

Supporting Information

Magnetic Field-Induced Porous Carbon Aerogel Supported CoFe Nanowires for Electromagnetic Wave Absorption

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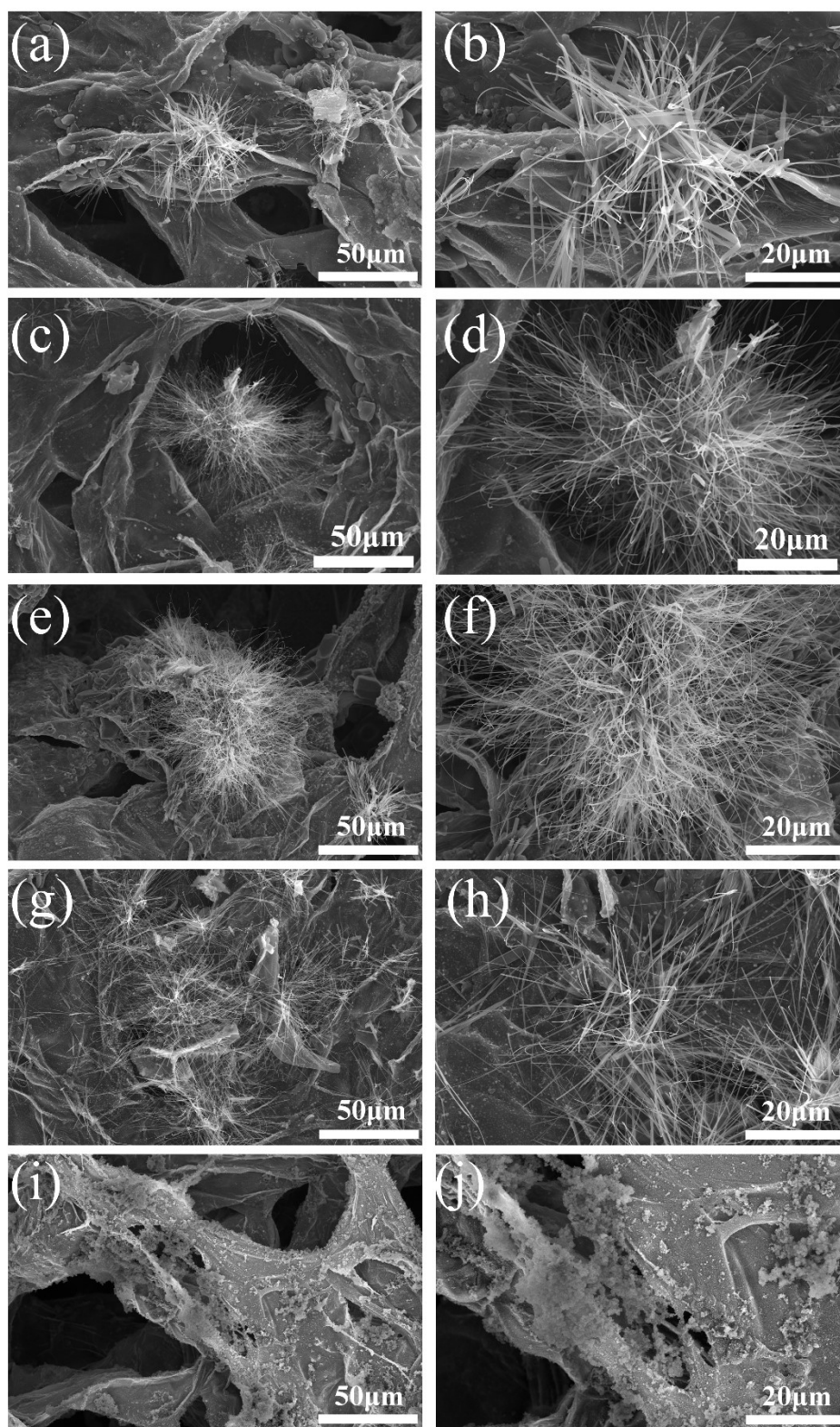


Fig. S1. SEM images of S-1(a-b), S-2(c-d), S-3(e-f), S-4(g-h) and S-5(i-j).

