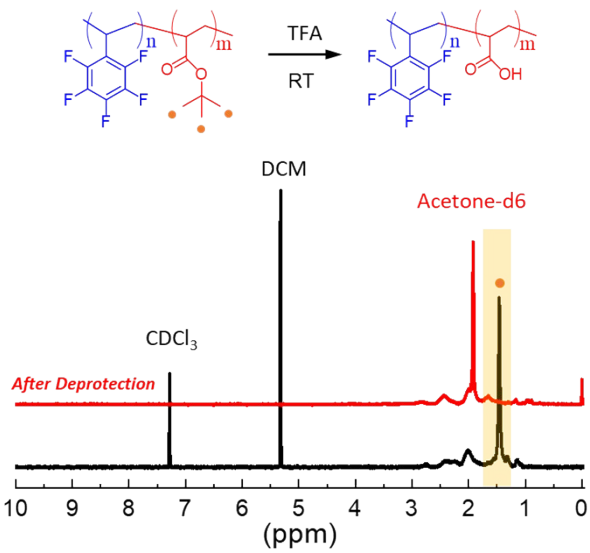

Fig. S3. ^{1}H NMR spectra of polymers before and after deprotection.

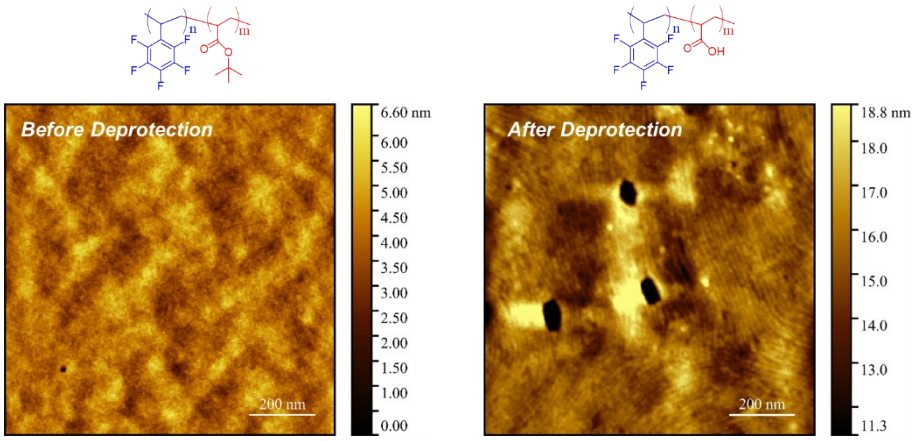

Fig. S4. AFM images of thin films of polymers before and after deprotection. The deprotection induces the phase separation and fingerprint-like lamellar structures appear after deprotection.

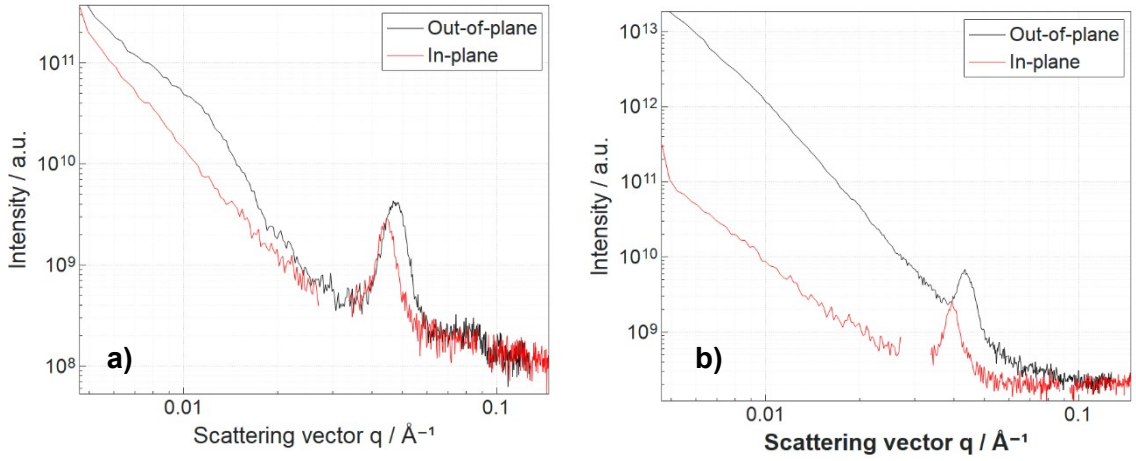

Fig. S5. The measured SAXS signal in the in-plane and out-of-plane directions for (a) without PFTR (P1) and (b) with PFTR (P2) samples.

$$x = R_g^2 q^2 \tag{2}$$

$$g(f,x) = 2[fx + \exp(-fx) - 1]/x^2 \tag{3}$$

$$F(f,x) = \frac{g(1,x)}{g(f,x)\, g(1-f,x) - \frac{1}{4}[g(1,x) - g(f,x) - g(1-f,x)]^2} \tag{4}$$

$$S(q)^{-1} = \frac{F(f,x)}{N} - 2\chi \tag{5}$$

According to the Leibler theory, Equations 2 to 5 were used to calculate the χ parameter of P(PFS-b-AA). R_g is the radius of gyration of an ideal (Gaussian) chain and q is the wave vector that is measured by SAXS. $g(f,x)$ is the Debye function, where f is the volume fraction of any block. The dimensionless structure factor, S, is a function of q and obtained by SAXS, and N is the total number of segments. R_g^2 is found to be 64.76 nm^2 and q is 0.46 nm^{-1}.

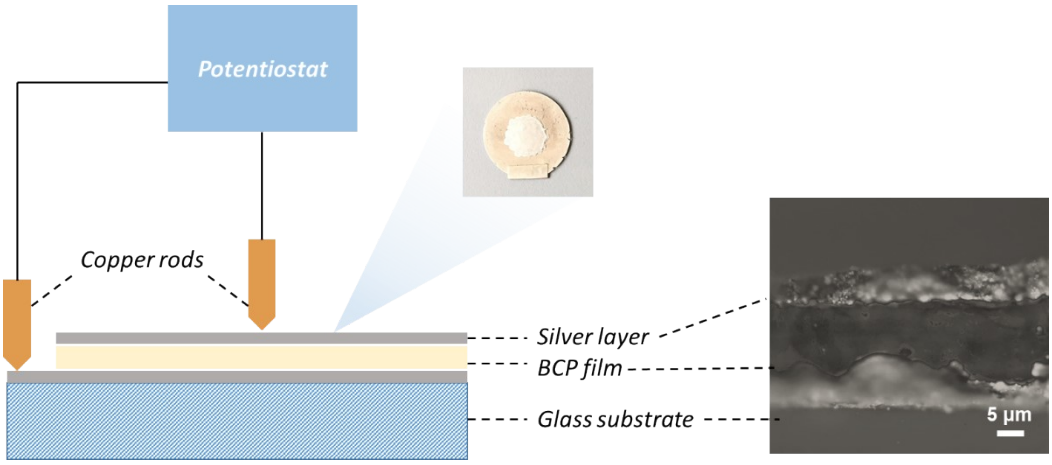

Fig. S6. Schematic presentation connections for dielectric measurement. Cross sectional microscope image and photo of EIS samples.