Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information

for

Transmissive to Black Electrochromic Aramids with High Near-Infrared and Multicolor Electrochromism Based on Electroactive Tetraphenylbenzidine Units

by

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Table S1. Inherent Viscosity and Molecular Weights of Polyamides

Code	η_{inh} [a] (dL/g)	M_w [b]	Mn [b]	PDI [c]
Ia	0.91	95,900	58,100	1.65
Ib	0.76	94,600	60,500	1.56
Ic	0.75	102,500	69,600	1.47
I'a	0.52	45,800	32,400	1.41
I'b	0.42	125,600	72,700	1.73
I'c	0.42	89,300	47,200	1.89
IIb	0.63	95,700	52,700	1.82

[a] Measured at a polymer concentration of 0.5 g/dL in DMAc at 30 °C (**I'a** measured in NMP).
[b] Calibrated with polystyrene standards, using DMF as eluent at a constant flow rate of 1 ml/min at 70 °C.
[c] Polydispersity Index (*Mw*/*Mn*).

Table S2. Solubility Behavior of Polyamides

Code	Solubility in various Solvent[a]						
	NMP	DMAc	DMF	DMSO	*m*-cresol	THF	$CHCl_3$
Ia	+ +	+ +	+ -	-	+ +	-	-
Ib	+ +	+ +	+ +	+ -	+ +	-	-
Ic	+ +	+ +	+ +	+ +	+ +	+ +	-
I'a	+ +	+ -	+ -	-	-	-	-
I'b	+ +	+ +	+ +	-	+ +	-	-
I'c	+ +	+ +	+ +	+ -	+ +	+ +	-
IIb	+ +	+ +	+ +	+ -	+ +	+ -	-

[a] The solubility was determined with a 5 mg sample in 1 mL of a solvent. **+ +**, soluble at room temperature; **+**, soluble on heating; **+ -**, partially soluble or swelling; **-**, insoluble even on heating. THF: tetrahydrofuran; $CHCl_3$: chloroform.

Table S3. Thermal Properties of Polyamides

Polymer[a]	T_g (°C)[b]	T_d^5 (°C)[c]		T_d^{10} (°C)[c]		R_{w800} (%)[d]
		N_2	Air	N_2	Air	
Ia	280	475	465	495	495	53
Ib	270	495	485	530	540	70
Ic	290	495	510	535	560	68
I'a	315	450	440	475	490	59
I'b	290	490	480	585	570	71
I'c	295	520	495	575	555	73

[a] The polymer film samples were heated at 300 °C for 1 h prior to all the thermal analyses.
[b] Midpoint temperature of baseline shift on the second DSC heating trace (rate: 20 °C /min) of the sample after quenching from 400 °C to 50 °C (rate: 200 °C /min) in nitrogen.
[c] Temperature at which 5 % and 10% weight loss occurred, respectively, recorded by TGA at a heating rate of 20 °C/min and a gas flow rate of 20 cm^3/min.
[d] Residual weight percentages at 800 °C under nitrogen flow.

