

Supporting Information

Corrosion-resistant Graphene-based Magnetic Composite Foams for Efficient Electromagnetic Absorption

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Synthesis of 4, 4'-bis (3, 4-dicyanophenoxy) biphenyl (BPH). A mixture containing 4, 4'-biphenol (0.6 mol) and 4-nitrophthalonitrile (1.2 mol) in 600 mL of *N, N*-Dimethylformamide (DMF) was stirred at room temperature for 30 min. 1.3 mol anhydrous potassium carbonate (K_2CO_3) was then added into the mixture in three portions at 1 h intervals. After being continuously stirred for 72 h at room temperature, the obtained mixture was slowly poured into 10 % aqueous hydrochloric acid solution (600 mL). The separated precipitate was isolated by suction filtration, washed with water until clear and neutral, and dried. Purification was realized by recrystallization from acetone-water to afford 95% of BPH. 1H NMR (ppm): 8.12-8.07, 7.83, 7.81-7.76, 7.45-7.40, 7.30-7.24; FTIR (cm^{-1}): 3074, 3034, 3101, 2240, 1592, 1491, 1410, 959; T_m : 233 °C.

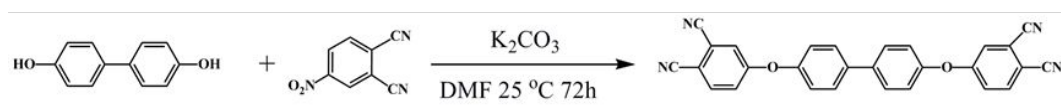


Figure S1. Synthesis of 4, 4'-bis (3, 4-dicyanophenoxy) biphenyl.

Preparation of graphene-based magnetic composite foam

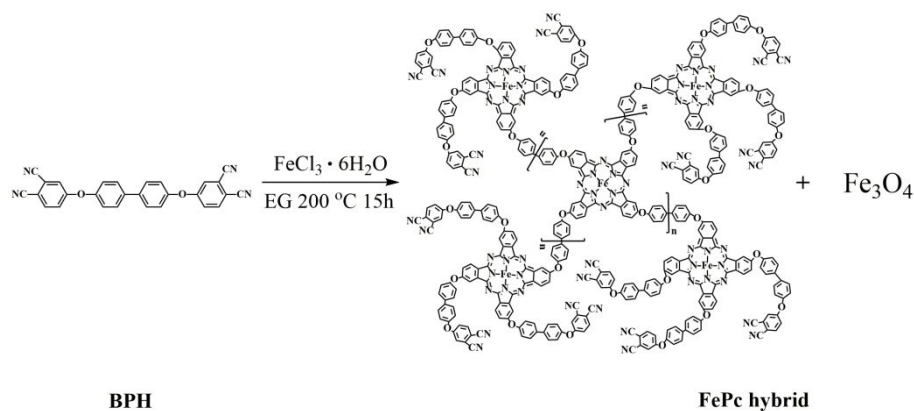


Figure S2. Synthetic illustration of FePc hybrid under solvothermal condition.

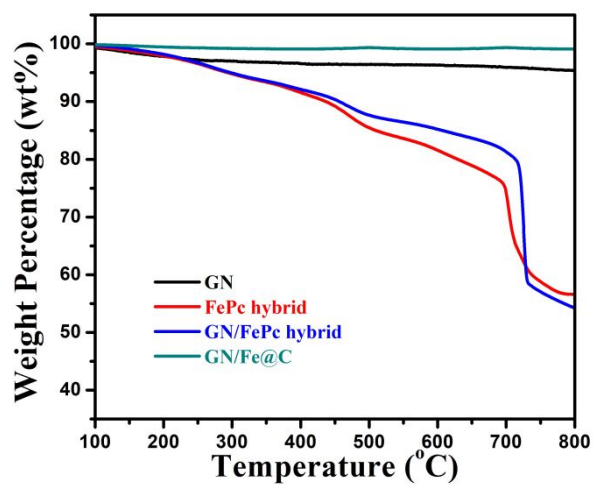


Figure S3. The thermogravimetric curves for GN, FePc hybrid, GN/FePc hybrid and GN/Fe@C foams.

