Controlled synthesis of poly(pentafluorostyrene-ran-methyl methacrylate) copolymers by nitroxide mediated polymerization and their use as dielectric layers in organic thin-film transistors

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SUPPORTING INFORMATION

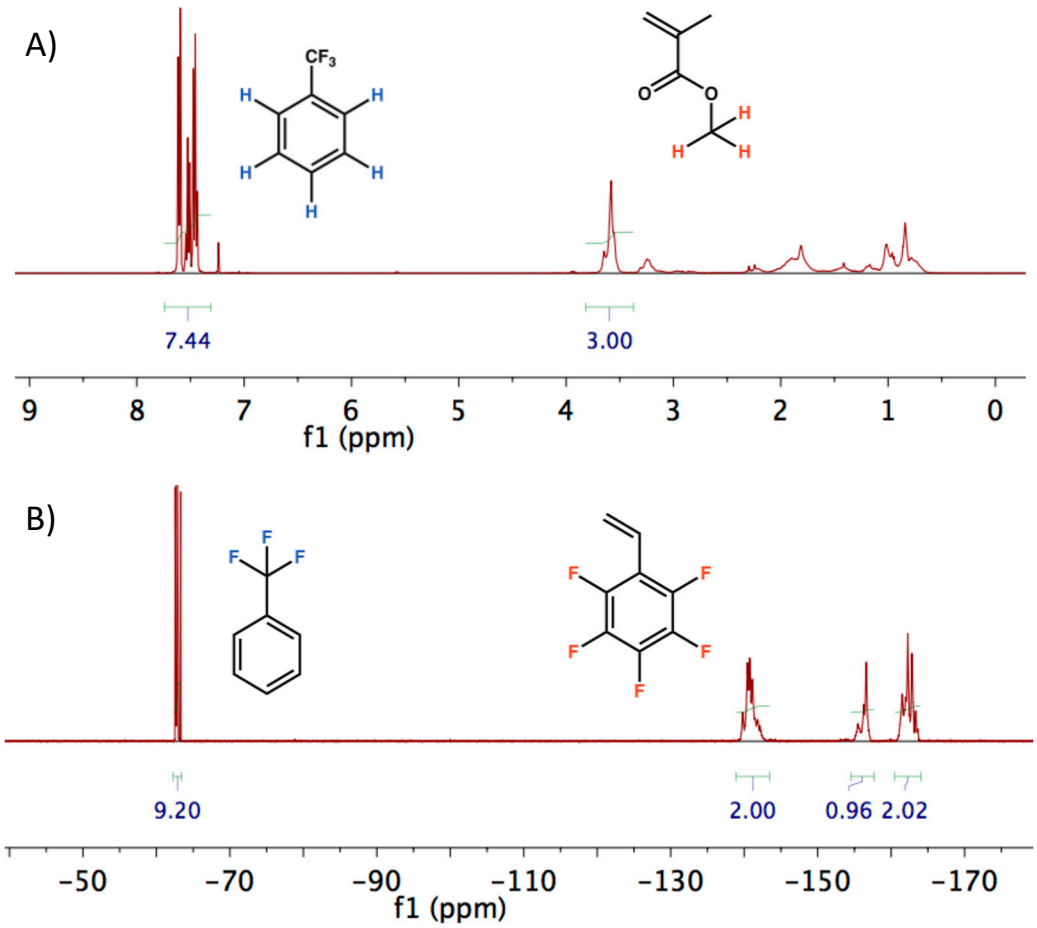

Figure S1. A) ^{1}H NMR and B) ^{19}F NMR spectrum of the final copolymer PFS/MMA 80/20 with α-α-α-trifluorotoluene marker MMA to TFT ratio of 7.44 : 3.00 and PFS to TFT ratio of 9.20 : 2.0.

The following is a derivation of the equation used to determine the molar composition of the copolymers using the same NMR solution and using TFT as a standard for NMR comparison. (Figure S1).

^{19}F NMR:

$$TFT = \frac{1}{3}\delta_{-63} \quad ; \quad PFS = \frac{1}{2}\delta_{-140} \quad ; \quad \frac{PFS}{TFT} = \frac{\left(\frac{1}{2}\delta_{-140}\right)}{\left(\frac{1}{3}\delta_{-63}\right)}$$