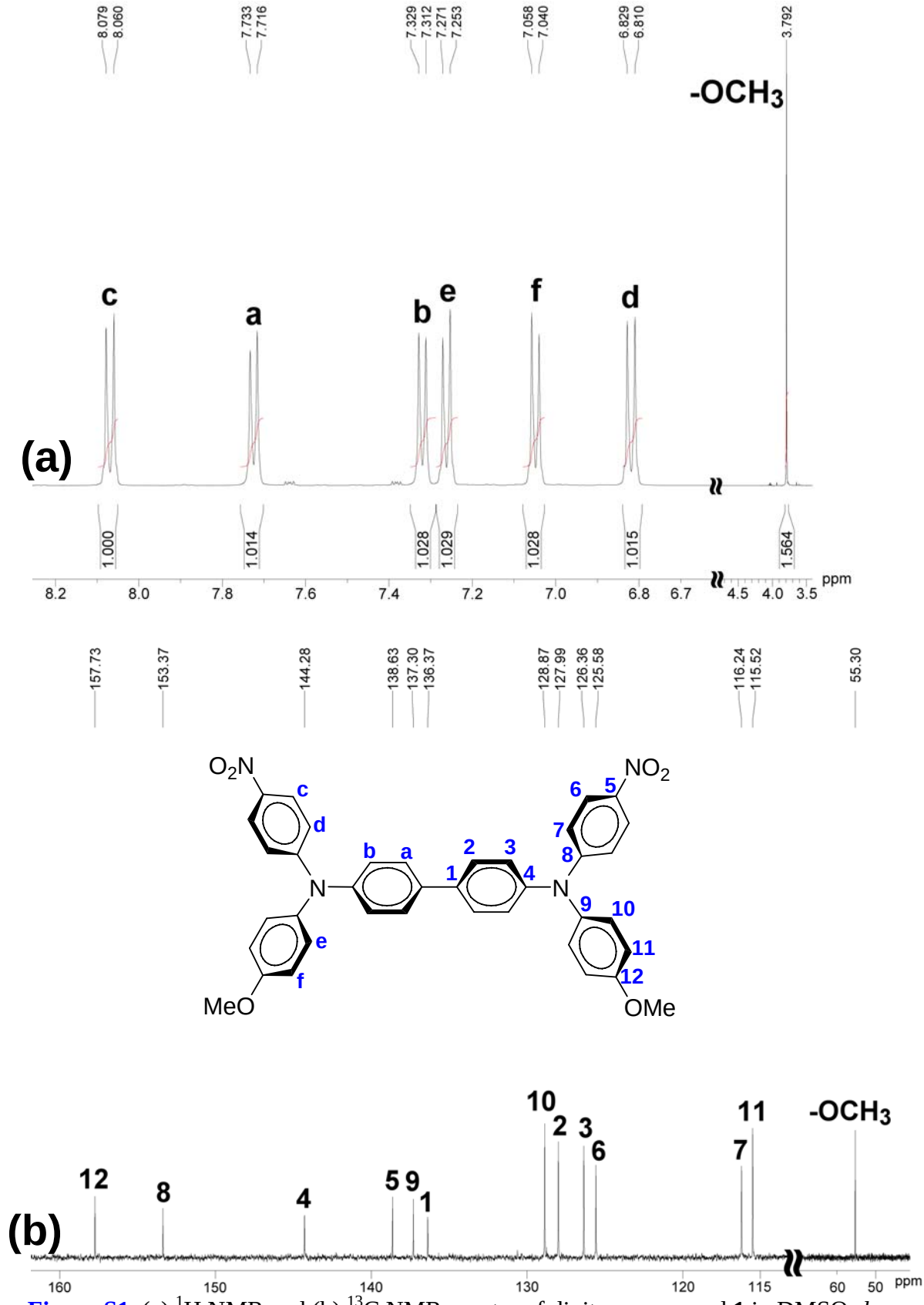

Figure S1. (a) ^{1}H NMR and (b) ^{13}C NMR spectra of dinitro compound **1** in DMSO-d_6.