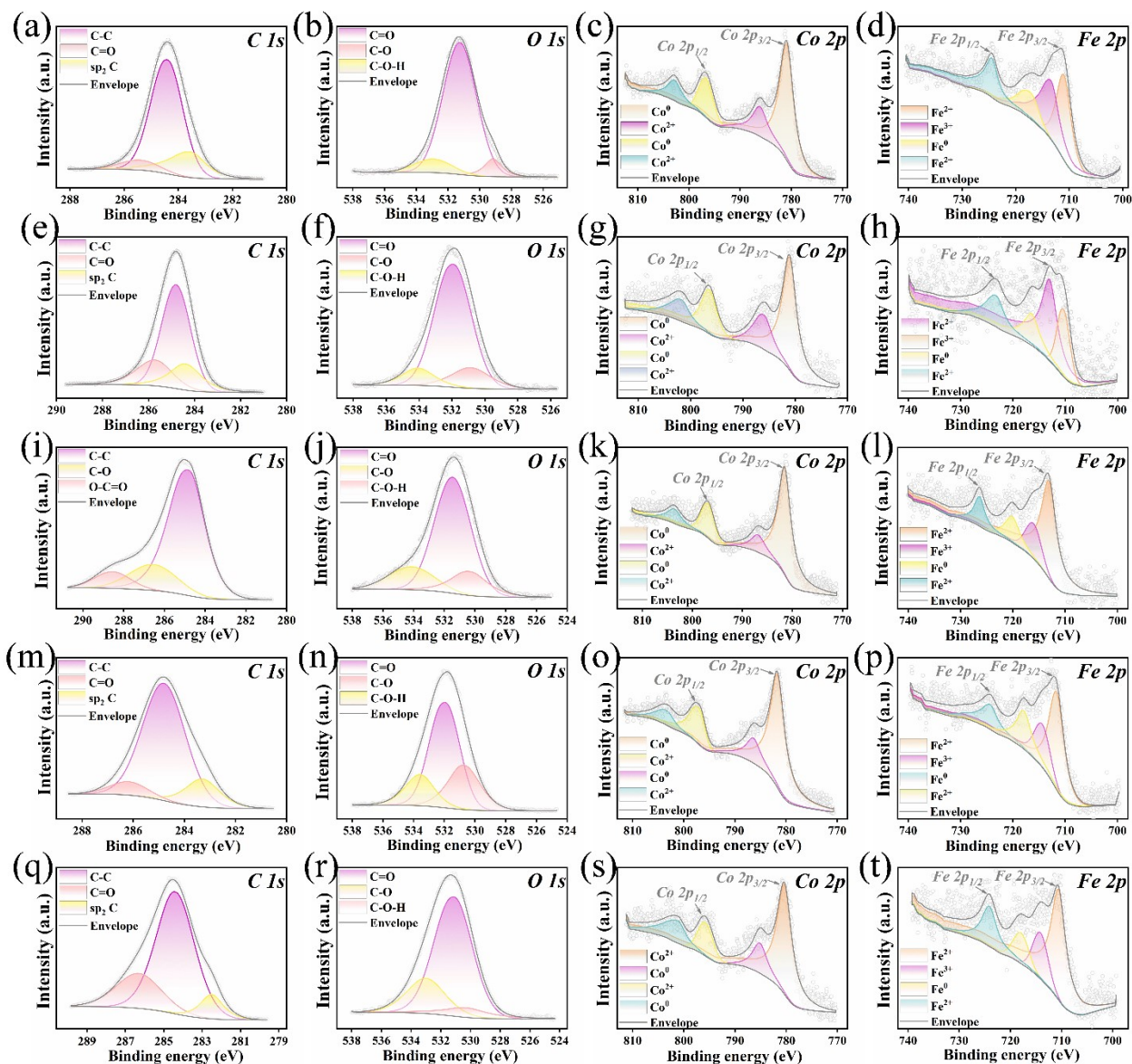


Fig. S2. XPS characteristic peaks of S-1(a-d), S-2(e-h), S-3(i-l), S-4(m-p) and S-5(q-t).

