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Electronic Supplementary Information for

High-Performance Functional Phthalonitrile Resin with a Low Melting Point and Low Dielectric Constant

Minjie Wu[a], Jianjun Xu[a], Shengnan Bai[a], Xinggang Chen[a], Xiaoyan Yu[a] *, Kimiyoshi Naito[b], Zhenjiang Zhang[d] and Qingxin Zhang[a, c] *

[a]Hebei Key Laboratory of Functional Polymers, School of Chemical Engineering and Technology, Hebei University of Technology, Tianjin 300130, China; E-mail: **zhqxcn@163.com**;**yuxycnn@163.com**

[b]National Institute for Materials Science (NIMS), 1-2-1 Sengen, Tsukuba 305-0047, Japan

[c]Tianjin Key Laboratory of Materials Laminating Fabrication and Interface Control Technology, Hebei University of Technology, Tianjin 300130, China

[d]College of Chemistry and Materials Science, Ludong University, Yantai, 264025, China

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Experimental section of Electronic Supplementary Information

Synthesis of PBDP monomer

BPA (9.13 g, 39.92 mmol), powdered anhydrous K_2CO_3 (12.41 g, 90.01 mmol), toluene (10 mL) and DMF (50 mL) were added into a 250 mL three-necked flask equipped with a magnetic stirrer, a Dean-Stark trap and a condenser. The resulting mixture was degassed with nitrogen at ambient temperature and the Dean-Stark trap was filled with toluene. The mixture was refluxed at 160 °C under a nitrogen atmosphere for 8 h. Then water was removed from the reaction mixture by azeotropic distillation, and excess toluene was distilled off. The mixture was cooled to room temperature. DFBP (6.68 g 19.96 mmol) was added in one portion and the mixture was stirred for another 16 h. Subsequently, 4-nitrophthalonitrile (6.93 g, 39.93 mmol) was added to the flask and the reaction mixture was heated at 80 °C for 8 h. The mixture was cooled to ambient temperature and poured into deionized water to provide the raw product as a pale yellow solid. The raw product was collected by filtration, washed with deionized water and then dried in vacuum at 60 °C to give 16.81 g (yield, 76%) of pure PBDP monomer. The characteristic spectra of the monomer were as follows.

IR [cm^{-1}]: ν 2967 (CH_3), 2231 (CN), 1249 (C-O), 1172 (C-F).

^{1}H NMR (400 MHz, DMSO-d_6) δ (ppm): 8.11 (d, *J*= 8.80 Hz, 2 H, Ar-H), 7.80 (d, *J*= 2.40 Hz, 2 H, Ar-H), 7.38-7.12 (m, 18 H, Ar-H), 1.67 (t, *J*=19.60 Hz, 12 H, -CH_3). ^{13}C NMR (100 MHz, DMSO-d_6) δ (ppm): 162.04 (C 15), 155.43 (C 5), 152.54 (C 14), 148.44 (C 8,), 146.89 (C 11), 146.59 (C 2), 144.09 (C 3), 141.18 (C 17), 137.28 (C 4), 135.67 (C 7), 129.68 (C 12), 129.15 (C 16), 123.57 (C 20), 120.79 (C 6), 117.67 (C 13), 116.87 (C 19), 116.37 (C 22) 116.14 (C 21), 109.04 (C1) 103.00 (C 18), 42.90 (C 10), 31.47 (C 9).

