Supporting Information

Intrinsic Low Dielectric Constant Polyimides: Relationship between Molecular Structures and Dielectric Properties

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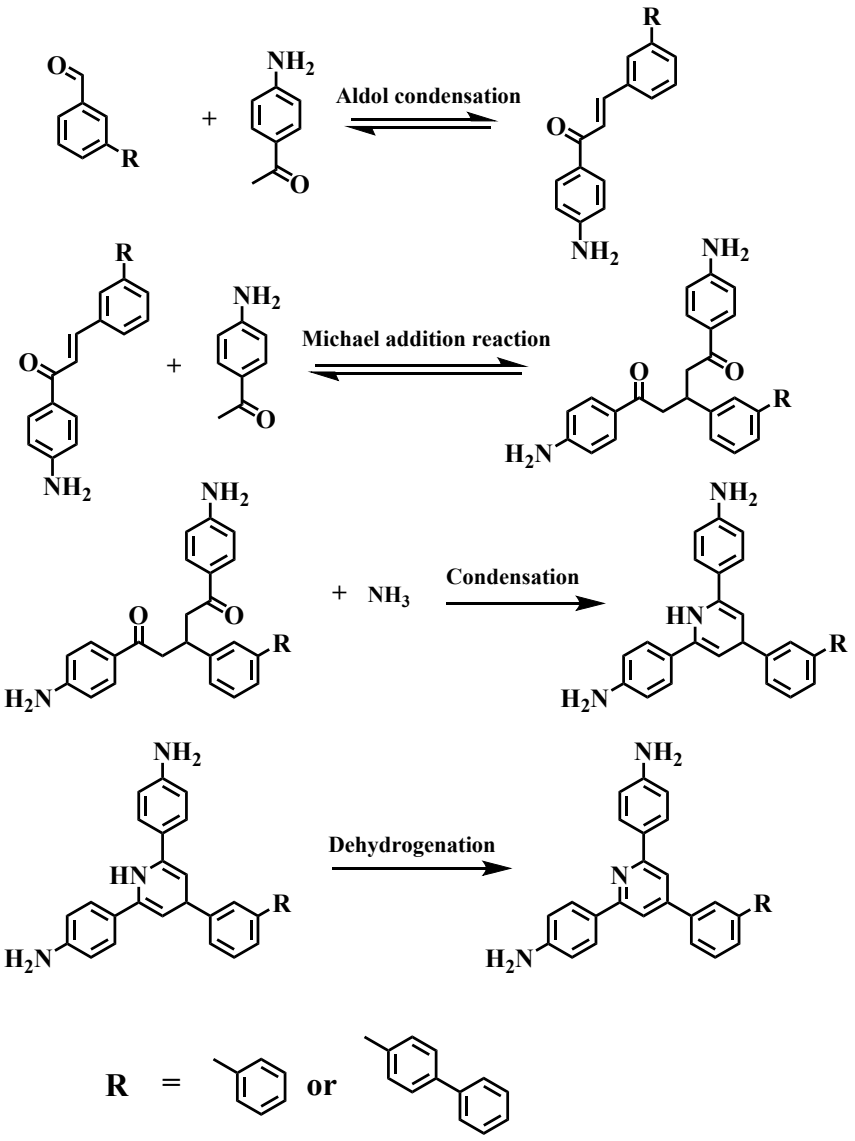


Scheme S1. Reaction mechanism discussion of synthesizing **mBPPy** and **mTPPy**.