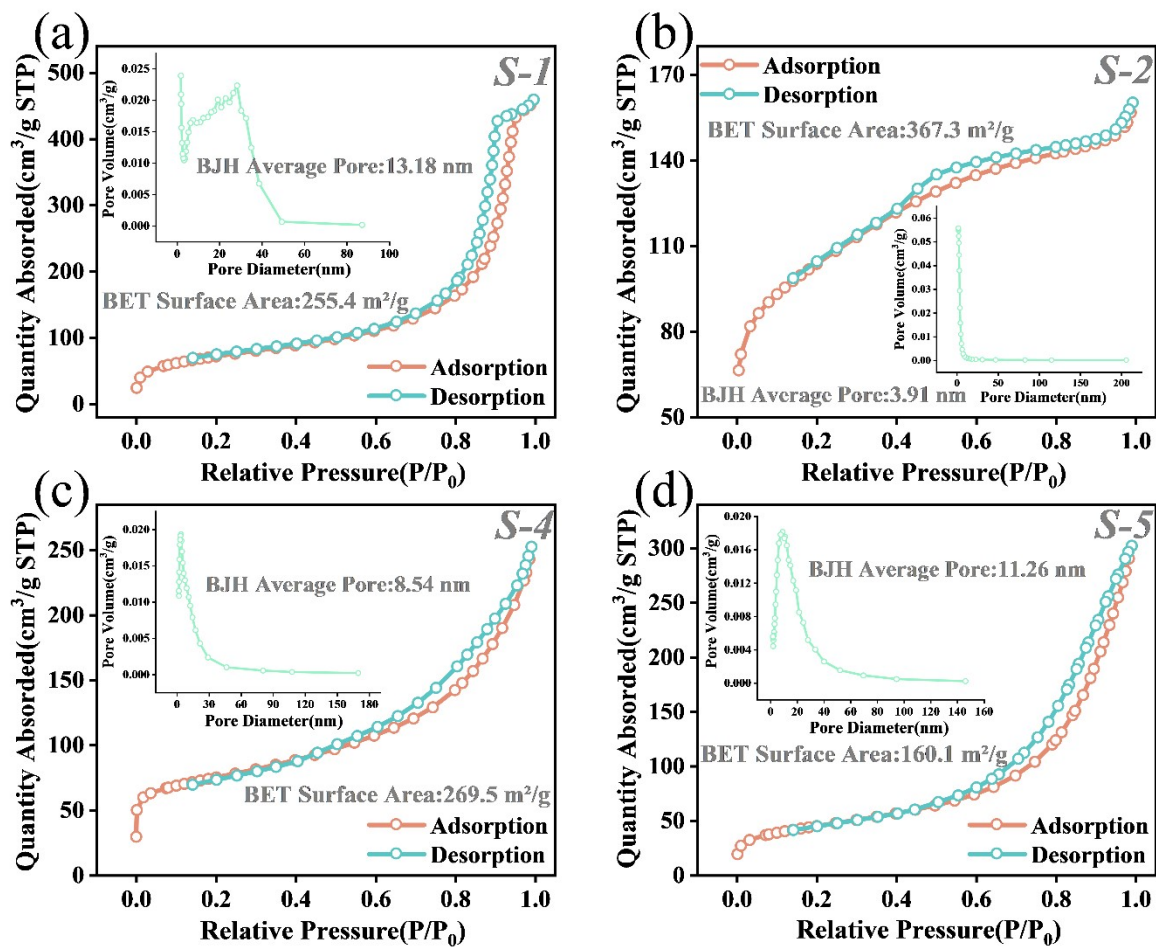


Fig. S3. N_2 absorption-desorption isotherms and polar size distributions for S-1 (a), S-2 (b), S-4(c) and S-5 (c).