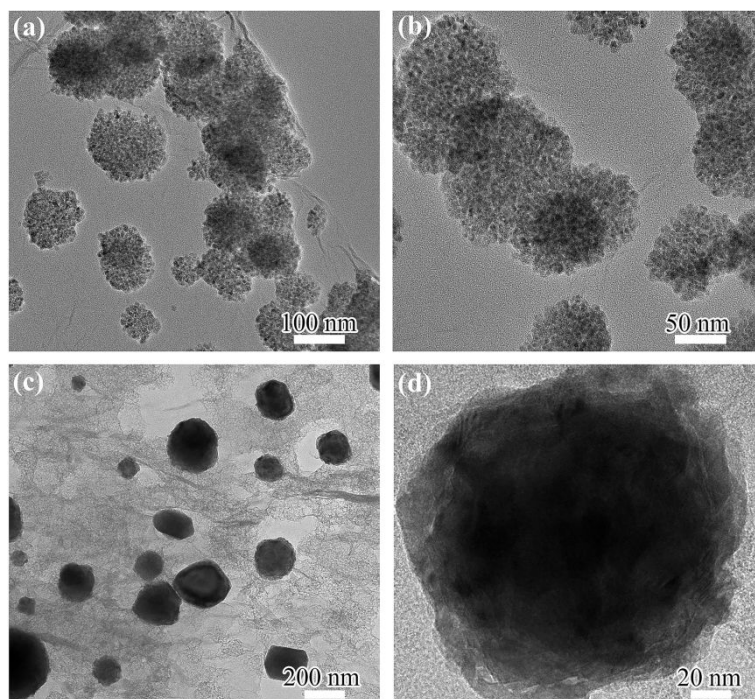


Figure S4. TEM images of (a, b) GN/FePc hybrid foam and (c, d) GN/Fe@C foam.

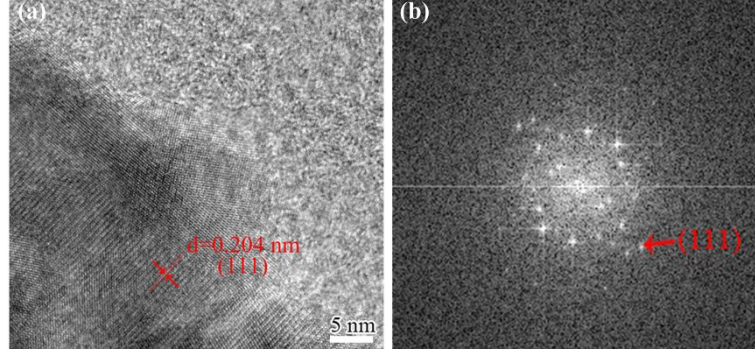


Figure S5. (a) HR-TEM images of shell in Fe@C; (b) the corresponding Fourier-transform diffraction patterns of the HR-TEM image.

