Self-assembly of semiaromatic poly(amic acid) into flower-like microparticles via one-step precipitation polymerization

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Table S1. Result of solubility test for DA-6 (5 mg/ mL).

Solvent	Solubility		
	r.t.	Upon heating	Recovered to r.t.
EtOH	-	-	
THF	-	+	+
Ether	-	-	
DMF	+		
DMSO	+		
DMAc	+		
Acetone	-	-	
Hexane	-	-	
Toluene	-	-	
Ethyl acetate	-	-	
Chloroform	-	-	
Dichloromethane	-	+	-
Chlorobenzene	-	-	
Pyridine	+		
NMP	+		
Acetonitrile	-	-	
Methyl ethyl ketone	-	-	
Acetophenone	-	-	
Cyclohexanone	-	+	+

-:insoluble, +:soluble, -/recovered to r.t.: precipitate if recovered to r.t., +/recovered to r.t.: do not precipitate if recovered to r.t.

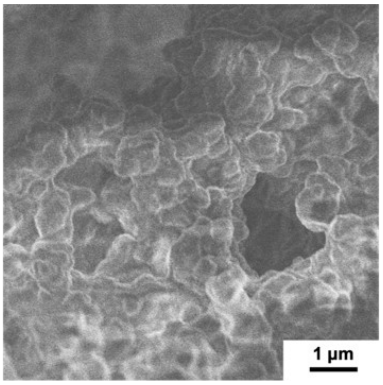

Figure S1. FE-SEM images of DA-6/PMDA prepared from THF.

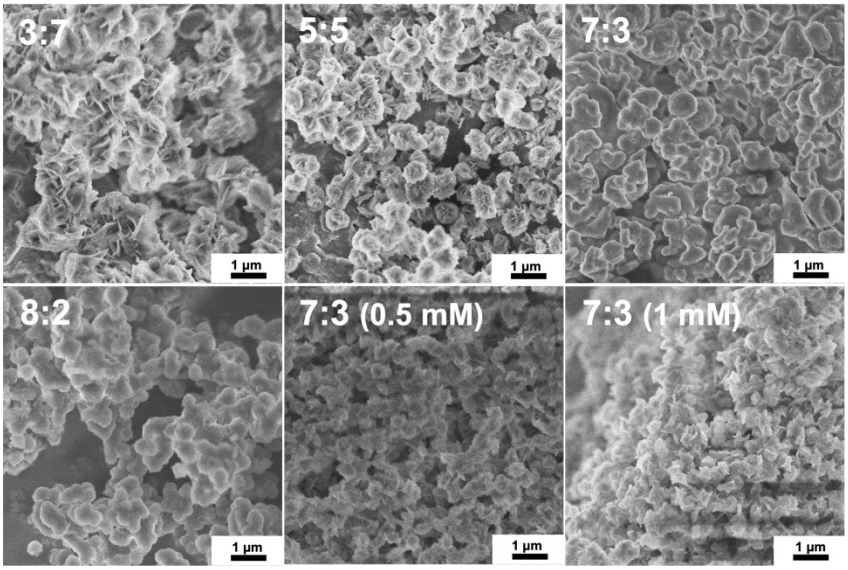

Figure S2. FE-SEM images of DA-6/PMDA prepared in the mixed solvents of cyc/tol = 3:7, 5:5, 7:3, 8:2 and the influence of monomer concentration was studied in the condition of cyc/tol = 7:3.