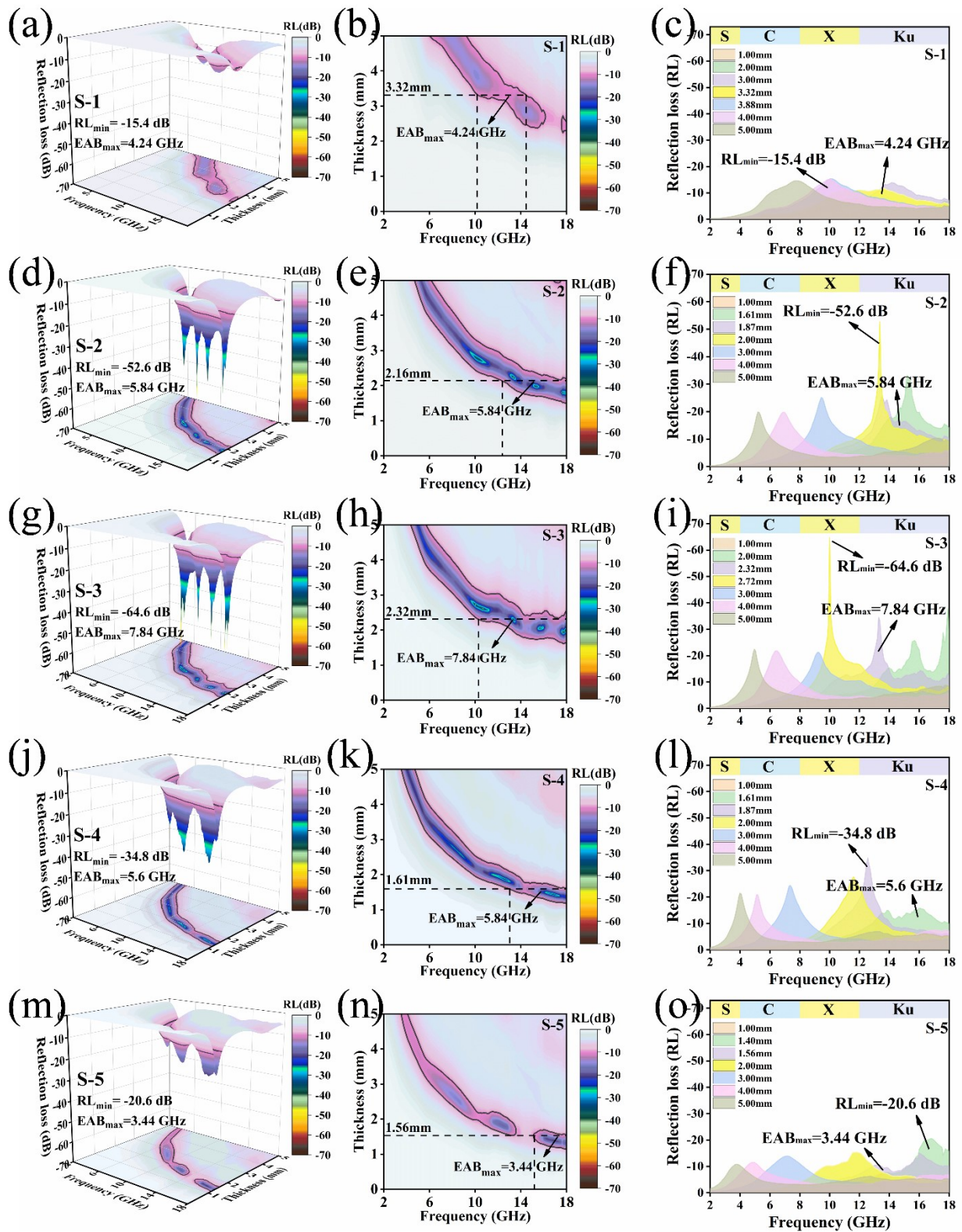


Fig. S4. Reflection loss 3D, 2D and 1D diagrams for CoFe NWs/CAP composites.

