

Electronic Supplementary Information

Exceptionally thermostable and soluble aromatic polyimides with special characteristics: intrinsic ultralow dielectric constant, static random access memory behaviors, transparency and fluorescence

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Table S1 Thermal and photophysical properties of the WuCF₃DA

Compd	T_g ^{a)} [°C]	T_d ^{b)} [°C]		$\lambda_{\max}^{\text{abs c)}$ [nm]	$\lambda_{\max}^{\text{em}}$ [nm]	
		5%	10%		THF ^{d)}	Powder
WuCF ₃ DA	165	378	402	314	510	446

a) measured by DSC at a heating rate 10°C/min;

b) measured at a heating rate of 20 °C /min under N₂;

c) WuCF₃DA concentration of 10⁻⁵ mol/L in THF;

d) measured in THF solution and a concentration of 10⁻⁵ mol/L.

Table S2 Mechanical and dielectrical properties of the WuCF₃PI films

Polymer	Tensile Strength [MPa]	Tensile Modulus [GPa]	Dielectric Constant
WuCF ₃ PI-6F	85.7	2.9	1.93
WuCF ₃ PI-BP	81.1	3.3	2.25
WuCF ₃ PI-BT	88.3	3.1	2.07
WuCF ₃ PI-PM	74.3	3.0	2.27

Figure S1 (a) ^1H NMR, (b) ^{13}C NMR, (c) H-H COSY (d) C-H QC and (e) C-H BC spectra of WuCF₃DA in DMSO-*d*₆.

