Electronic Supplementary Material (ESI) for Materials Horizons.

Electronic supplementary information for

Entropy engineering enhances the electromagnetic wave absorption of high-entropy transition metal dichalcogenides/N-doped carbon nanofiber composites

Shipeng Wang[a], Qiangchun Liu[c], Shikuo Li*[a,b], Fangzhi Huang*[b], and Hui Zhang*[a,b]

[a] Anhui Key Laboratory of Magnetic Functional Materials and Devices, School of Materials Science and Engineering, Anhui University, Hefei, 230601, P.R. China

[b] School of Chemistry and Chemical Engineering, Anhui University, Hefei, 230601, PR China

[c] School of Physics and Electronic Information, Huaibei Normal University, Huaibei 235000, China

*Corresponding author: Shikuo Li E-mail: lishikuo@ahu.edu.cn; Fangzhi Huang E-mail: huangfangzhi@163.com; Hui Zhang E-mail: zhhui@ahu.edu.cn

Formula S1: configurational entropy:

The calculation of configurational entropy for as-prepared samples could be made following the equation:

$$\Delta S_{mix} = -R\sum_{i=1}^{n} c_i \ln c_i$$

Where ΔS_{mix} is the configurational entropy of mixing, R is the gas constant, and c_i is the molar fraction of each component. n is the total number of elements involved.

Table S1. The molar fraction of each element is calculated according to XPS.

	Mo	W	S	Se	Te	$\Delta S_{mix}/R$
MS	0.32		0.68			0.63
MWS	0.28	0.036	0.684			0.74
MWSS	0.24	0.05	0.61	0.1		1.02
MWSST	0.25	0.038	0.52	0.176	0.016	1.18