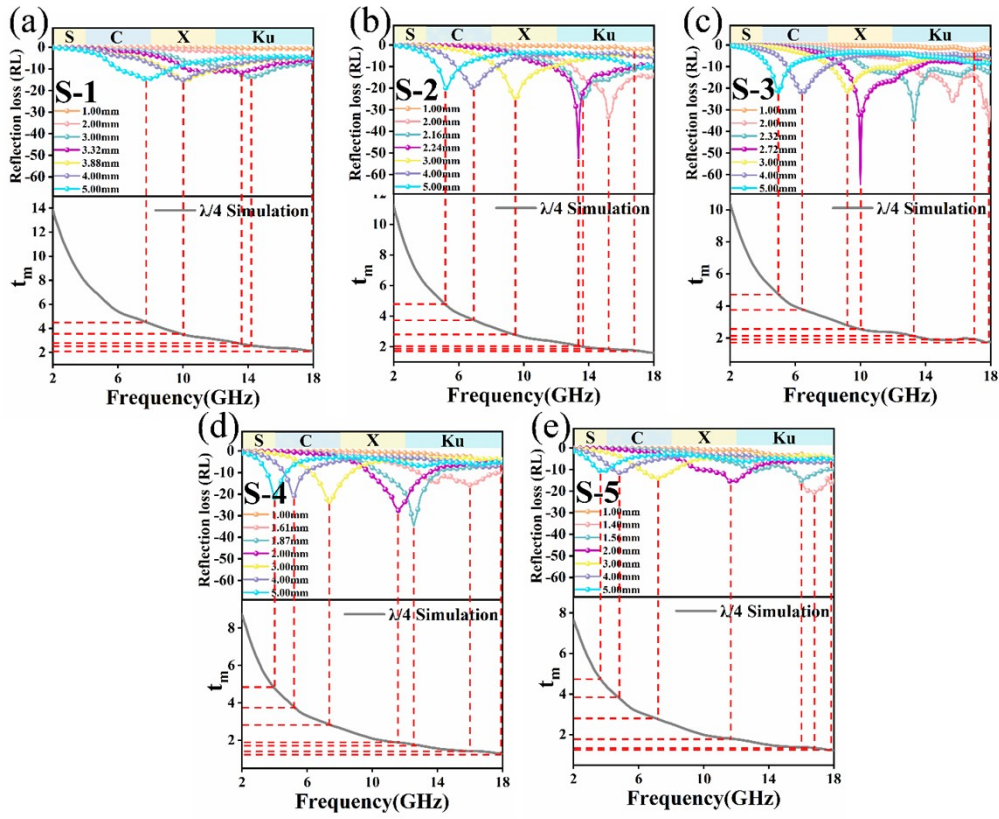


Fig. S5. Theoretical study on $\lambda/4$ waveguide properties and corresponding reflection loss of CoFe NWs/CAP composites.