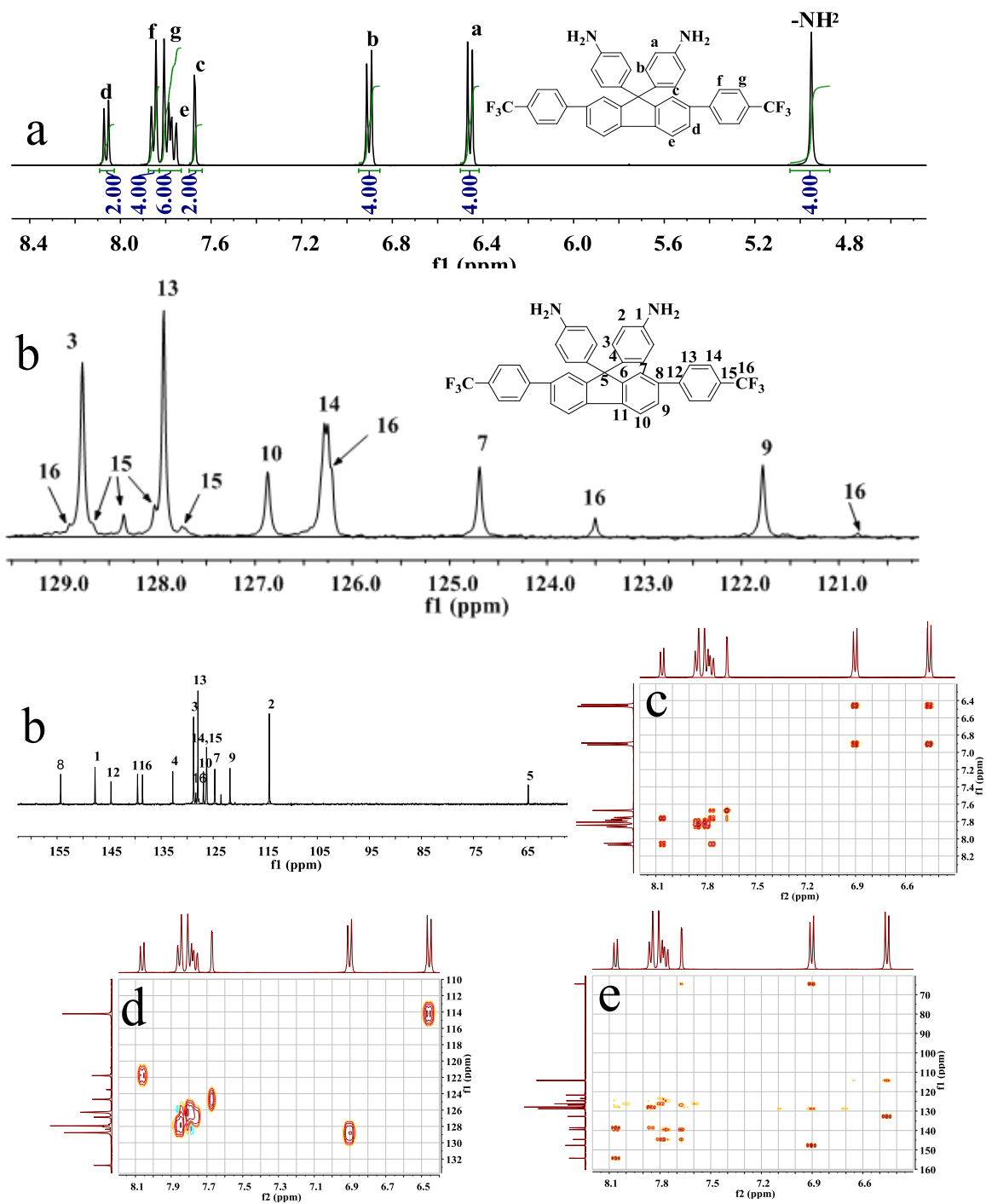


Figure S2 FTIR spectra of WuBrDN, WuCF₃DN, WuCF₃DA and the polyimide WuCF₃PIs.

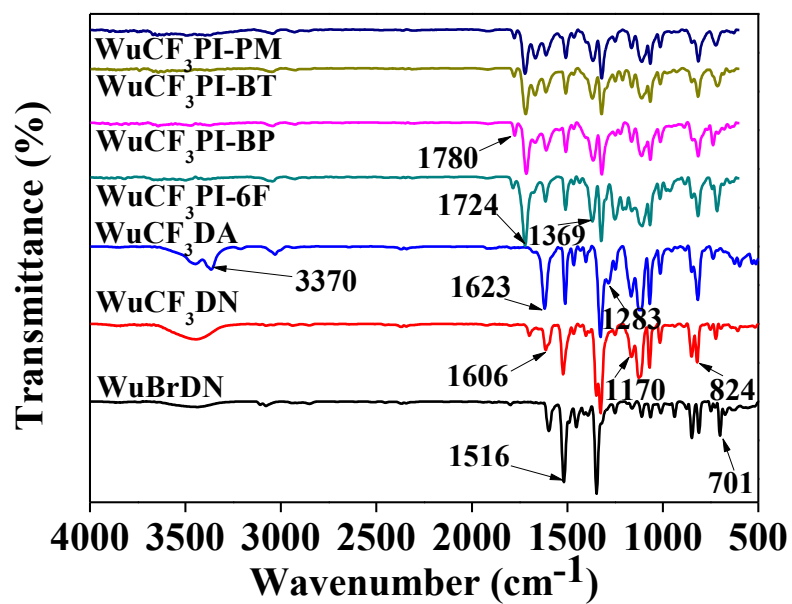


Figure S3 (a) ¹H NMR and (b) H-H COSY spectra of F WuCF₃PI in DMSO-*d*₆.

