Supplementary Information (SI) for Dalton Transactions.

Supporting Information

Toward Enhancing the Electromagnetic Wave Absorption Performance of CeFe-PBA Derived Composites: Morphology Controlling

*Xuan Zhang, Xueling Wang, Hongbo Tai, and Zhiliang Liu**

Corresponding Author

Zhiliang Liu - Inner Mongolia Key Laboratory of Chemistry and Physics of Rare Earth Materials, School of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot, 010021, P.R. China. Email: cezlliu@imu.edu.cn. **ORCID**: 0000-0001-7105-7950

Authors

Xuan Zhang - College of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot 010021, P. R. China.

Xueling Wang - College of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot 010021, P. R. China.

Hongbo Tai - College of Chemistry and Chemical Engineering, Inner Mongolia University, Hohhot 010021, P. R. China.

Supplementary discussion

Debey theory

The Cole-Cole plot illustrates the relationship between ε' and ε'' as expressed by the following equation [1]:

$$\varepsilon^{'} = \varepsilon_{\infty} + \frac{\varepsilon_{S} - \varepsilon_{\infty}}{1 + (2\pi f)^{2}\tau^{2}} \quad \text{equation (1)}$$

$$\varepsilon^{''} = \frac{2\pi f\tau(\varepsilon_{S} - \varepsilon_{\infty})}{1 + (2\pi f)^{2}\tau^{2}} \quad \text{equation (2)}$$

$$\left(\varepsilon^{'} - \frac{\varepsilon_{S} - \varepsilon_{\infty}}{2}\right)^{2} + \left(\varepsilon^{''}\right)^{2} = \left(\frac{\varepsilon_{S} - \varepsilon_{\infty}}{2}\right)^{2} \quad \text{equation (3)}$$

Where τ displays the polarization relaxation time, ε_S represents the static dielectric constant, and ε_∞ is the high frequency limited dielectric constant.

Radar cross-section (RCS)

The RCS value of the samples was simulated using the CST Studio Suite 2019 software. An absorber of 180◊180◊2.35 mm^3 and a perfect electric conductor (PEC) of 180×180×1 mm^3 were constituted the simulation model. The incident EMW spreads in the negative direction of the x-axis, and the field monitoring frequency was 11.68 GHz.

The stealth performance of the target under radar detection of the three materials is evaluated by the RCS values, which are usually calculated using the following formula [2, 3]:

$$\sigma\ (dBm^{2}) = 10\ lg\left(\lim_{R\to\infty} 4\pi R^{2}\frac{|Es|^{2}}{|Ei|^{2}}\right) \quad \text{equation (4)}$$

Where R represents the twice distance from the radar to the target, E_s and E_i represent the scattered electric field intensity and the incident electric field intensity, respectively.

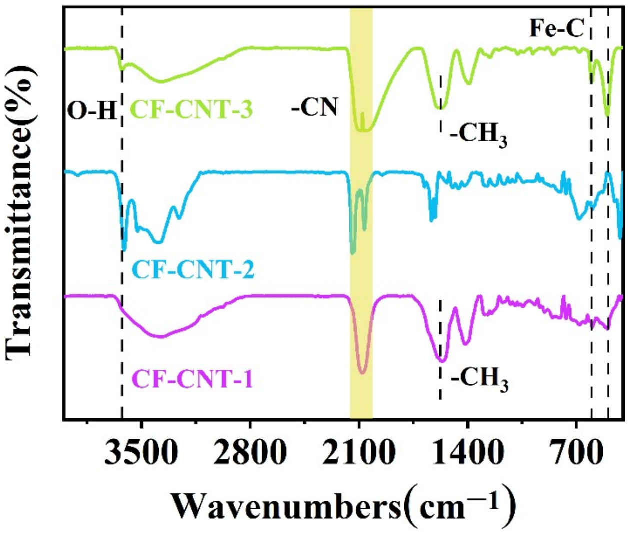

Fig. S1. FT-IR of the synthesized different CeFe-PBA precursors.