^{1}H NMR:

$$MMA = \frac{1}{3}\delta_{3.6} \quad ; \quad TFT = \frac{1}{5}\delta_{7.5} \quad ; \quad \frac{TFT}{MMA} = \frac{\left(\frac{1}{5}\delta_{7.5}\right)}{\left(\frac{1}{3}\delta_{3.6}\right)}$$

$$\frac{PFS}{MMA} = \frac{PFS}{TFT} \times \frac{TFT}{MMA} = \frac{\left(\frac{1}{2}\delta_{-140}\right)\left(\frac{1}{5}\delta_{7.5}\right)}{\left(\frac{1}{3}\delta_{-63}\right)\left(\frac{1}{3}\delta_{3.6}\right)}$$

$$F_{PFS} = \frac{PFS}{PFS\ +\ MMA} = \frac{\frac{PFS}{MMA}}{\frac{PFS}{MMA} + \frac{MMA}{MMA}} = \frac{\frac{\left(\frac{1}{2}\delta_{-140}\right)\left(\frac{1}{5}\delta_{7.5}\right)}{\left(\frac{1}{3}\delta_{-63}\right)\left(\frac{1}{3}\delta_{3.6}\right)}}{\frac{\left(\frac{1}{2}\delta_{-140}\right)\left(\frac{1}{5}\delta_{7.5}\right)}{\left(\frac{1}{3}\delta_{-63}\right)\left(\frac{1}{3}\delta_{3.6}\right)} + 1}$$

$$\boldsymbol{F_{PFS}} = \frac{\left(\frac{1}{2}\boldsymbol{\delta_{-140}}\right)\left(\frac{1}{5}\boldsymbol{\delta_{7.5}}\right)}{\left(\frac{1}{2}\boldsymbol{\delta_{-140}}\right)\left(\frac{1}{5}\boldsymbol{\delta_{7.5}}\right) + \left(\frac{1}{3}\boldsymbol{\delta_{-63}}\right)\left(\frac{1}{3}\boldsymbol{\delta_{3.6}}\right)}$$

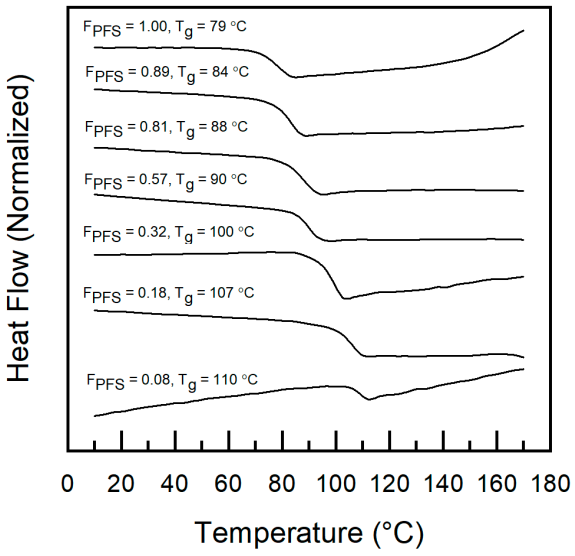

Figure S2. DSC exothermic thermograms of PFS/MMA copolymers

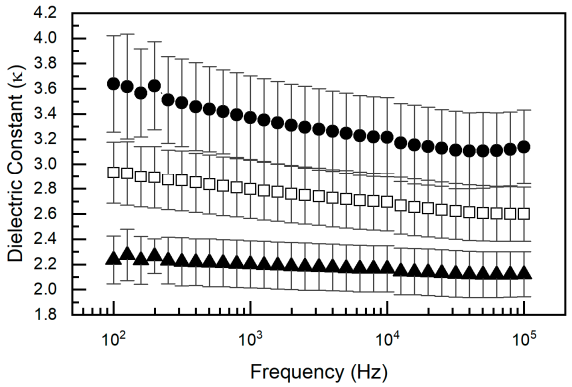

Figure S3. a) Dielectric constant versus frequency from 10^2 – 10^5 Hz obtained by impedance spectroscopy on MIM capacitors utilizing PFS/MMA copolymers as insulating layer of compositions: F_{PFS} = 0.08 (closed circles), F_{PFS} = 0.57 (open squares), and F_{PFS} = 0.81 (closed triangles).

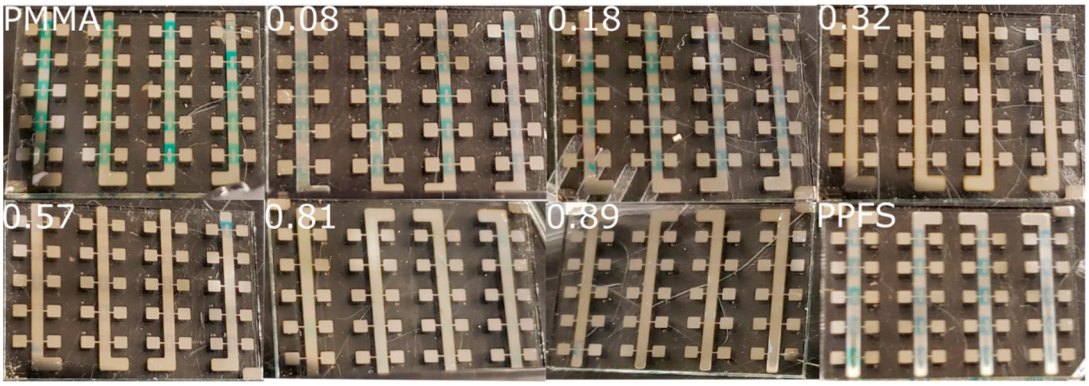

Figure S4. PFS/MMA copolymer OTFTs CuPc Visibility at varying PFS content.