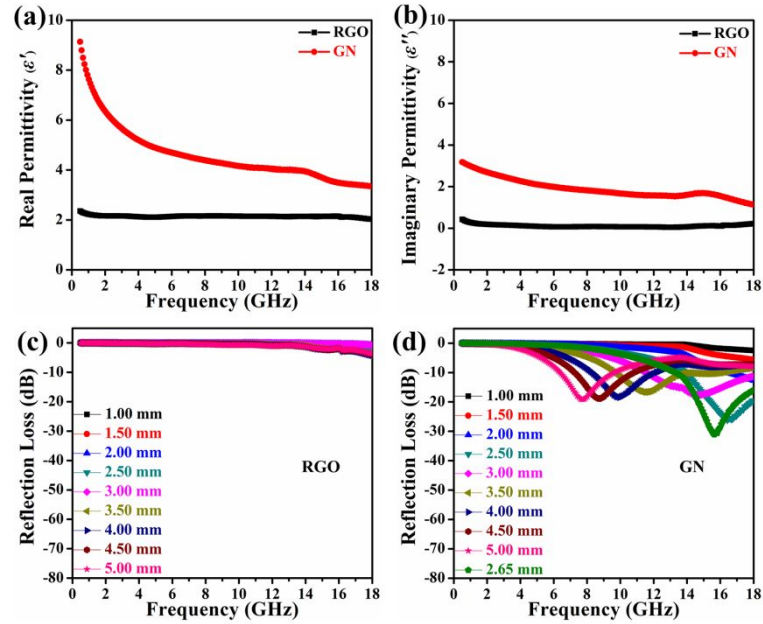


Figure S6 The real parts (a) and (b) imaginary parts of complex permittivity of RGO and GN foams; 2D reflection loss maps of the (c) RGO and (d) GN foams with different thickness (1-5 mm) at 0.5-18 GHz.

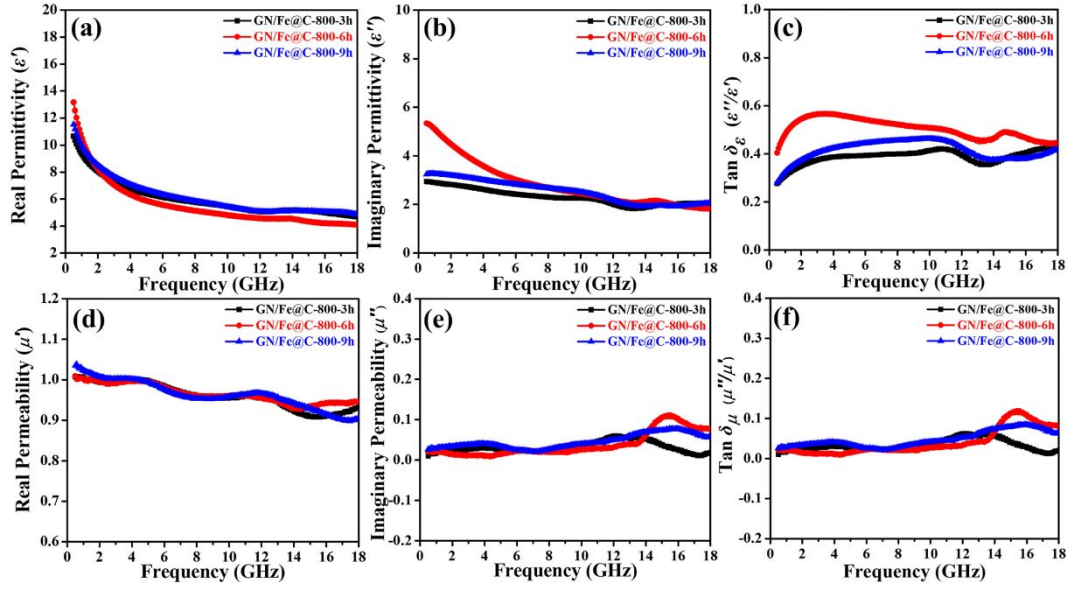


Figure S7. (a, d) the real parts, (b, e) imaginary parts, (c) dielectric loss tangent, and (f) magnetic loss tangent of complex permittivity and permeability for GN/Fe@C foams annealed at different times.