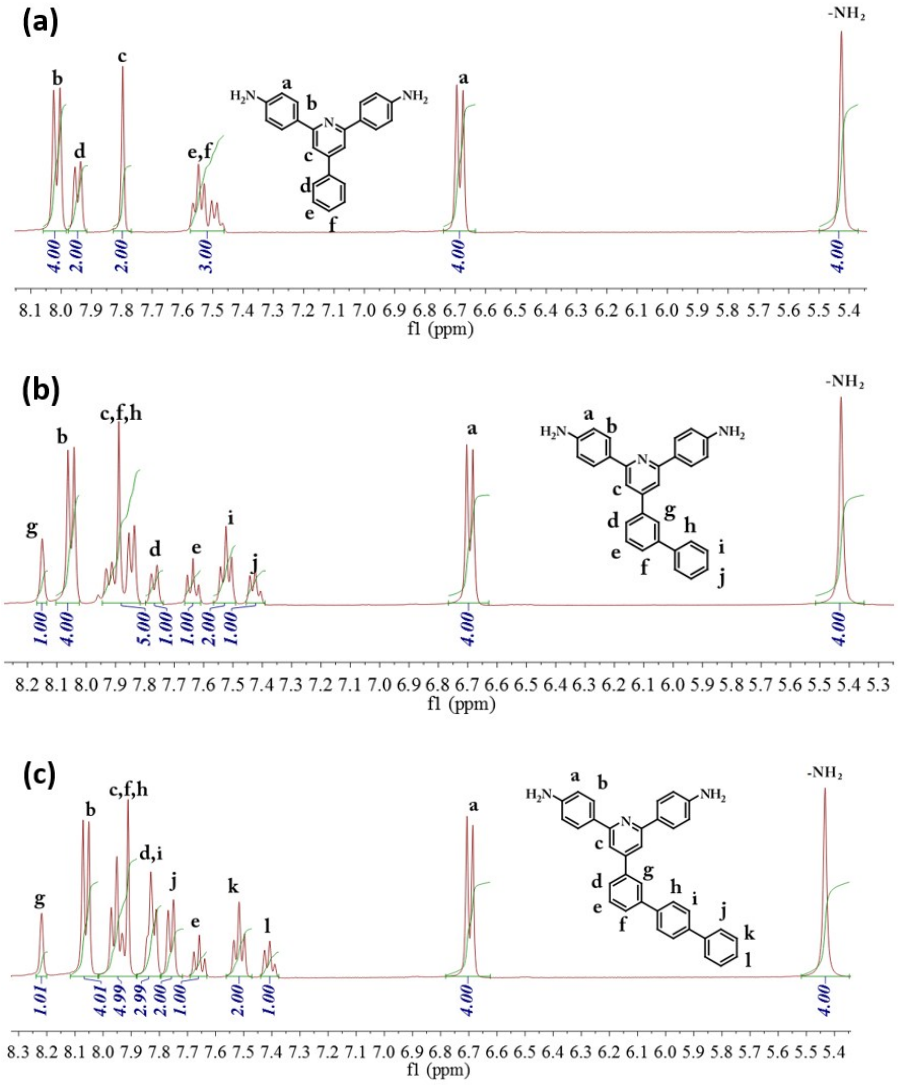


Figure S1. ^{1}H-NMR spectra of the diamines **PPy** (a), **mBPPy** (b) and **mTPPy** (c).