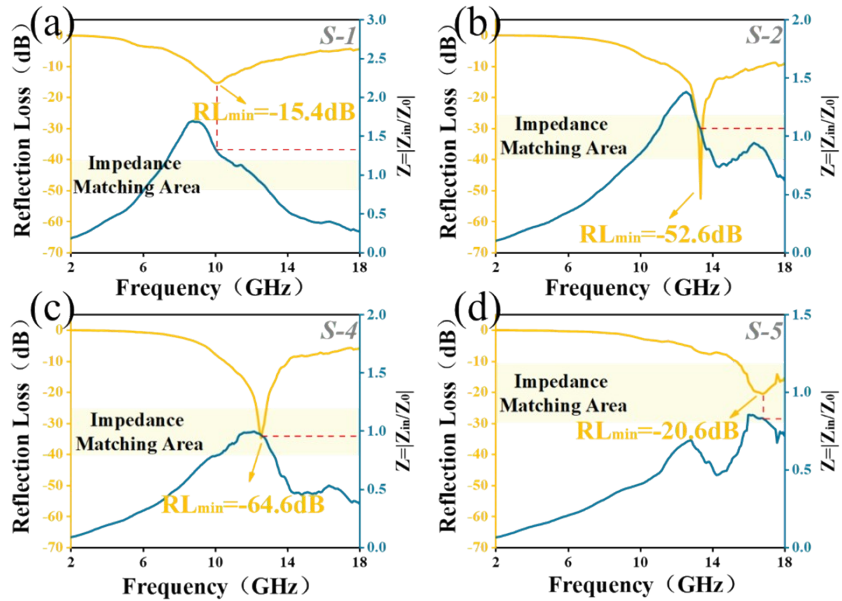


Fig. S6. Correspondence between RL and impedance matching of S-1(a), S-2(b), S-4(c) and S-5(d).

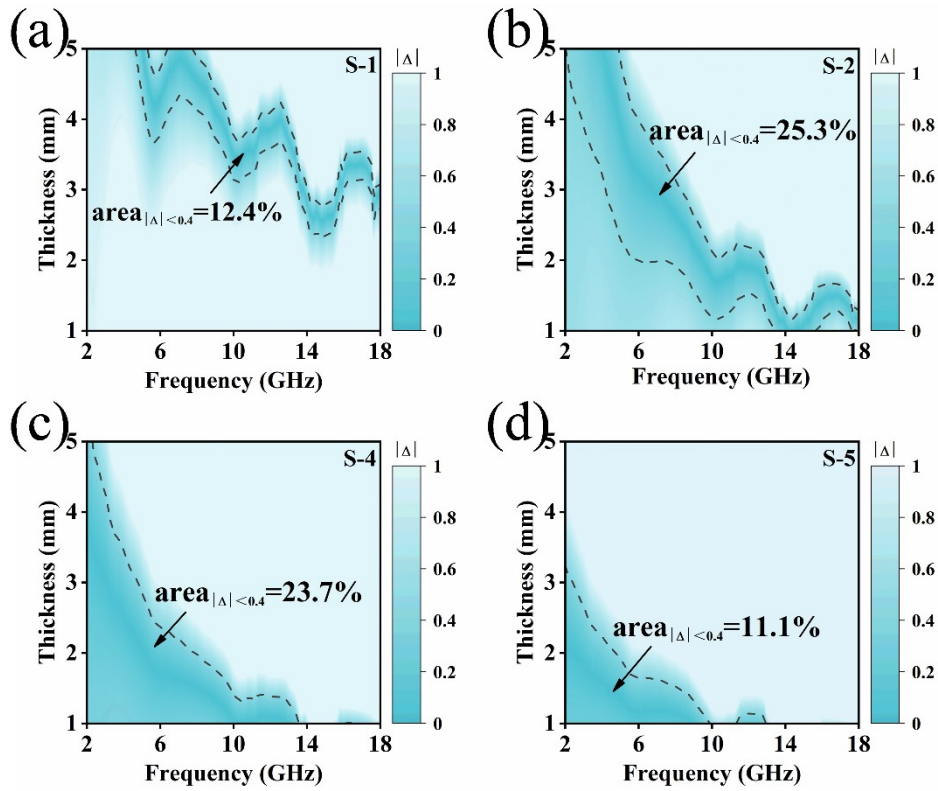


Fig. S7. Impedance matching of S-1(a), S-2(b), S-4(c) and S-5(d).