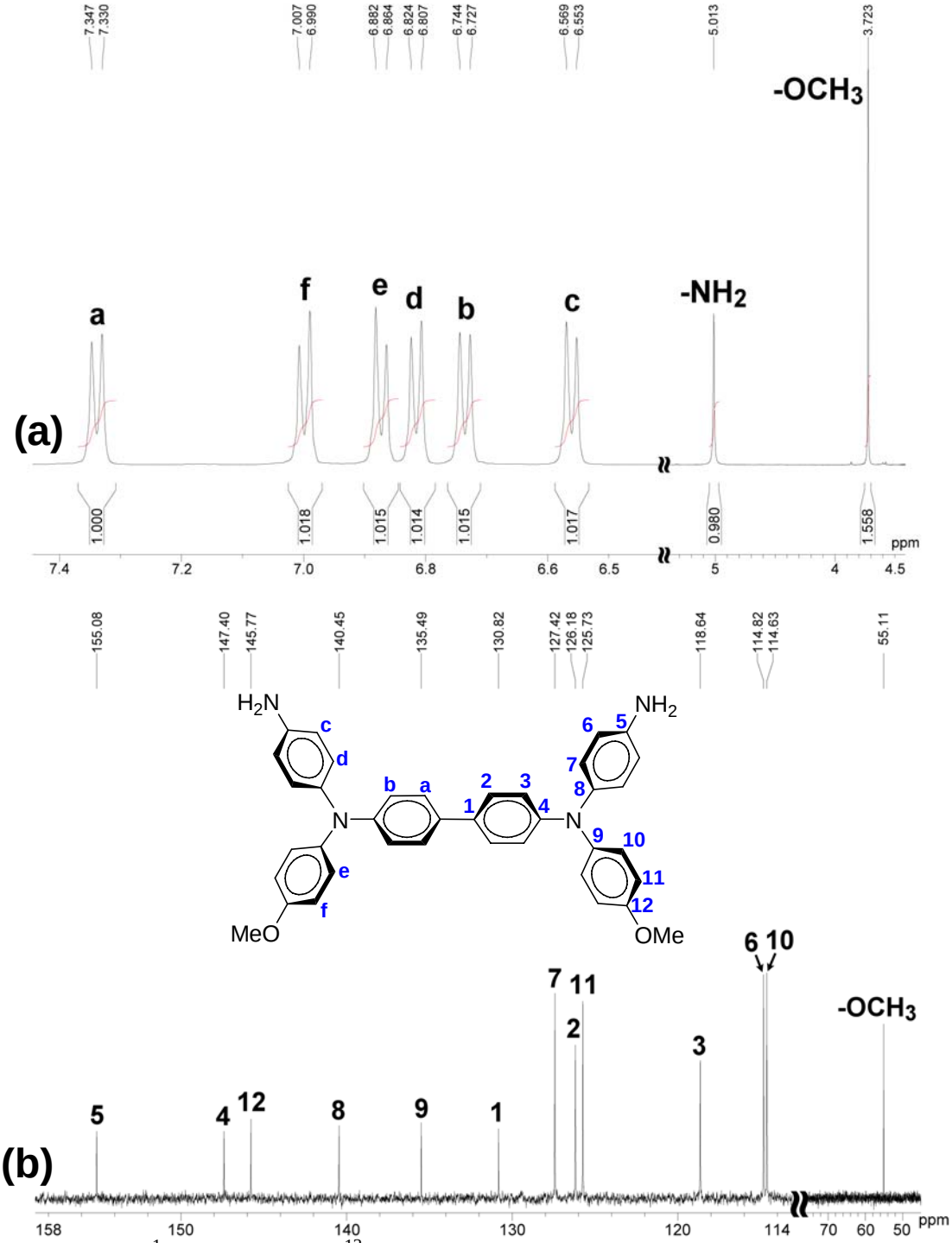

Figure S2. (a) ^{1}H NMR and (b) ^{13}C NMR spectra of diamine monomer **2** in DMSO-d_6.

