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Supporting Information For

Ferrocene derivatives and aniline copolymers with tunable magnetoresistance and dielectric properties

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S1 Preparation of FcA

Preparation of 1,1'-Bis(chlorocarbonyl)ferrocene (Fc(COCl)₂): oxalyl chloride (1.25 mL, 14.6 mmol) was added to a suspension of Fc(COOH)₂ (1.0 g, 3.65 mmol) in anhydrous CH₂Cl₂ (50 mL), followed by 1-2 drops of DMF. The reaction mixture was stirred at rt for 3h, then concentrated in vacuo to afford Fc(COCl)₂ as a red solid without further purification.

Preparation of 1,1'-Bis[[(4-aminophenyl)amino]carbonyl]ferrocene (FcA): A solution of freshly prepared Fc(COCl)₂ (938 mg, 3.00 mmol) in CH₂Cl₂ (50 mL) was added dropwise to a solution of *p*-phenylenediamine (973 mg, 9.00 mmol) and pyridine (0.36 mL) in anhydrous CH₂Cl₂ (50 mL) at room temperature over 30 min. The reaction mixture was stirred for 8 h, the resulting precipitate was collected by filtration, washed with CH₂Cl₂, and dried in vacuo to afford FcA (1.805 mg, 93%) as an orange powder.

S2. Molar ratios of FcA to aniline for different polymers

polymers	Molar ratio	FcA (g)	Aniline (mL)	HCl (mL)	APS (g)
PANI	-	-	1.35	3.75	2.8475
P(ANI-co-FcA)-1	1:20	0.3407	1.35	3.75	2.8475
P(ANI-co-FcA)-2	1:17.5	0.3894	1.35	3.75	2.8475
P(ANI-co-FcA)-3	1:15	0.4543	1.35	3.75	2.8475
P(ANI-co-FcA)-4	1:10	0.6814	1.35	3.75	2.8475

Table S1. Molar ratios of FcA to aniline for different polymers.



S3. FTIR spectra of *p*-PDA, FcA, Fc(COCl)₂ and Fc(COOH)₂

Fig. S1 FTIR spectra of *p*-PDA, FcA, Fc(COCl)₂ and Fc(COOH)₂.

S4. SEM images of FcA and copolymers



Fig. S2 SEM images of (A) FcA, (B) P(ANI-co-FcA)-1, (C) P(ANI-co-FcA)-2, (D) P(ANI-co-FcA)-4.

S5. High-resolution XPS spectra of pure PANI



Fig. S3 High-resolution N 1s XPS spectra of pure PANI.



S6. High-resolution XPS spectra of copolymers

Fig. S4 High-resolution N 1s XPS spectra of (A) P(ANI-co-FcA)-1, (B) P(ANI-co-FcA)-2, (C) P(ANI-co-FcA)-4; high-resolution Fe 2p XPS spectra of (D) P(ANI-co-FcA)-1, (E) P(ANI-co-FcA)-2, (F) P(ANI-co-FcA)-4.

S7. TGA curve of pure PANI, FcA, and copolymers



Fig. S5 TGA curve of (a) pure PANI, (b) P(ANI-co-FcA)-1, (c) P(ANI-co-FcA)-2, (d) P(ANI-co-FcA)-3, (e) P(ANI-co-FcA)-4 and (f)FcA.

S8. Imaginary permittivity of pure PANI and copolymers



Fig. S6 Imaginary permittivity of (a) pure PANI, (b) P(ANI-co-FcA)-1, (c) P(ANI-co-FcA)-2, (d) P(ANI-co-FcA)-3 and (e) P(ANI-co-FcA)-4.