Electronic Supplementary Information
For

Biobased Dimethyl Isosorbide as an Efficient Solvent for Alkaline Hydrolysis Waste Polyethylene Terephthalate to Terephthalic Acid

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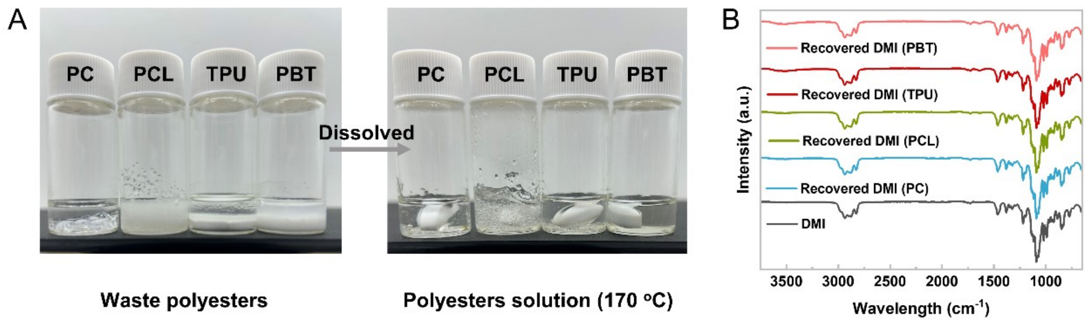

Fig. S1. The dissolution process of the PC, PCL, TPU, and PBT (A). ATR-FTIR spectra of the fresh DMI and the recovered DMI (B).

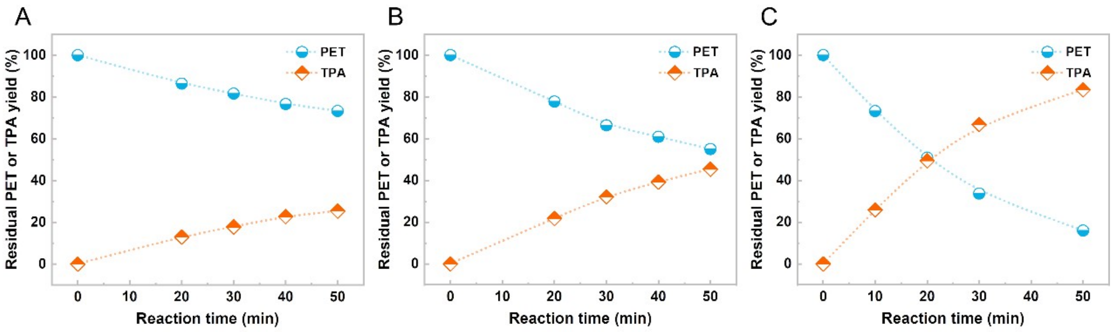

Fig. S2. Effect of reaction temperature on the alkaline hydrolysis of PET to generate TPA in DMI/EG mixed solvent. (A) 70 ^{o}C, (B) 80 ^{o}C, and (C) 90 ^{o}C. Reaction conditions: waste PET, 0.3 g; KOH, 0.5 g; DMI/EG (6:4, v:v) mixed solvents, 10 mL.