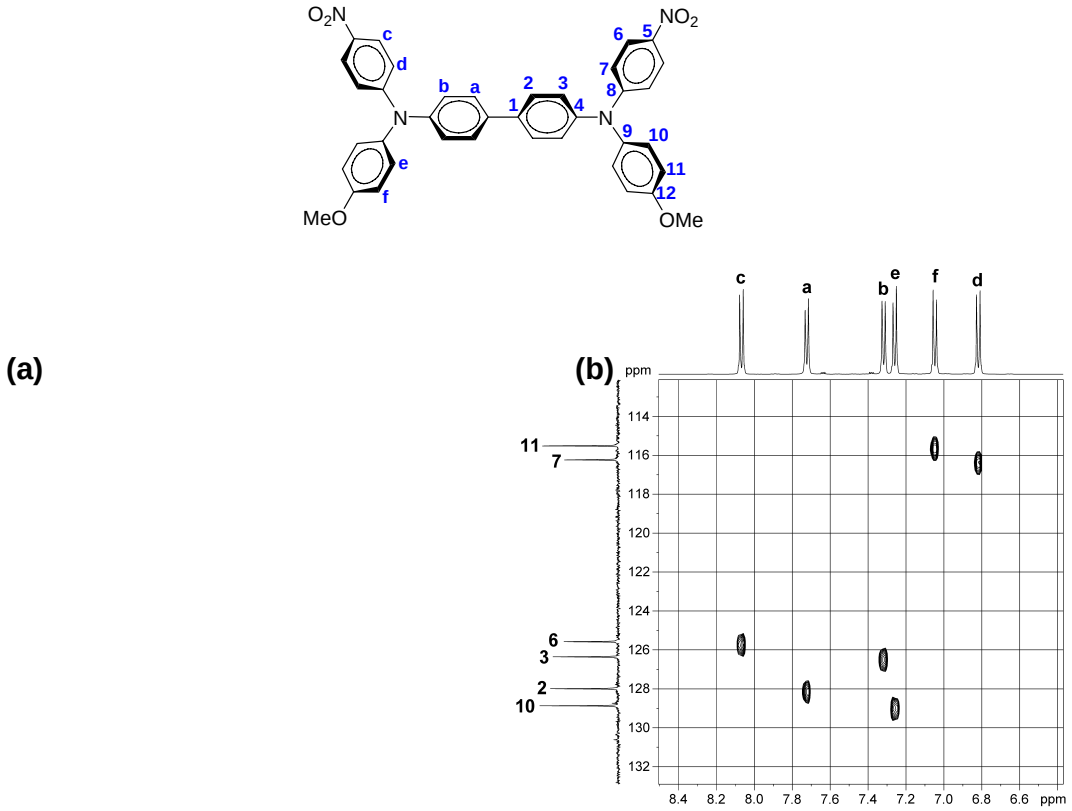

Figure S3. 2D (a) H-H COSY and (b) C-H HMQC NMR spectra of dinitro compound **1** in DMSO-d_6.

