## **Supporting Information for**

## Soluble Perfluorocyclobutyl Aryl Ether-Based Polyimide for High-Performance Dielectric Material

Mingchen Jia,<sup>a</sup> Yongjun Li,<sup>a</sup>\* Chunqing He,<sup>b</sup> and Xiaoyu Huang<sup>a</sup>\*

<sup>a</sup> Key Laboratory of Synthetic and Self-Assembly Chemistry for Organic Functional Molecules, Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, 345 Lingling Road, Shanghai 200032, People's Republic of China
<sup>b</sup> Key Laboratory of Nuclear Solid Physics of Hubei Province, School of Physics and Technology, Wuhan University, 16 Luojiashan Road, Wuhan, Hubei 430072, People's Republic of China

\* To whom correspondence should be addressed, E-mail: xyhuang@sioc.ac.cn (Tel: +86-21-54925310, Fax: +86-21-64166128); liyongjun78@sioc.ac.cn, (Tel: +86-21-54925309, Fax: +86-21-64166128).



Figure S1. <sup>1</sup>H NMR spectrum of PFCBBBPA diamine monomer in CDCl<sub>3</sub>.



Figure S2. <sup>13</sup>C NMR spectrum of PFCBBBPA diamine monomer in CDCl<sub>3</sub>.



Figure S3. <sup>19</sup>F NMR spectrum of PFCBBBPA diamine monomer in CDCl<sub>3</sub>.



Figure S4. FT-IR spectrum of PFCBBBPA diamine monomer.



Figure S5. UV-Vis spectrum of PFCBBPPI film with a thickness of 20 µm.



Figure S6. XRD pattern of PFCBBPPI film.



**Figure S7.** Photograph of solubility test in different solvents (from left to right: DMF, CHCl<sub>3</sub>, CH<sub>2</sub>Cl<sub>2</sub>, NMP, THF, acetone, and DMSO, respectively).



Figure S8. TGA curve (in N<sub>2</sub>) of PFCBBPPI with a heating rate of 10°C/min.



Figure S9. DMA curve of PFCBBPPI film at a frequency of 1 Hz



Figure S10. DSC curve (in N<sub>2</sub>) of PFCBBPPI with a heating rate of 20°C/min.

Decay Component	$ au_1$	$\tau_2$	$ au_3$	$ au_4$
Lifetime (ns)	0.125	0.294	0.604	2.811
Intensity (%)	7.27	69.87	17.45	5.42

 Table S1. Analyzed Data for Positron Lifetime in PFCBBPPI Film