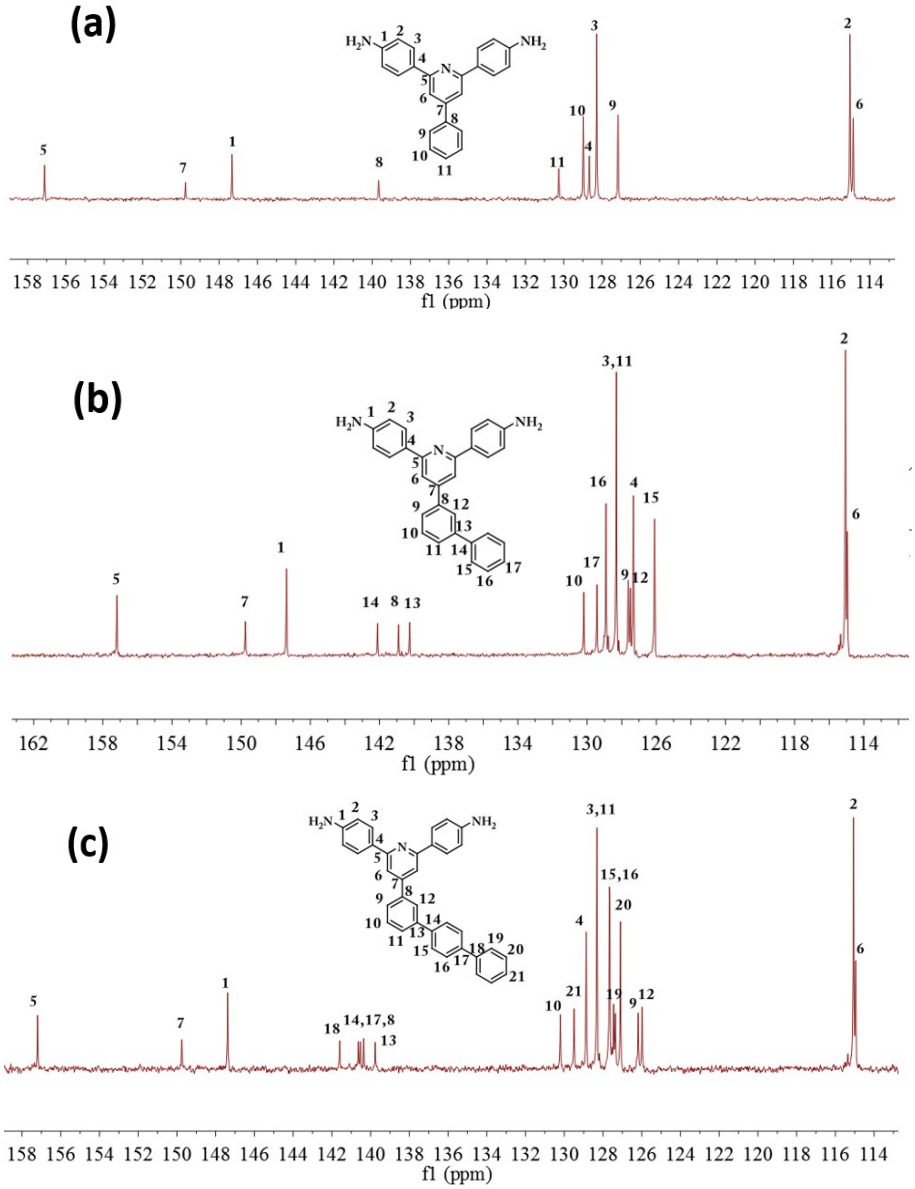


Figure S2. ^{13}C-NMR spectra of diamines **PPy** (a), **mBPPy** (b) and **mTPPy** (c).

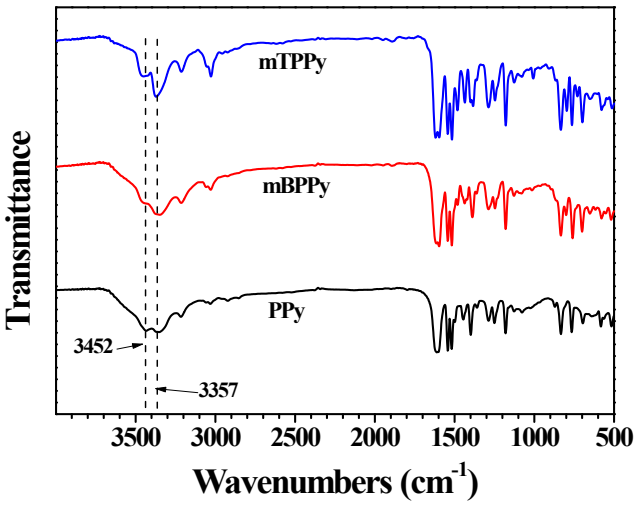


Figure S3. FT-IR spectra of diamines **PPy**, **mBPPy** and **mTPPy**.