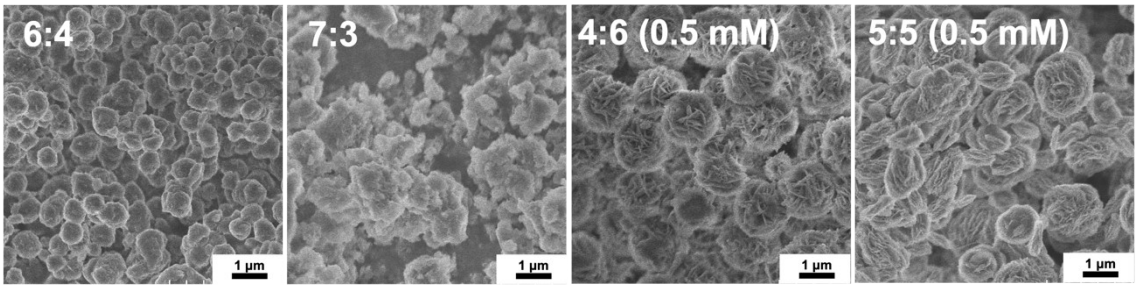

Figure S3. FE-SEM images of DA-6/PMDA prepared in the mixed solvents of cyc/ace = 6:4, 7:3, and in an elevated concentration of 0.5 mM/ 100 mL in cyc/ace = 4:6 and 5:5.

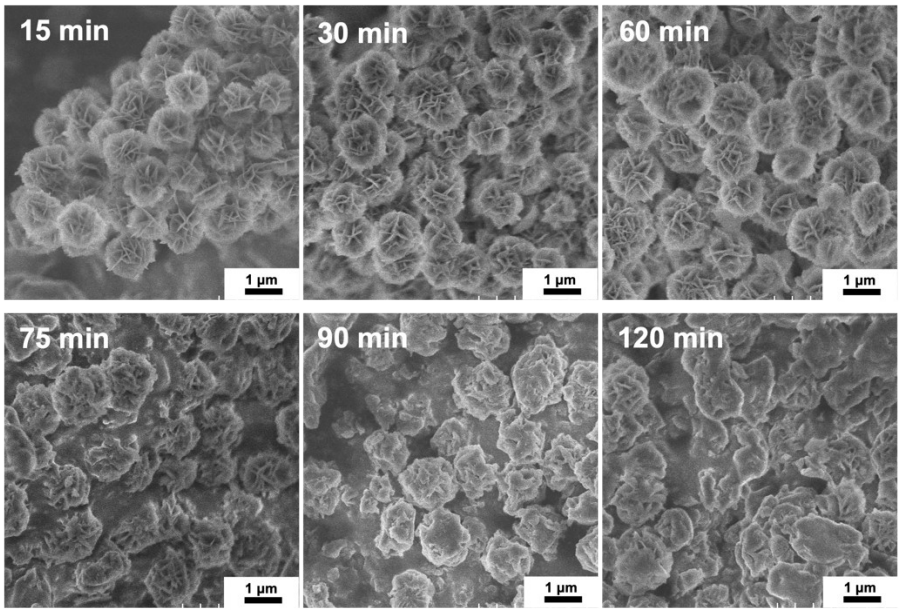

Figure S4. The morphology evolution of FLPs was studied by observing particle morphology at 5-minute intervals up to 120 min in the cyc/ace = 4:6. FLPs were visible from the beginning, but their morphology became increasingly blurred after 60 minutes of reaction time.

Table S2. Inherent viscosities of PAA particles prepared in the mixed solvent of cyc/tol = 7:3 and cyc/ace = 8:2, and PAA of the same chemical composition prepared from solution polymerization

	η_{inh}* [dL/g]
Cyc/tol = 7:3	0.14
Cyc/ace = 8:2	0.26
DA-6/PMDA PAA	1.11

*The inherent viscosities (η_{inh}) of the PAAs were measured in NMP at a solid content of 0.5 dL/g at 30 °C using an Ostwald viscometer