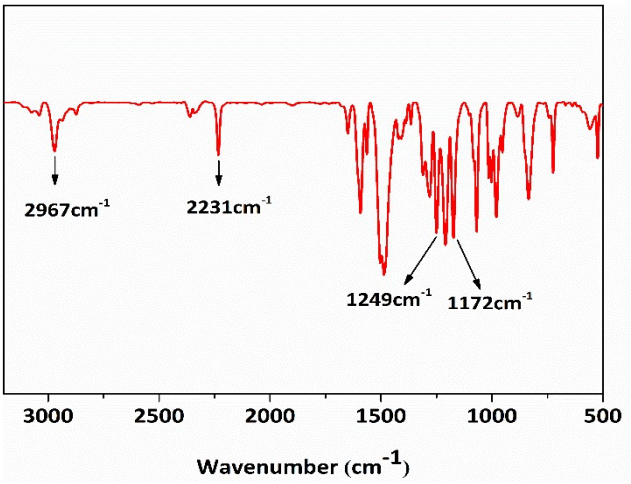
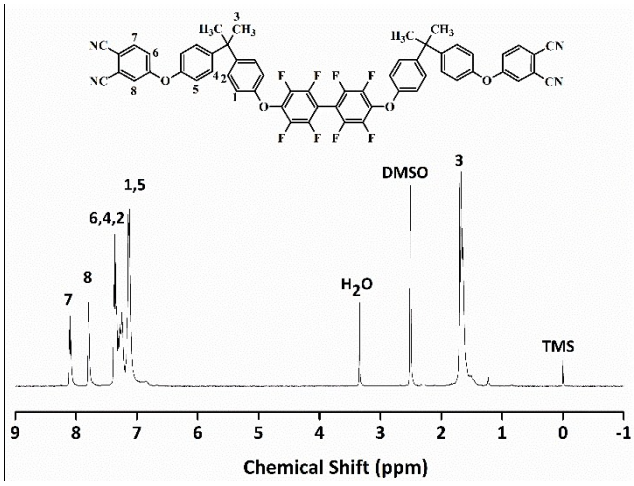
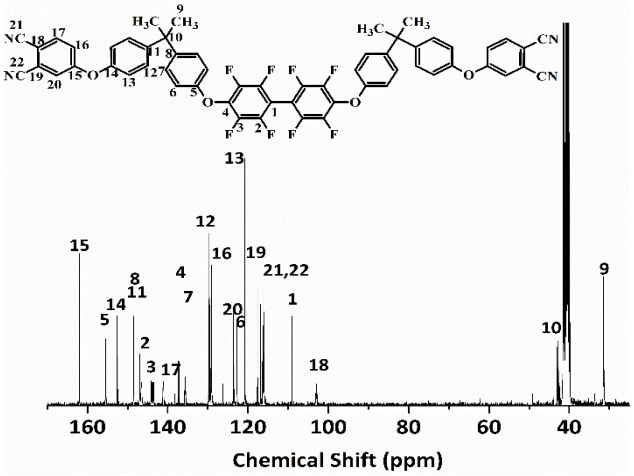


Fig. S1 FTIR spectrum of the PBDP monomer.



(A)



(B)

Fig. S2 (A) ^{1}H-NMR spectrum of PBDP monomer; (B) ^{13}C-NMR spectrum of PBDP monomer.

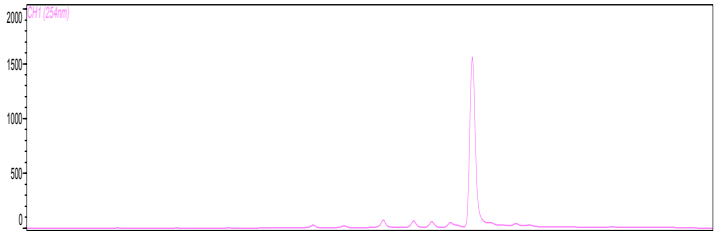


Fig.S3 LC spectrum of PBDP monomer.

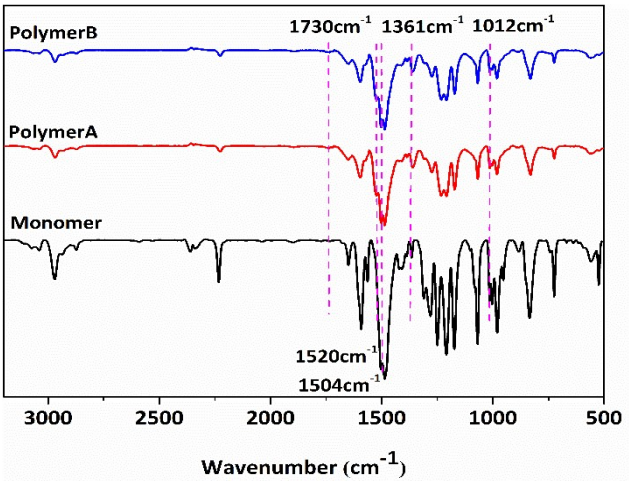


Fig. S4 FTIR spectra of PBDP monomer, polymer A and polymer B.

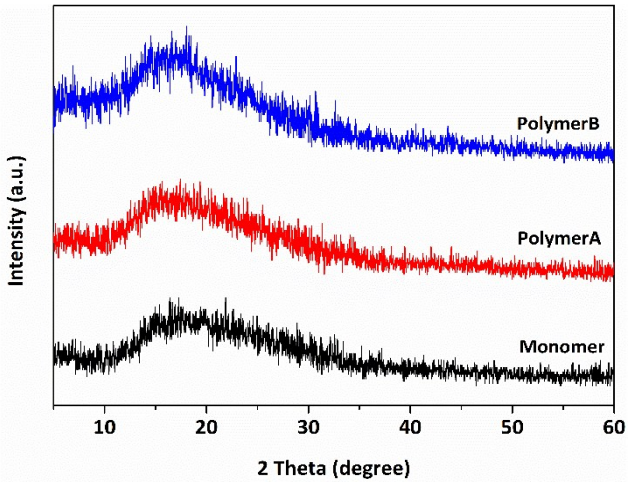


Fig. S5 WAXD patterns of PBDP monomer, polymer A and polymer B.