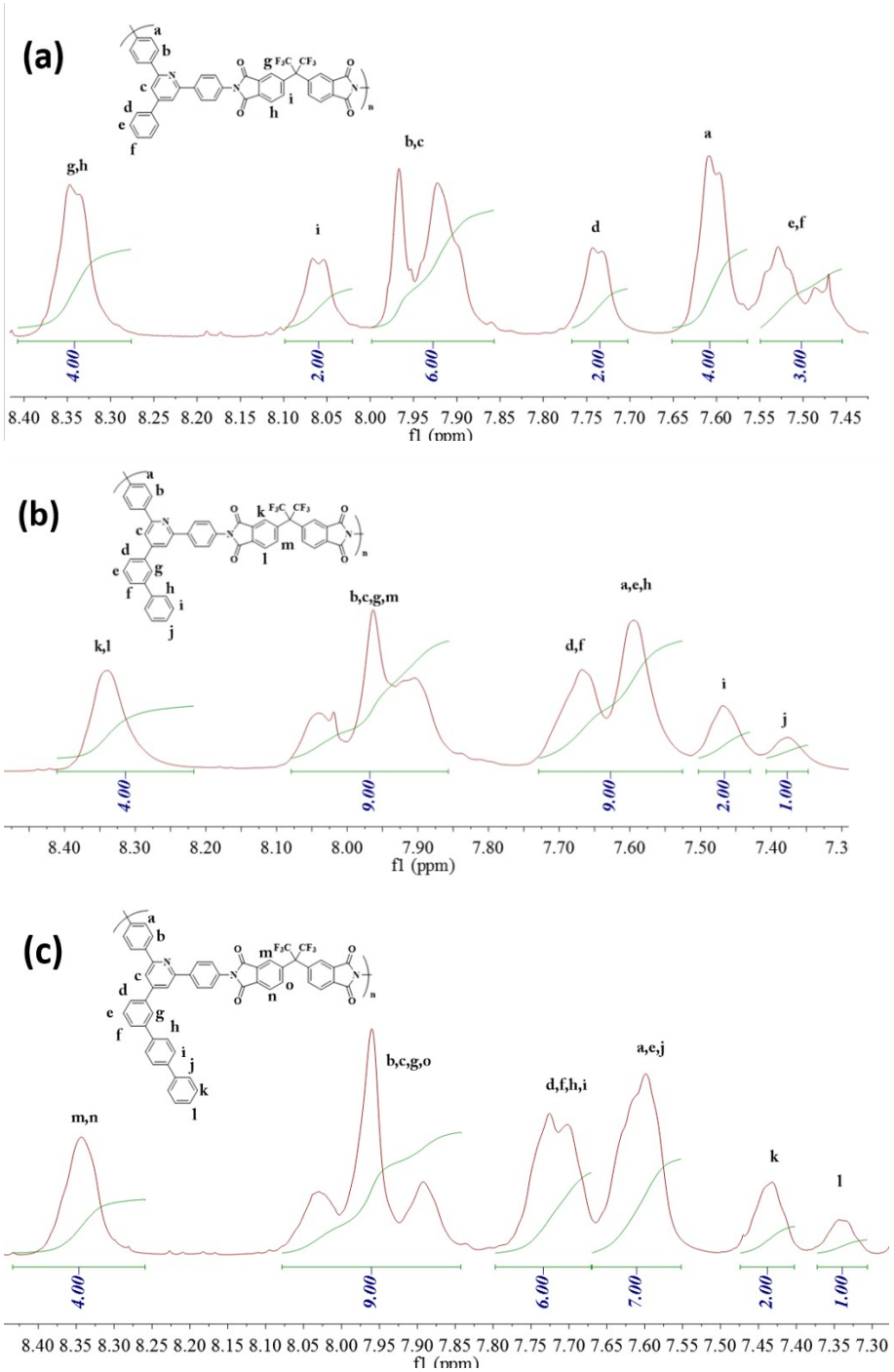


Figure S4. ^{1}H-NMR spectra of polyimides **PPy6F** (a), **mBPPy6F** (b) and **mTPPy6F** (c).