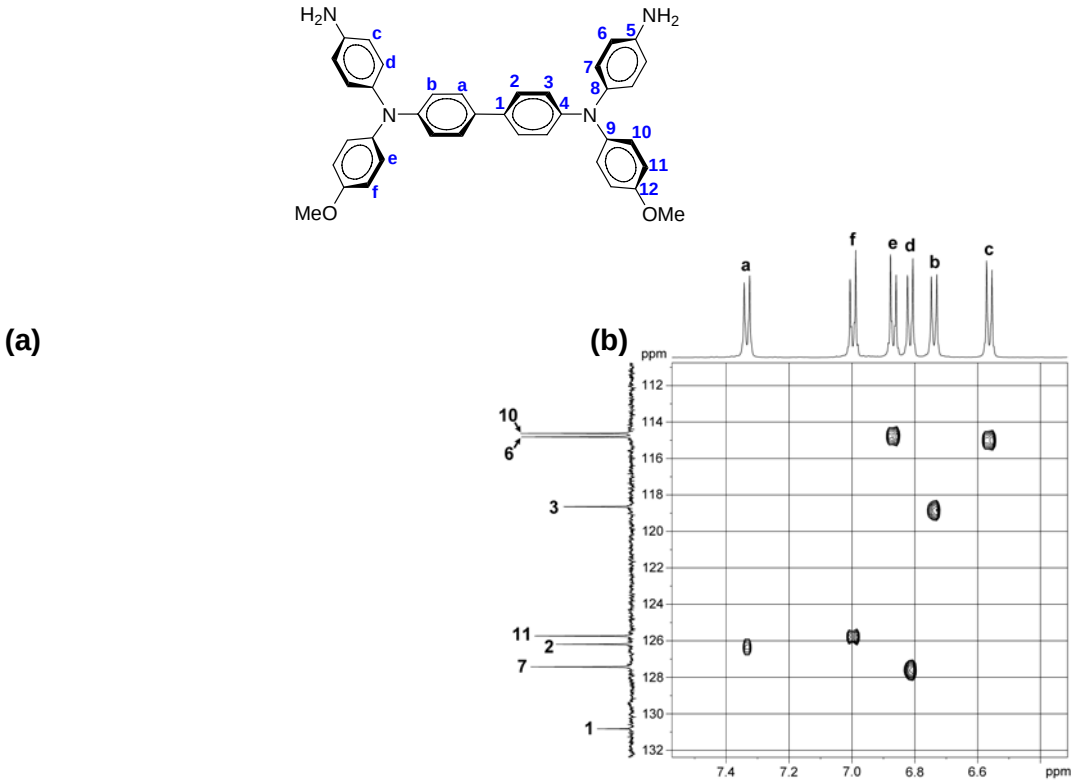

Figure S4. 2D (a) H-H COSY and (b) C-H HMQC NMR spectra of diamine monomer **2** in DMSO-d_6.