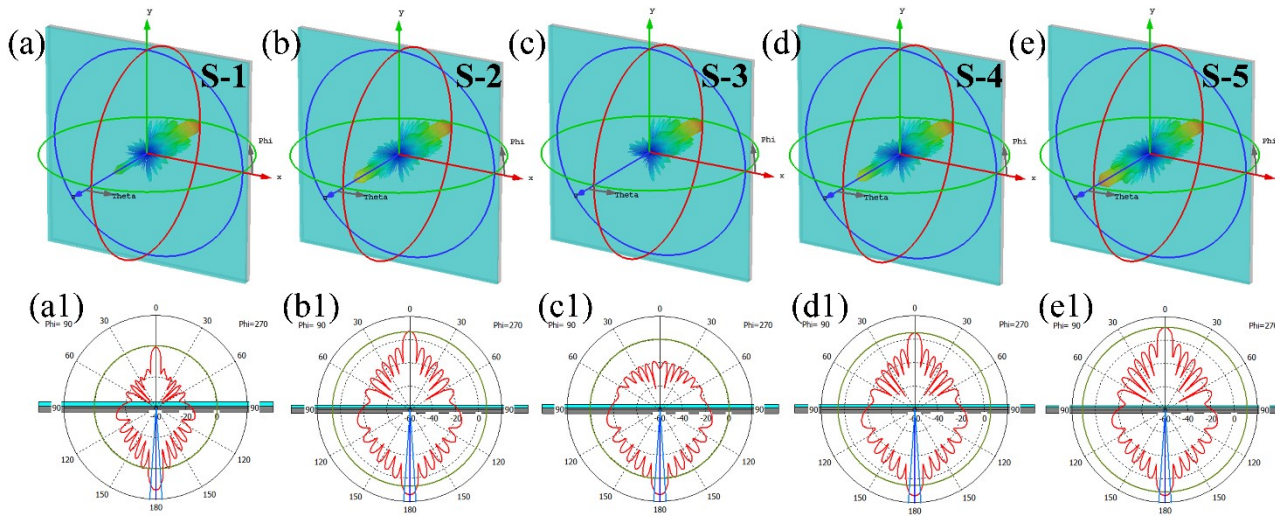


Fig. S8. RCS 3D and 2D plots for S-1 (a, a1), S-2 (b, b1), S-3 (c, c1), S-4 (d, d1) and

S-5(e, e1).

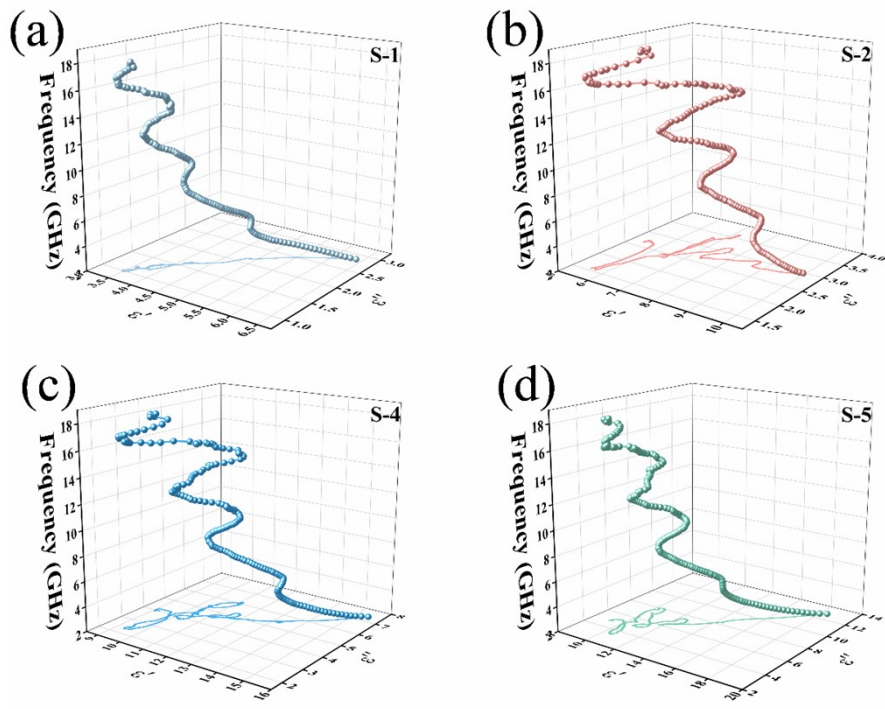


Fig. S9. Cole-Cole curve of S-1(a), S-2(b), S-4(c) and S-5(d).