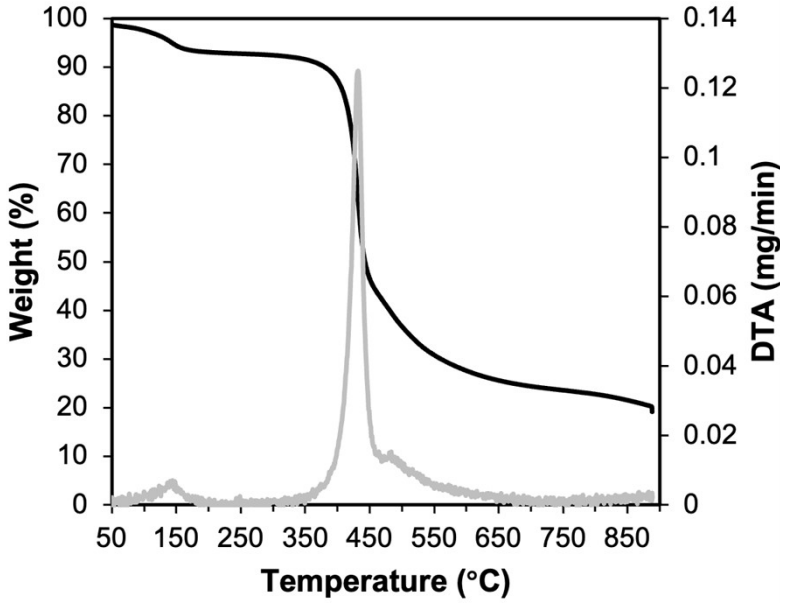

Figure S5. TGA/DTA of PAA FLPs.