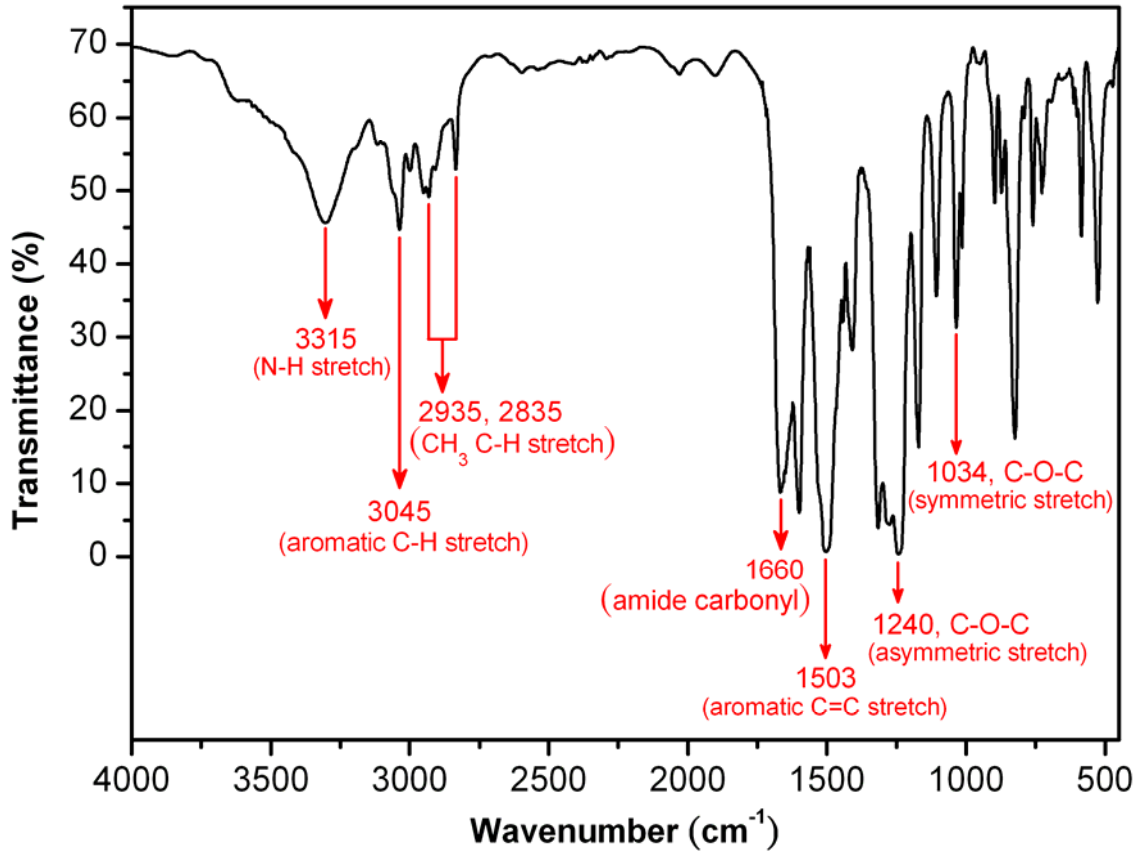

Figure S5. IR spectrum of polyamide **Ib** film.

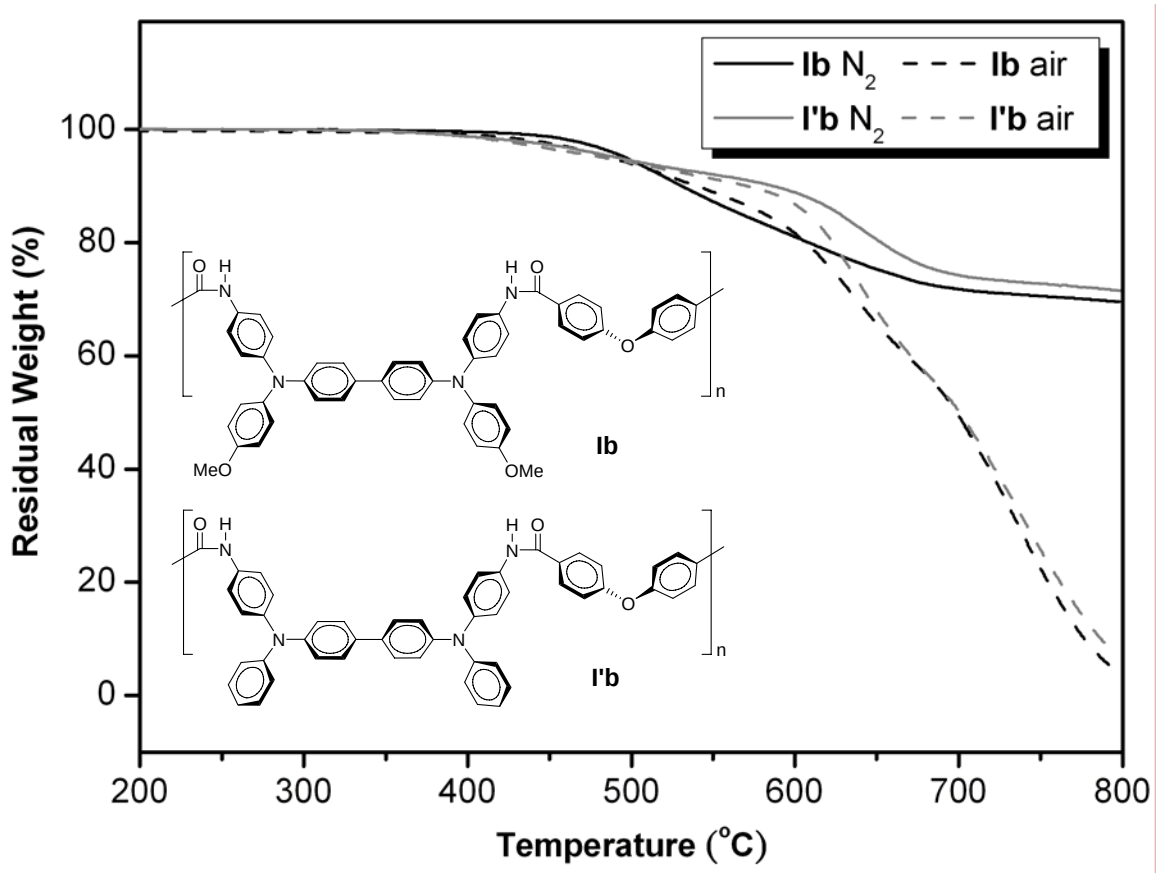

Figure S6. TGA thermograms of polyamides **Ib** and **I'b** at a scan rate of 20 °C/min.