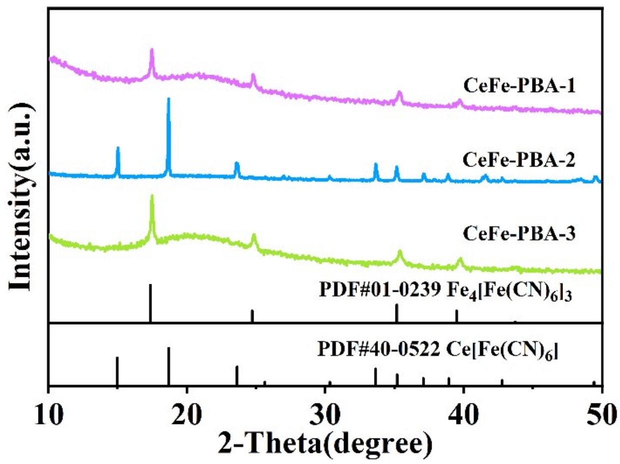

Fig. S2. XRD of CeFe-PBA precursors.

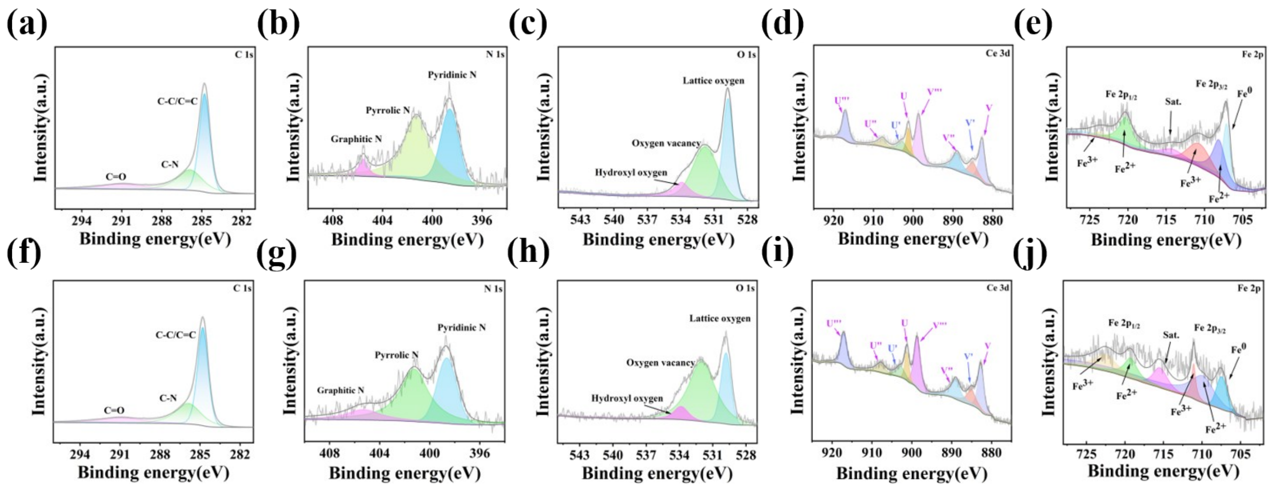

Fig. S3. XPS spectra of (a-e) CF-CNT-1 and (f-j) CF-CNT-3.

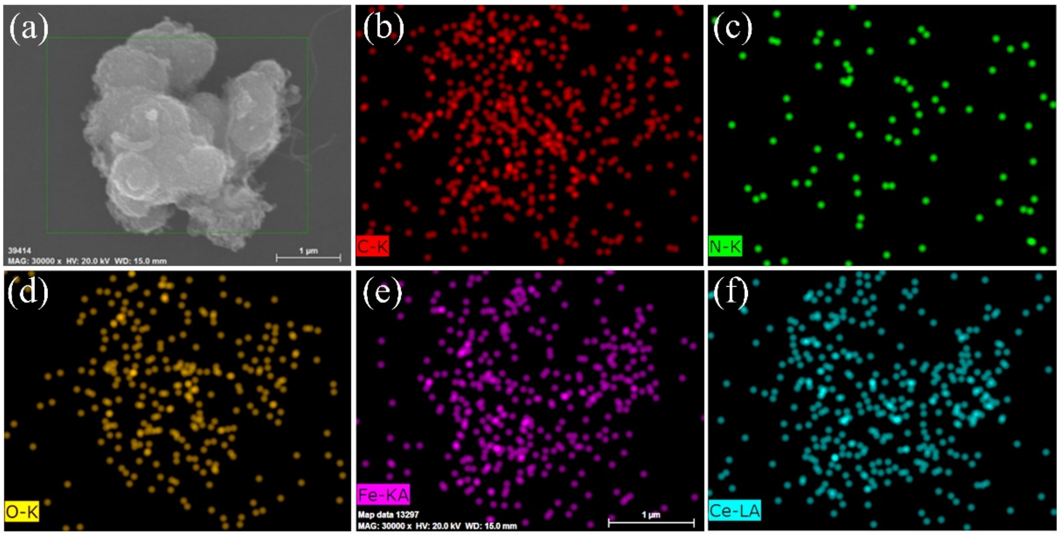

Fig. S4. The elemental mappings of CF-CNT-1.