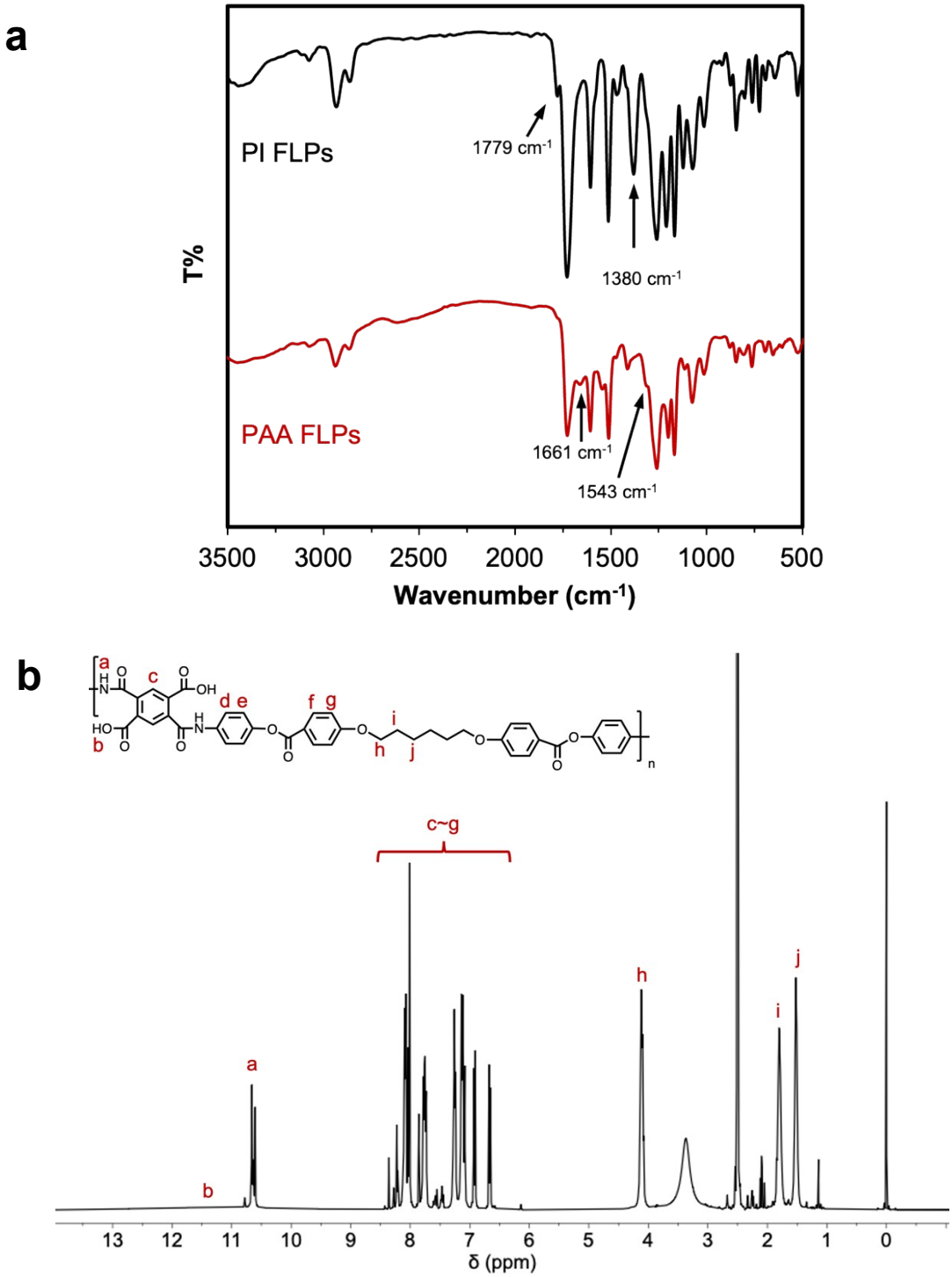

Figure S6. (a) FT-IR spectra of PAA FLPs prepared in cyc/ace = 5:5 as an example and PI. (b)^{1}H NMR (400 MHz) spectra of DA-6/PMDA PAA particles in DMSO-D_6 prepared in cyc/ace = 2:8 as the representative. The carboxyl proton was not obvious, which could be attributed to COOH-NH- interactions and 3D conformation and concentration of PAA.[1]

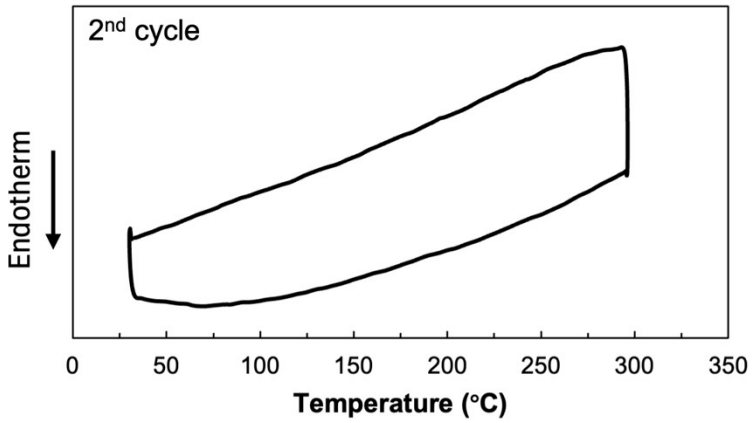

Figure S7. DSC thermogram of PI FLPs prepared in cyc/ace = 2:8 shows no phase transition behavior between 30~300 °C.