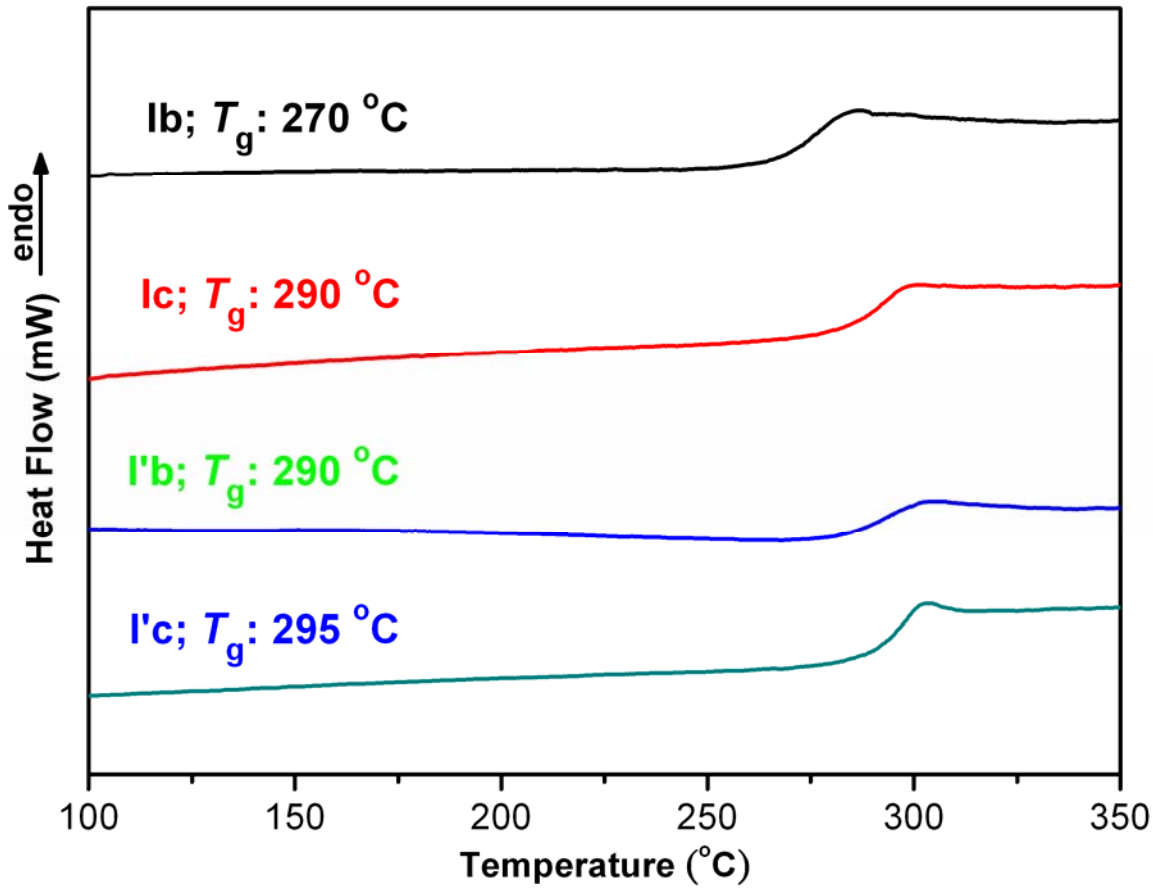

Figure S7. DSC traces of polyamides with a heating rate of 20 °C/min in nitrogen.