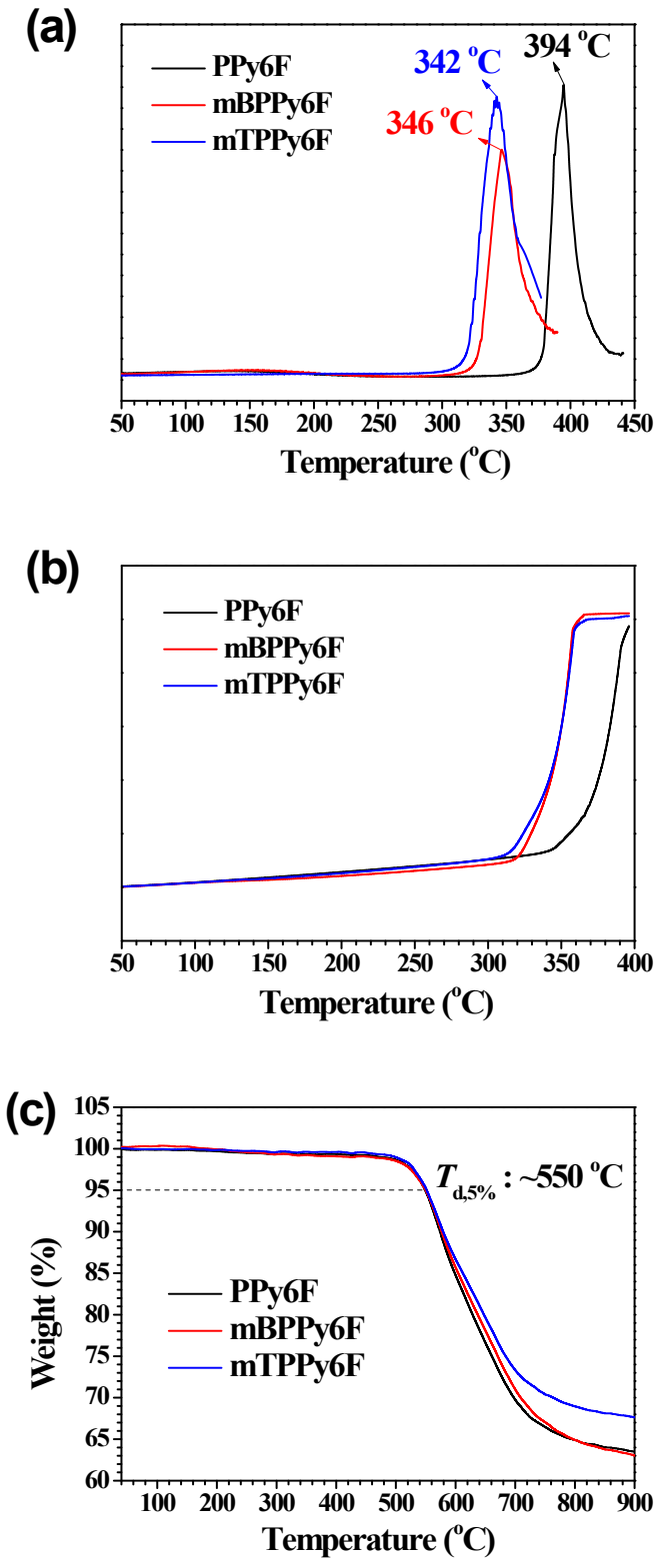


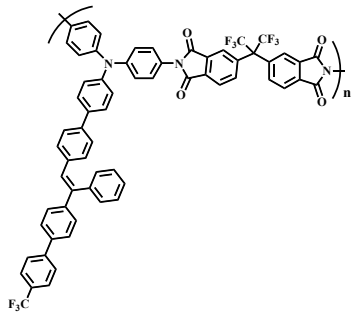
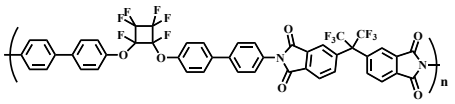
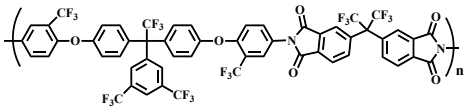
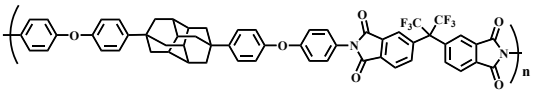
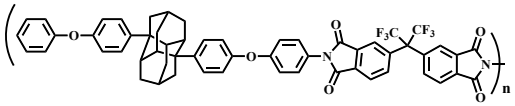
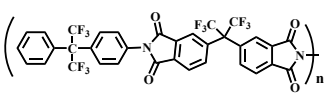
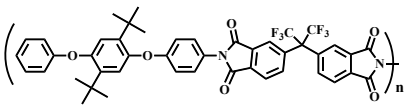
Figure S5. Thermal properties of polyimides **PPy6F**, **mBPPy6F** and **mTPPy6F**: (a)DMA; (b)TMA; (c)TGA.

Table S1. The details in dielectric measurements of polyimides at 10^4 Hz

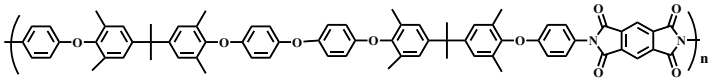
Polyimides	A ($\times10^{-4}$ m^2)	k_0 ($\times10^{-12}$ F·m^{-1})	l ($\times10^{-6}$ m)	C ($\times10^{-11}$ F)	k
PPy6F	1.0404	8.854	113	2.29	2.81
mBPPy6F	1.0404	8.854	105	2.29	2.61
mTPPy6F	1.0404	8.854	100	2.25	2.44