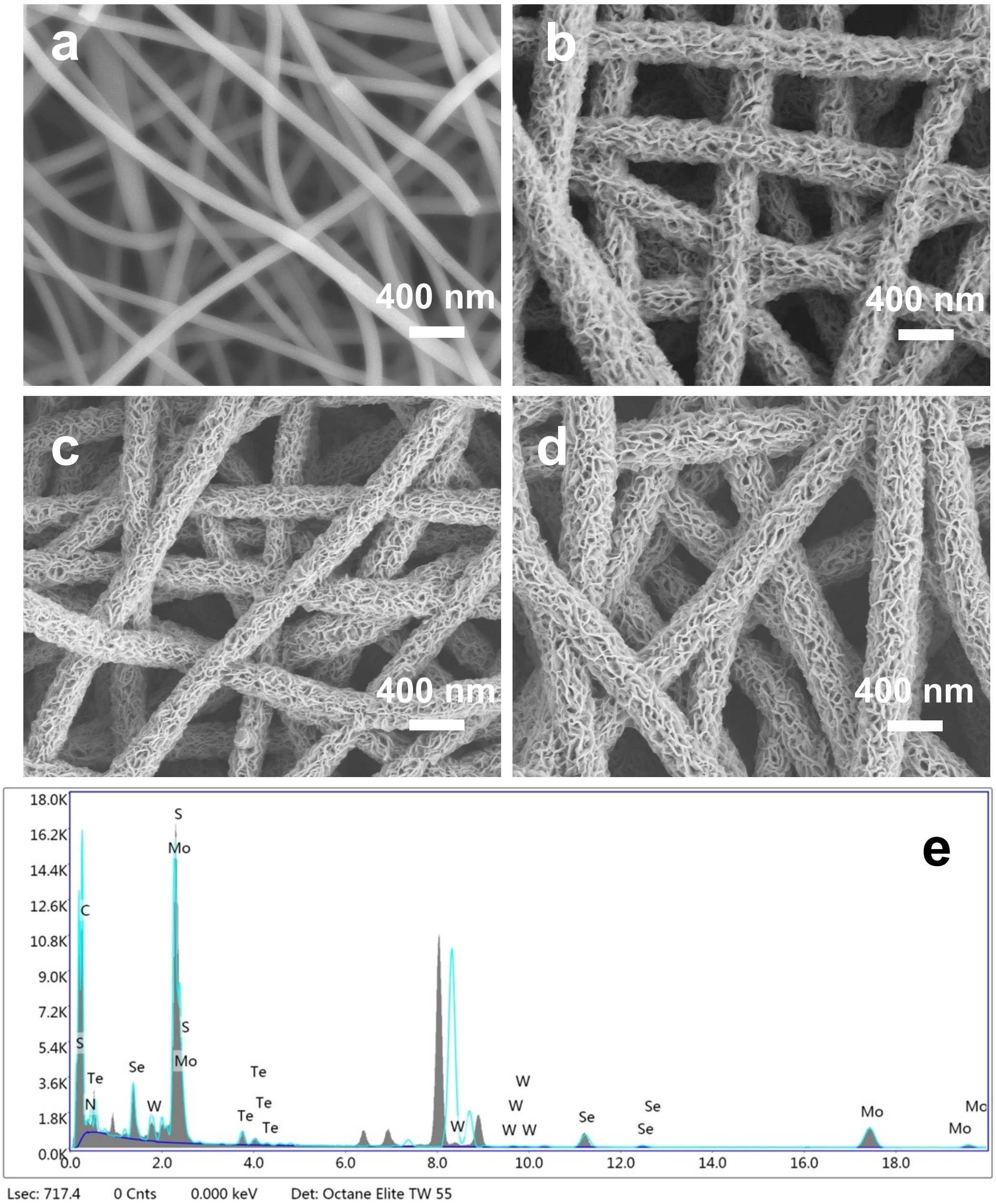

Fig. S1 SEM images of **a** NCNF, **b** NCNF/MS, **c** NCNF/MWS, **d** NCNF/MWSS. **e** EDS spectrum of NCNF/MWSST

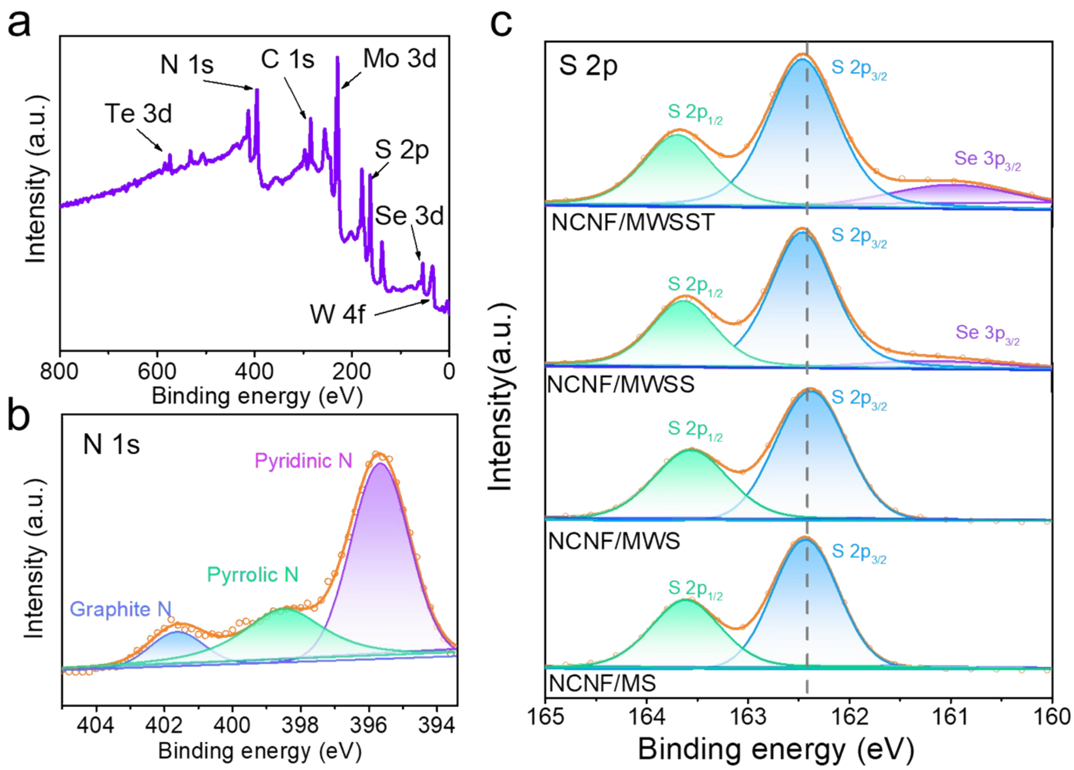

Fig. S2 a Full XPS spectrum of the NCNF/MWSST. **b** N1s spectrum. **c** S 2p spectra of all the samples.