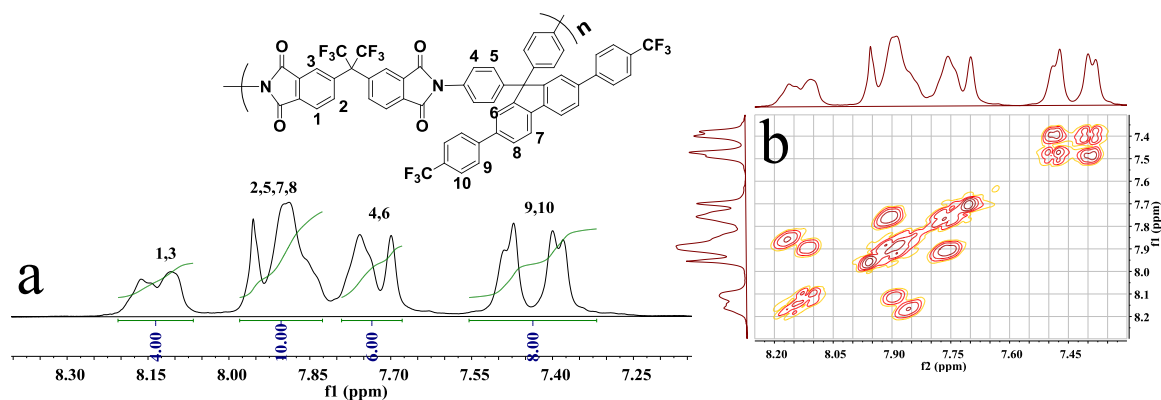


Figure S4 TGA curves of the WuCF_3PI films

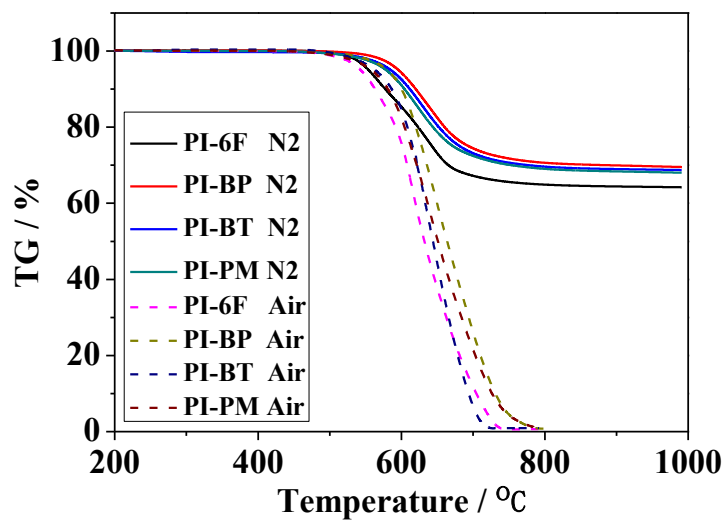


Figure S5 DSC curves of the WuCF_3PI films

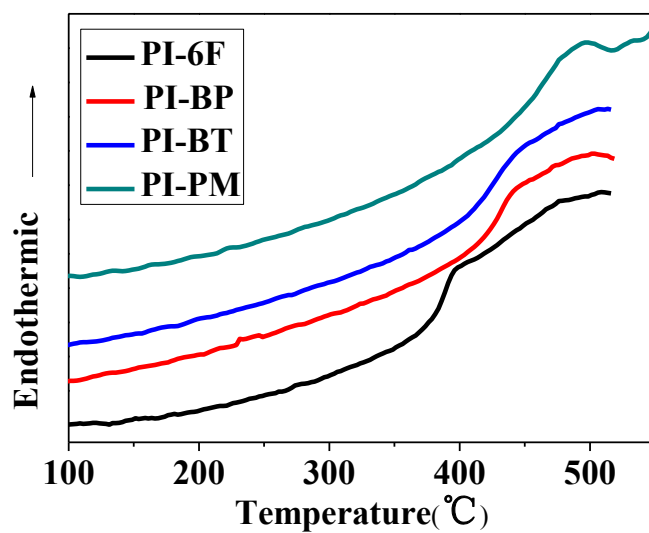


Figure S6 DMA curves of the WuCF₃PI films

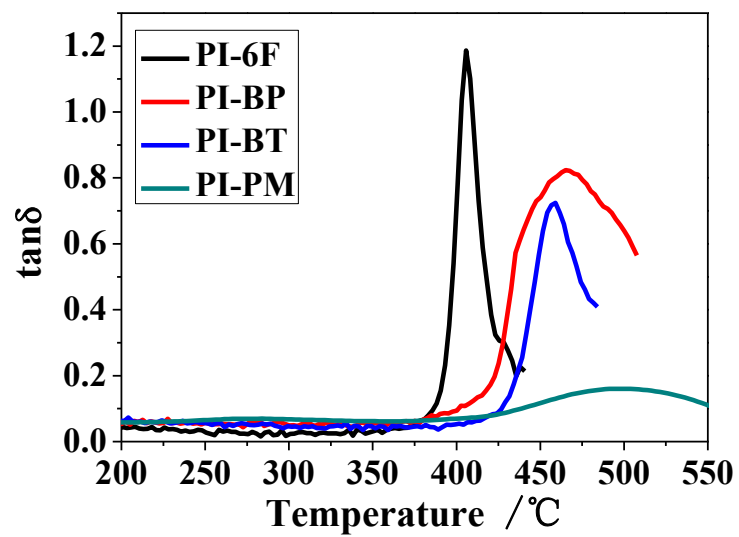


Figure S7 WAXD patterns of the WuCF₃PI films.

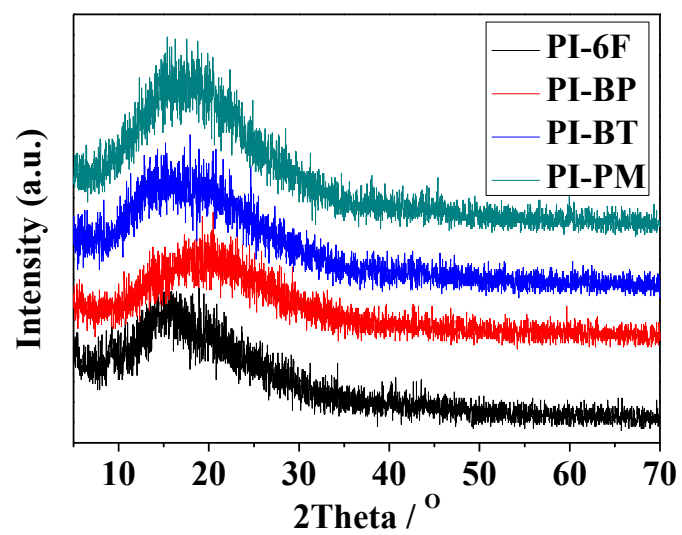


Figure S8 The UV/vis spectrum of WuCF₃DA.

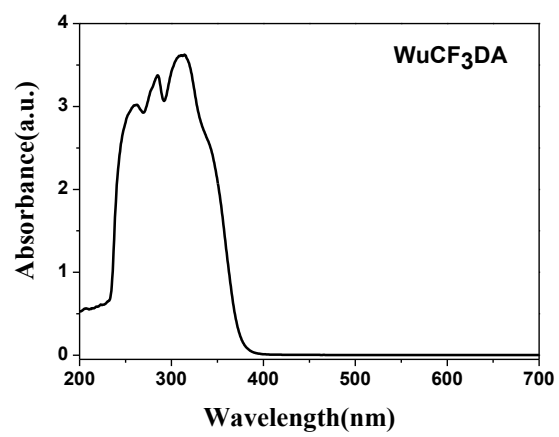


Figure S9 Chemical structure of diamine WuCF₃DA and polyimide WuCF₃PI. a, Novel diamine of **WuCF₃DA** containing vertical large rigid conjugated fluorene moiety and low-polarity –CF₃ groups. **b,** Polyimide containing **WuCF₃DA** moieties, in which the fluorene and –CF₃ moieties act as vertical large rigid side chains, which is beneficial in creating large free-volume hole in the amorphous polyimide film and thus producing the ultralow-*k* properties. **c,** Typical molecular structure of the a DuPont™ Kapton® polyimide film, which is a linear molecule without a non-polar, large, rigid side chain.