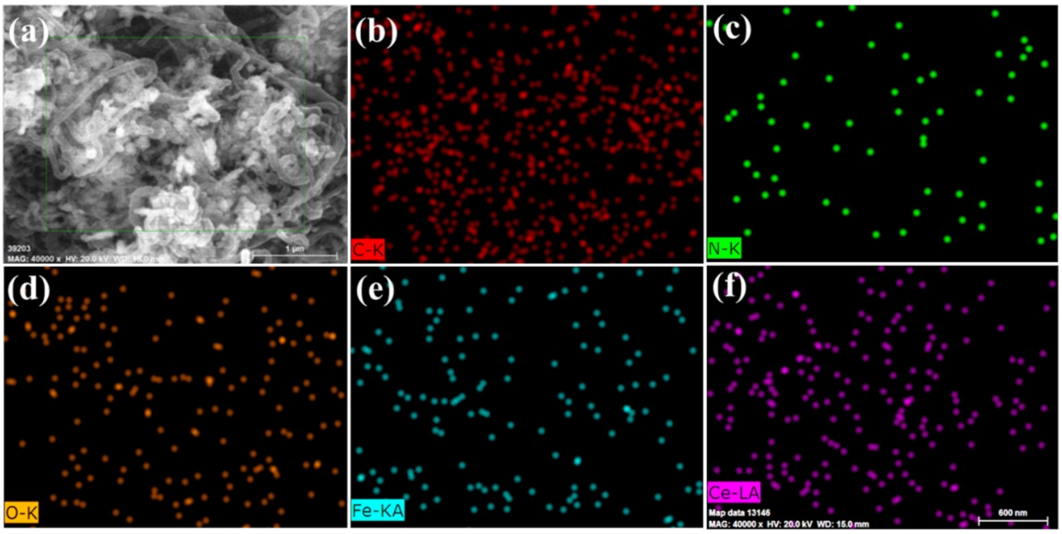

Fig. S5. The elemental mappings of CF-CNT-2.

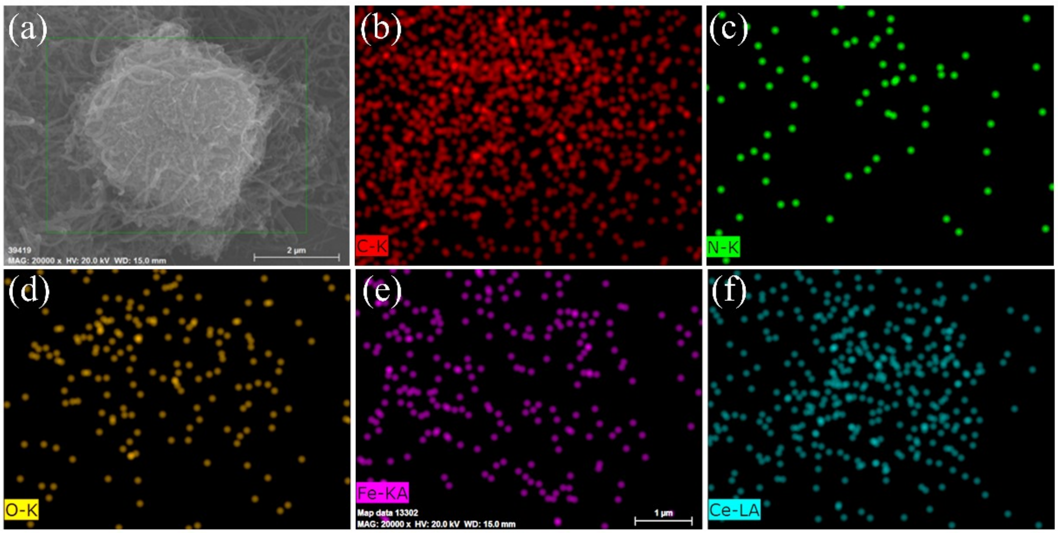

Fig. S6. The elemental mappings of CF-CNT-3.