The error of the film thickness is 1×10^{-6} m, the relative error is 0.9%-1%, the error of the capacitance is 1×10^{-13} F, the relative error is about 0.5%. According to the Eqn.1, the relative error of k is 1.5%.

Table S2. Intrinsic low-k polyimides and their structure. [20, 21, 50-57]

Polyimides	Structure
FPTTPI	
PFCBBPPI	
PI-8	
7d''	
7d'	
PI-1	
5d	

8a



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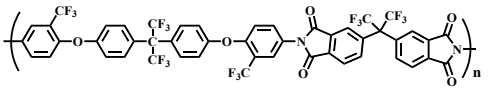

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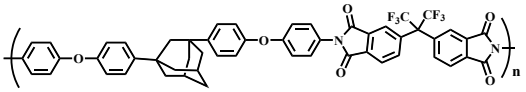
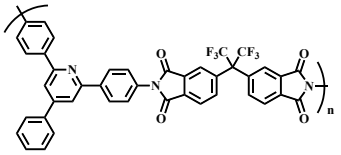
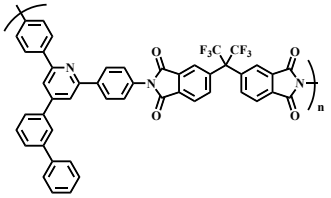


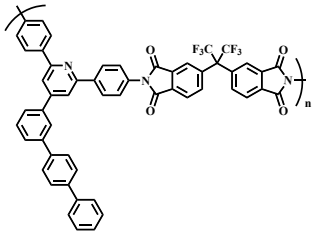
PPy6F



mBPPy6F



mTPPy6F



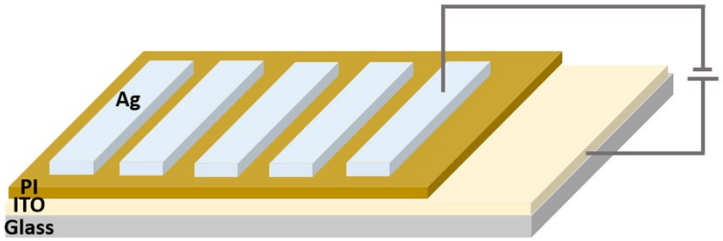


Figure S6. Schematic diagram of the devices fabricated with PIs.