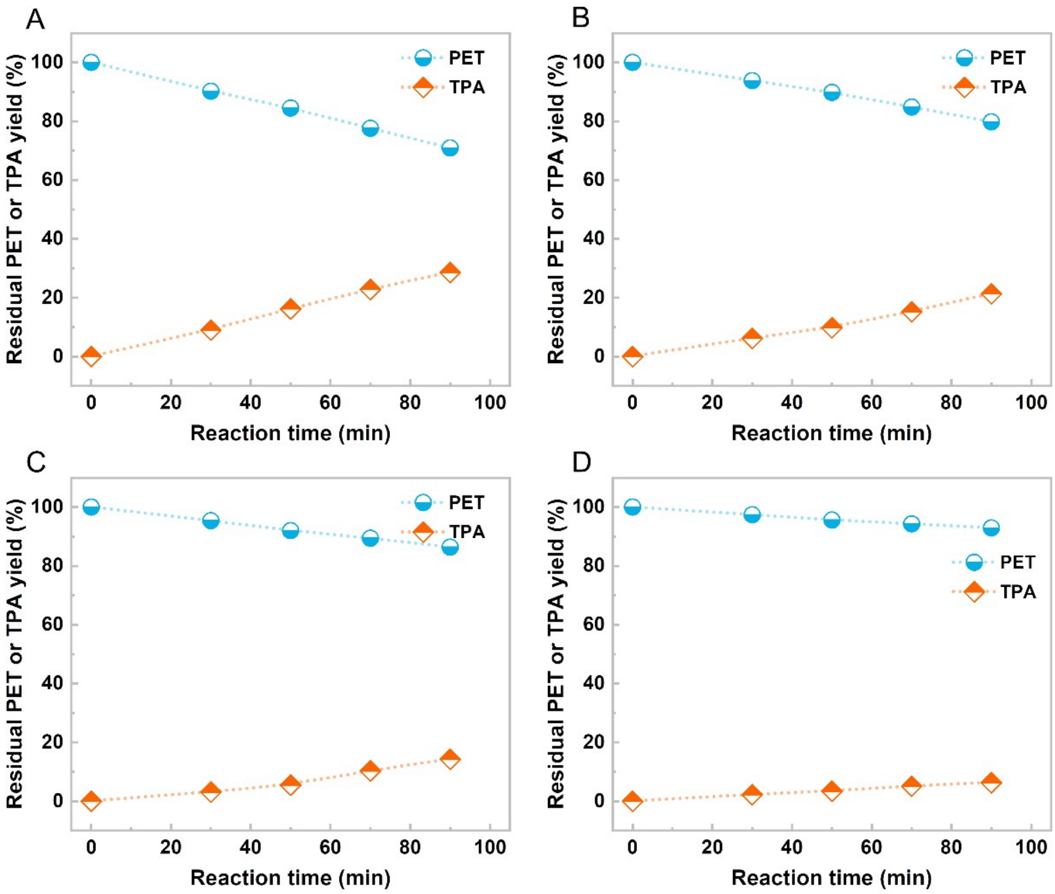

Fig. S3. Effect of reaction temperature on the alkaline hydrolysis of PET to generate TPA in pure EG. (A) 120 ^{o}C, (B) 110 ^{o}C, (C) 100 ^{o}C, and (D) 90 ^{o}C. Reaction conditions: waste PET, 0.3 g; KOH, 0.5 g; EG, 10 mL.

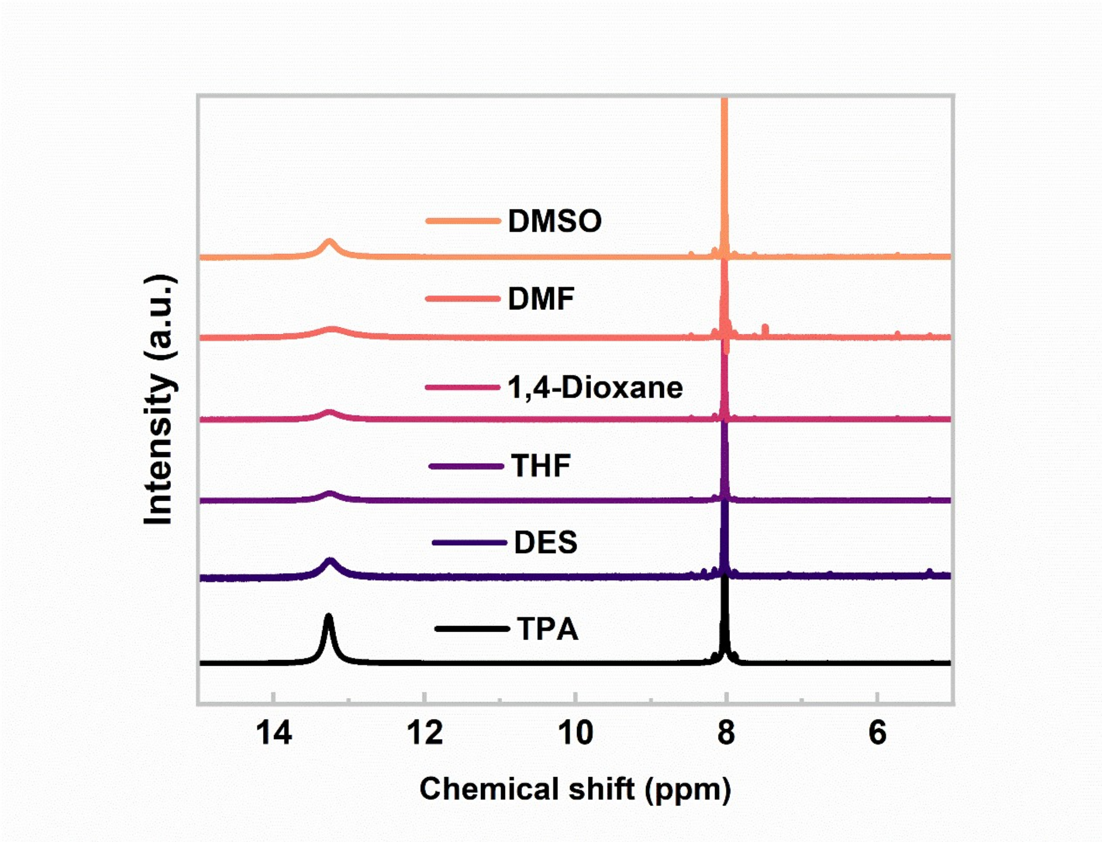

Fig. S4. ^{1}H NMR spectra of the obtained TPA in various solvents.