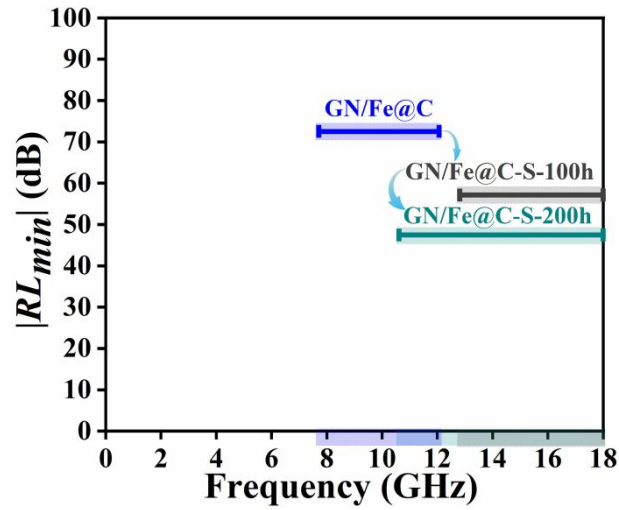


Figure S8. The summary of MA performance for the GN/Fe@C foams treated at different salt spray testing time.

Table S1 Microwave absorption parameters of GN, GN/FePc hybrid and GN/Fe@C

	GN	GN/FePc hybrid	GN/Fe@C
RL_{min}			
RL (dB)	-31.40	-27.24	-72.46
Frequency (GHz)	15.64	17.82	9.33
Thickness (mm)	3.15	2.40	3.85
EAB (GHz)	4.62	2.70	4.30
Range (GHz)	13.38-18.00	15.30-18.00	7.68-12.00
Band	Ku	Ku	C, X
EAB_{max}			
Thickness (mm)	2.65	4.00	2.80
Bandwidth (GHz)	6.42	4.00	6.36
Range (GHz)	11.58-18.00	8.40-12.40	11.06-17.40
Band	X, Ku	Ku	X, Ku

Table S2 Microwave absorption parameters of GN/FePc hybrid at different annealing temperature

	GN/Fe@C-600	GN/Fe@C-800	GN/Fe@C-1000
RL_{min}			
RL (dB)	-46.05	-72.46	-19.17
Frequency (GHz)	14.06	9.33	4.34
Thickness (mm)	2.23	3.85	1.84
EAB (GHz)	5.60	4.30	1.48
Range (GHz)	12.40-18.00	7.68-12.00	3.77-5.25
Band	Ku	C, X	S, C

EAB_{max}	Thickness (mm)	2.45	2.80	5.00
	Bandwidth (GHz)	6.20	6.36	5.10
	Range (GHz)	11.80-18.00	11.06-17.40	12.90-18.00
	Band	X, Ku	X, Ku	Ku

Table S3 Microwave absorption parameters of GN/FePc hybrid at different annealing time

		GN/Fe@C-800-3h	GN/Fe@C-800-6h	GN/Fe@C-800-9h
RL_{min}	RL (dB)	-25.51	-72.46	-43.00
	Frequency (GHz)	10.83	9.33	9.51
	Thickness (mm)	3.20	3.85	3.56
	EAB (GHz)	4.12	4.30	4.35
	Range (GHz)	8.96-13.08	7.68-12.00	7.57-11.92
	Band	X, Ku	C, X	C, X
EAB_{max}	Thickness (mm)	2.54	2.80	2.53
	Bandwidth (GHz)	5.98	6.36	6.42
	Range (GHz)	11.62-17.60	11.06-17.40	11.58-18.00
	Band	X, Ku	X, Ku	X, Ku

Table S4 Microwave absorption parameters of GN/Fe@C after salt spray test in different time

		GN/Fe@C	GN/Fe@C-S-100h	GN/Fe@C-S-200h
RL_{min}	RL (dB)	-72.46	-56.79	-47.63
	Frequency (GHz)	9.33	14.81	12.70
	Thickness (mm)	3.85	2.53	3.15
	EAB (GHz)	4.30	5.20	7.38
	Range (GHz)	7.68-12.00	12.80-18.00	10.62-18.00
	Band	C, X	Ku	X, Ku

EAB_{max}	Thickness (mm)	2.80	2.97	3.38
	Bandwidth (GHz)	6.36	7.34	10.12
	Range (GHz)	11.06-17.40	10.66-18.00	9.88-18.00
	Band	X, Ku	X, Ku	X, Ku