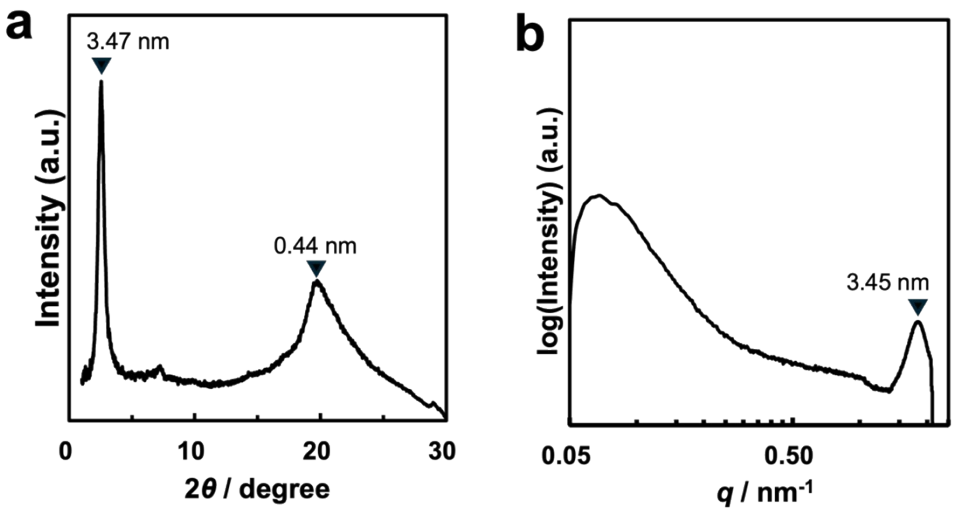

Figure S8. WAXD profile (a) and SAXS profile (b) of DA-6/PMDA bulk PI film.

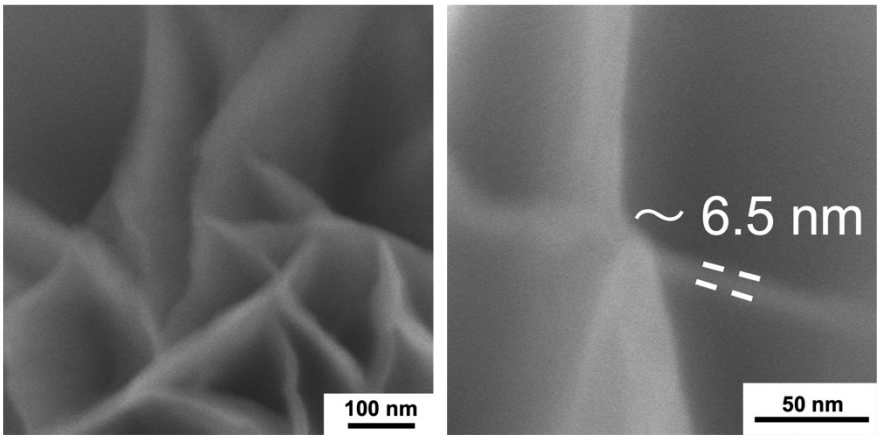

Figure S9. FE-SEM images of the layer thickness of the flower-like particles.

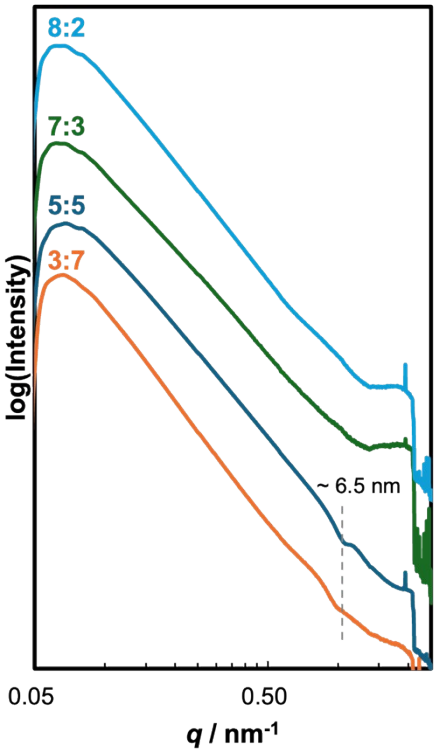

Figure S10. SAXS profile of DA-6/PMDA particles prepared in cyc/tol. Particles with fractal surface in cyc/tol = 3:7 and 5:5 exhibited oscillatory valley around 6.5 nm.