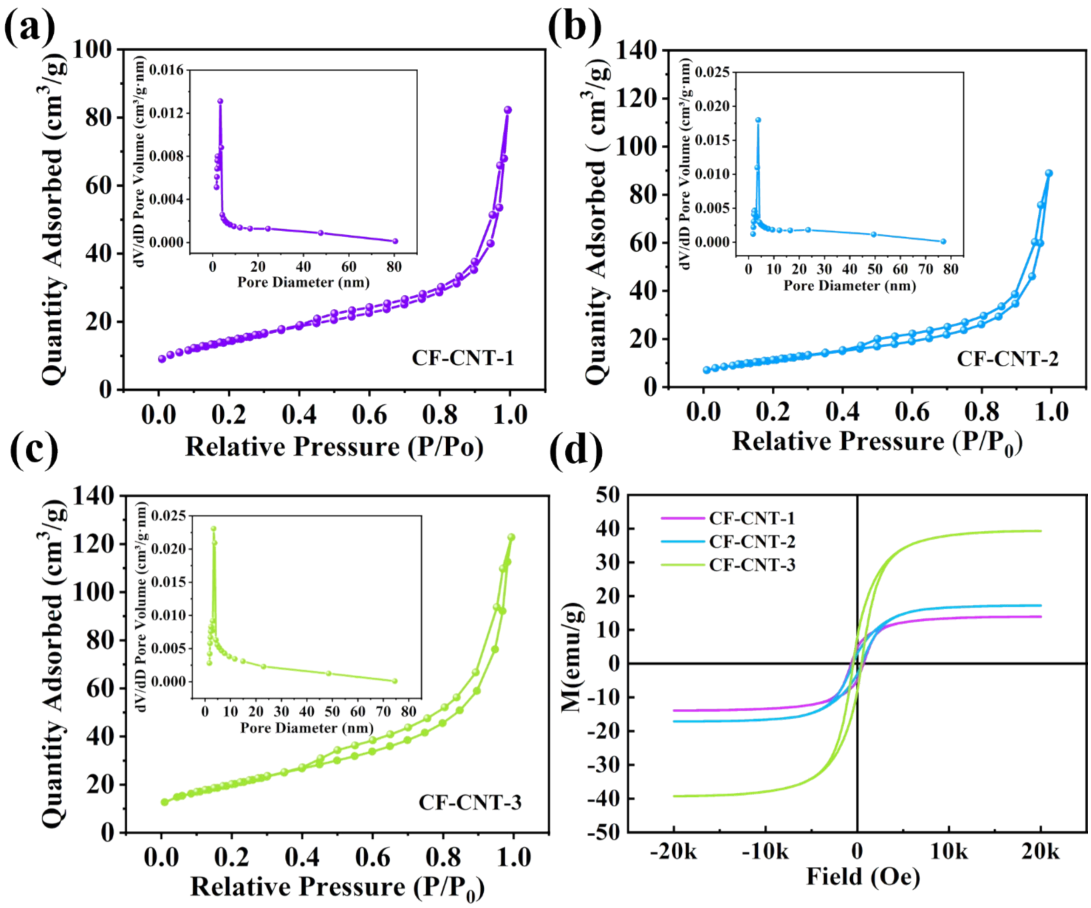

Fig. S7. The adsorption-desorption isotherm, pore-size distributions curve and magnetization hysteresis loops of CF-CNT-1, CF-CNT-2 and CF-CNT-3.

Table S1. Comparison of EMW absorption properties of recent CNT matrix composites

Sample	Loading(wt%)	RL(dB)/d(mm)	EAB(GHz)/d(mm)	Ref.
NiCo@CNTs/NC	20	−30.31/1.40	4.50/1.60	[4]
R-GdN/Co@CNT	30	−36.40/1.70	5.61/2.00	[1]
Dy_2O_3/Co@CNT	40	−48.32/1.75	5.68/1.75	[5]
MCHS@Co@CNTs	20	−37.30/2.10	4.40/2.10	[6]
TCM(700/800/900)	30	−42.55/1.91	4.60/1.38	[7]
NCNT/NiCo/C	15	−66.10/3.67	4.64/1.50	[8]
Mo_2N@CoFe@C/CNT	20	−53.50/2.00	5.00/2.00	[9]
FeCo/CNTs	50	−59.24/1.38	3.22/1.38	[10]
Co@CNTs/PC	20	−56.23/2.30	7.36/2.70	[11]
Ni@NCNT@SiO_2	30	−39.58/1.50	4.14/1.50	[12]
Fe_3C/CeO_2-CNT(B)	20	−62.60/2.35	5.28/2.00	This work

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