To dissect the loss processes in composites, the variation characteristics of the material's relative complex dielectric constant ($\epsilon_r = \epsilon' - j\epsilon''$) and complex magnetic permeability ($\mu_r = \mu' - j\mu''$) were analyzed. Among these, ϵ' , ϵ'' , μ' and μ'' represent the storage and dissipation of electrical and magnetic energy, respectively. The definitions of ϵ_r , ϵ' , ϵ'' , μ' , μ'' and $\tan\delta_\epsilon$ are as follows :¹⁻³

$$\epsilon_r = \epsilon_\infty + \frac{\epsilon_s - \epsilon_\infty}{1 + j2\pi f\tau} \# (S1)$$

$$\epsilon' = \epsilon_\infty + \frac{\epsilon_s - \epsilon_\infty}{1 + (2\pi f)^2\tau^2} \# (S2)$$

$$\epsilon'' = \frac{2\pi f\tau(\epsilon_s - \epsilon_\infty)}{1 + (2\pi f)^2\tau^2} \# (S3)$$

$$\mu' = 1 + \frac{M}{H}\cos\theta \# (S4)$$

$$\mu'' = 1 + \frac{M}{H}\sin\theta \# (S5)$$

$$\tan\delta_\epsilon = \frac{\epsilon''}{\epsilon'} = \frac{(\epsilon_s - \epsilon_\infty)2\pi f\tau}{\epsilon_s + \epsilon_\infty + (2\pi f)^2\tau^2} \# (S6)$$

Here, ϵ_∞ is the optical capacitance, ϵ_s stands for the static capacitance, H indicates the intensity of applied magnetic field, τ denotes the polarization relaxation time, where M represents magnetization intensity and θ denotes the phase lag angle.

Table S1. Comparison of the S_{BET} of S-3 with other EMA materials.

Sample	S_{BET} (cm ² /g)	Ref.
SiC/C composites	20.9	2
FeCo/CMT	221.4	4
Fe ₃ O ₄ /Fe/C/rGO	162.6	5
STC-600	53.9	6
SiC/G-2	147.3	7
FGA-9-1.5	110	8
Fe ₃ C/Fe/C-800	241.7	9
CoNC/HPC-1	199.9	10
Co10/CNF	46.2	11
BPC/Co/CNTs	144.2	12
S-3	535.1	This work

Table S2. Comparison of the performance of different types of EMA materials.

Sample	RL _{min} (dB)	EAB _{max} (GHz)	Ref.
CNWs/SiC/SiOC	-24.5	4.8	13
Ni _x Co ₁ S NWs	-30	6.16	14
SiC NWs/SiC	-33.2	4.2	15
SiC NWs	-37.92	4.59	16
C _f /SiC NWs	-41.08	3.68	17
MnO ₂ /CF	-42.9	3.84	18
HPCC	-44.2	4.2	19
Al ₄ C ₃ @C NWs	-47.1	5.5	20
FCNWs	-47.6	4	21
SiFeBOC	-47.96	3.52	22
HE carbides NWs	-50	4.67	23
NiS/Ni ₃ S ₄ @PPy@MoS ₂ NWs	-51.29	3.24	24
α-MnO ₂ NWs	-55.76	5.6	25
Fe@Ag core-shell NWs	-58.69	7.32	26
Ni@Co ₃ O ₄ NWs	-60	4.62	27
S-3	-64.6	7.84	This work

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