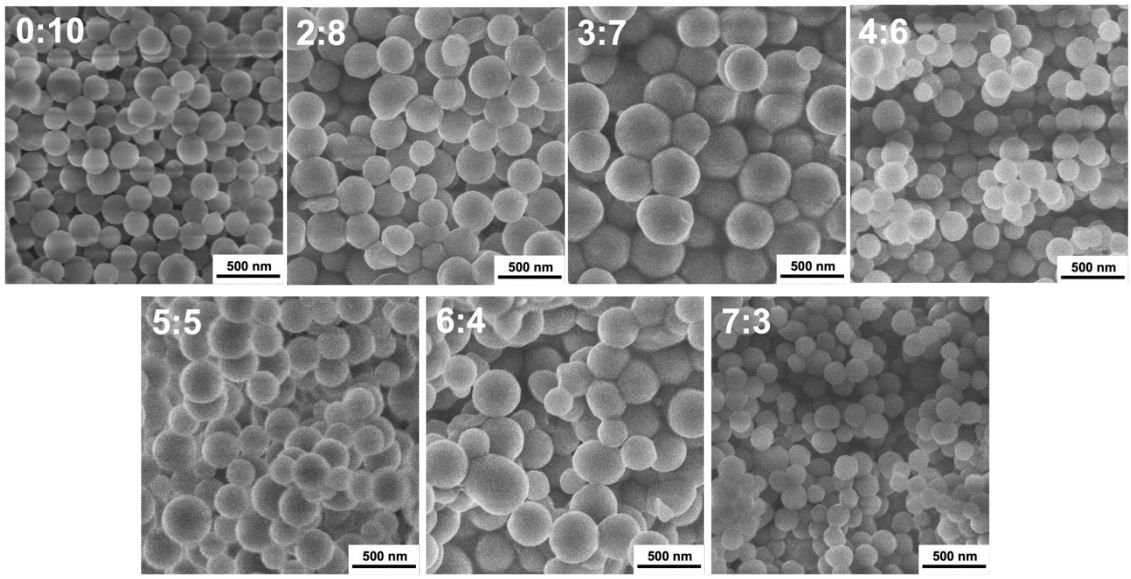

Figure S11. ODA/PMDA prepared in cyc/ace as the comparison.

Table S3. Half wave potential ($E_{1/2}$) and the on-set potential ($E_{0.1\ mA}$) defined as the potential at which a current density of 0.1 mA is achieved, are determined by the RRDE voltammogram of carbon flowers, amorphous carbon and KB.

	Carbon flowers	**Amorphous carbon**	**KB**
$E_{1/2}$ (V vs. RHE)	0.25	0.20	0.08
$E_{0.1\ mA}$ (V vs. RHE)	0.46	0.37	0.18

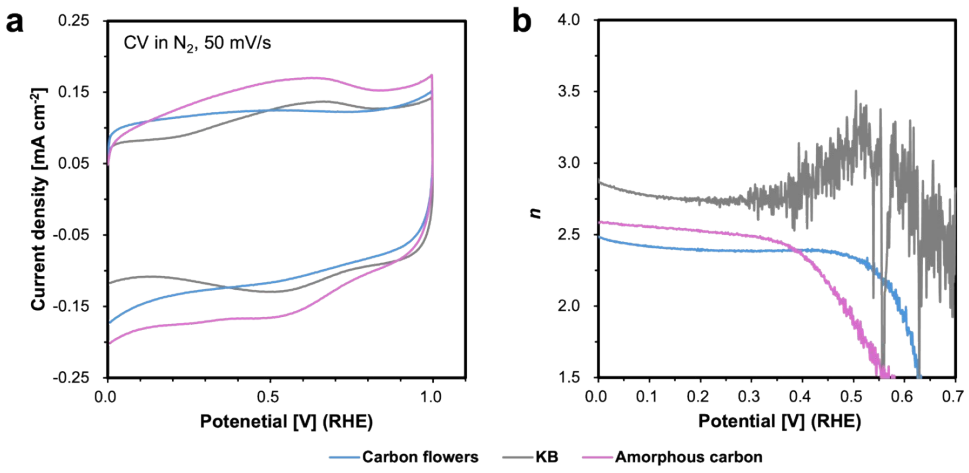

Figure S12. CV curves in N_2 (a) and electron transfer number (b) of carbon flowers, amorphous carbon, and KB.

Reference:

1 İ. Yazgan, *Polym. Bull.*, 2020, **77**, 1191–1203.