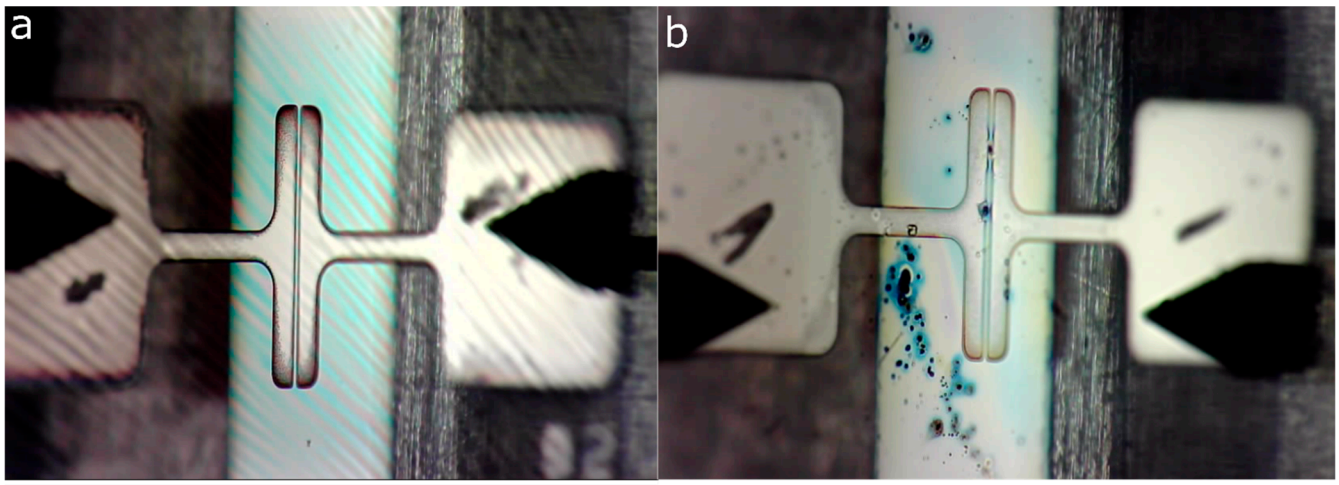

Figure S5. Microscope images of CuPc deposited on a). PFS 8 and b). PFS 81.

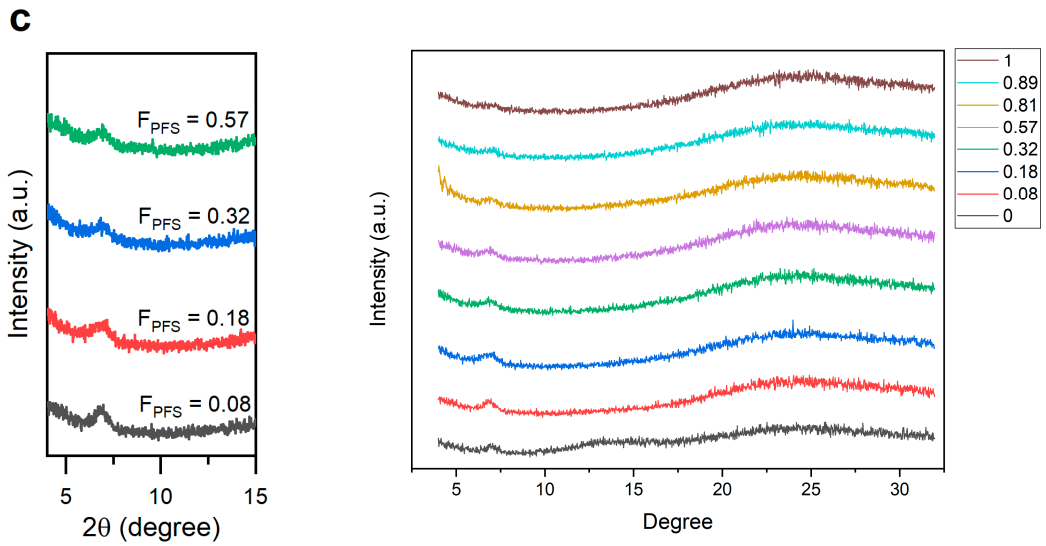

Figure S6. X-ray diffraction pattern performed on CuPc films deposited on PFS/MMA underlying films of varying compositions.