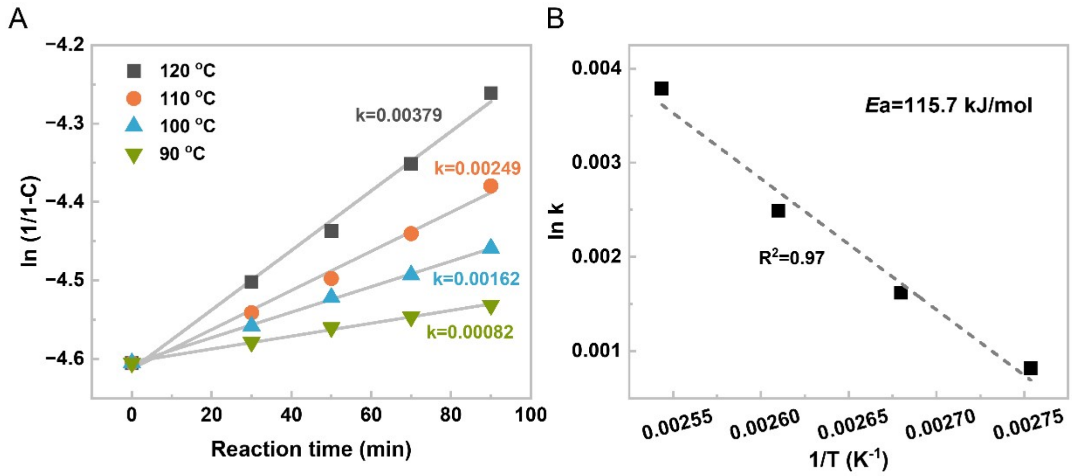

Fig. S5. First order kinetic curves (A) and the Arrhenius plot for the four temperatures studied in the PET conversion in pure EG (B). Reaction conditions: waste PET, 0.3 g; KOH, 0.5 g; pure EG, 10 mL.

Table S1. The intrinsic viscosities [η], degradation ratio, and number-average molecular weight of waste PET and recycled PET with different solubility and temperatures.

Samples	[η] (dL/g)[a]	Degradation ratio (%)	Number-average molecular weight (M_n)
PET	0.7627	-	21676.5
160-0.25[b]	0.7448	3.6	20900.9
160-0.30	0.6856	15.1	18396.2
160-0.35	0.6499	21.8	16941.4
170-0.25	0.7493	2.6	21094.2
170-0.30	0.7484	2.9	21055.5
170-0.35	0.7104	10.4	19430.7

[a]The value of intrinsic viscosities of all samples was the average of three measurements. [b]160-0.25 represented the sample with a solubility of 0.25 g_{PET}/g_{DMI} at 160 ^{o}C.

Table S2. TGA results, DSC results, intrinsic viscosity, and number-average molecular weight of the original PET (*o*-PET) and the regenerated PET (*r*-PET).

	T_{max} (°C)	$T_{d5\%}$ (°C)	Ash residue rate (%)	T_c (°C)	T_m (°C)	Melting range (°C)	[η] (dL/g)	Degradation ratio (%)	M_n (g/mol)
o-PET	439.8	400.2	11.0	196.6	250.1	34.5	0.763		21676.5
r-PET	438.7	397.8	10.8	210.0	249.4	37.3	0.948	2.9	21055.5

Table S3. The solubility of other polyesters.

Polyesters	Dissolution conditions	Solubility
PC	170 ^{o}C, 10 min	0.3 g g^{-1}
PCL	170 ^{o}C, 10 min	0.3 g g^{-1}
TPU	170 ^{o}C, 10 min	0.3 g g^{-1}
PBT	170 ^{o}C, 10 min	0.25 g g^{-1}

Table S4. Comparison of the cost of different bio-based solvents. [a]

Solvents	Price	Item No.	Manufacturers
GVL	119.00 (500 g)	A020399	Energy Chemical
Cyrene	258.00 (500 g)	D070287	Energy Chemical
DMI	1460.42 (100 mL)	807796-100ML	Sigma-Aldrich

[a]All data originate from https://www.energy-chemical.com/ and https://www.sigmaaldrich.cn/CN/zh. (accessed August 2023)

Table S5. Linear regression results for the data in Fig. S5A and B.

Temperature (°C)	Rate constant (k)	R^2	E_a (kJ/mol)	R^2
120	0.00379	0.99473	115.7	0.97994
110	0.00249	0.99216		
100	0.00162	0.99924		
90	0.00082	0.99658		

Table S6. Linear regression results for the data in Fig. 4D and E.

Temperature (°C)	Rate constant (k)	R^2	E_a (kJ/mol)	R^2
100	0.10755	0.99607	102.5	0.98315
90	0.03711	0.9985		
80	0.01210	0.99218		
70	0.00626	0.99243		