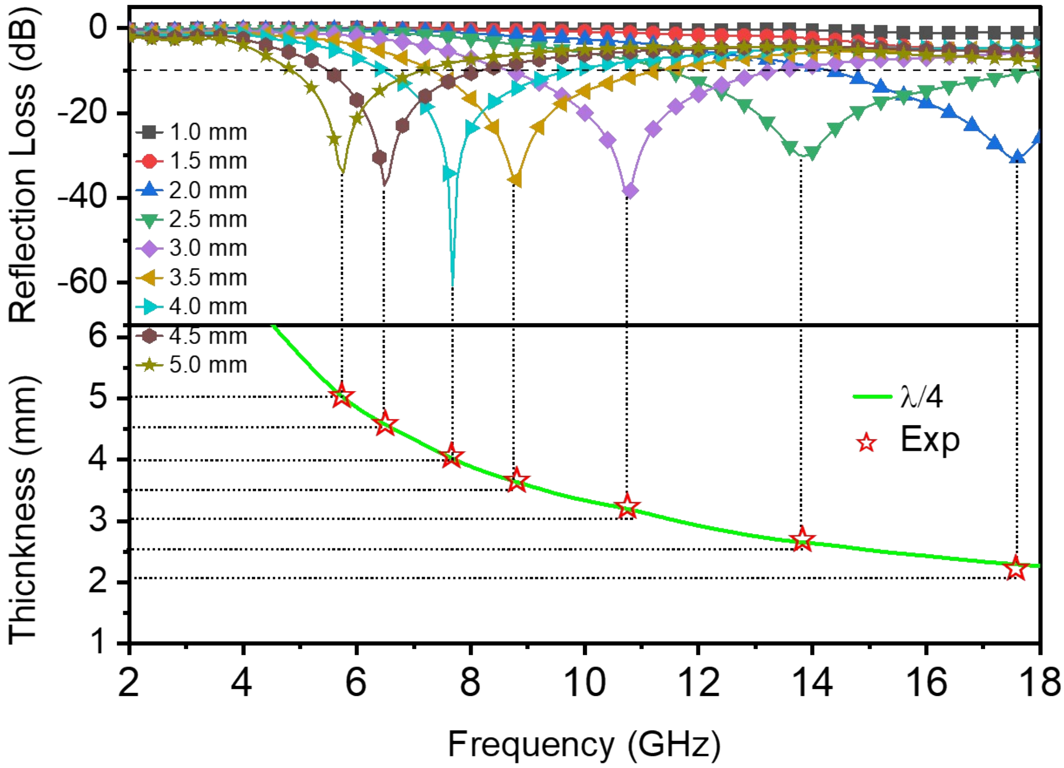

Fig. S3 simulations of the thickness of NCNF/MWSST (*t m*) versus peak frequency (*f m*) of NCNF/MWSST under the λ/4 model.

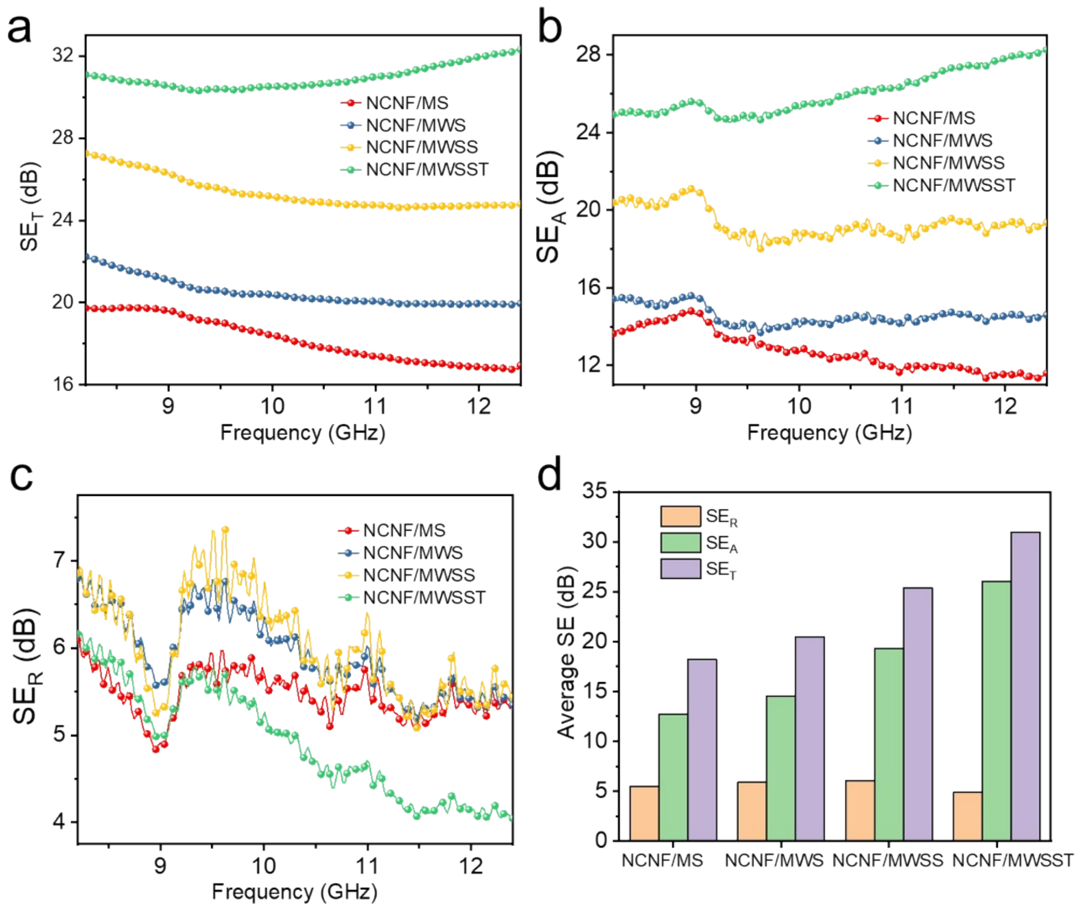

Fig. S4 The EMI **a** SE_T, **b** SE_A and **c** SE_R of the samples. **d** Average absorption and reflection shielding effectiveness.

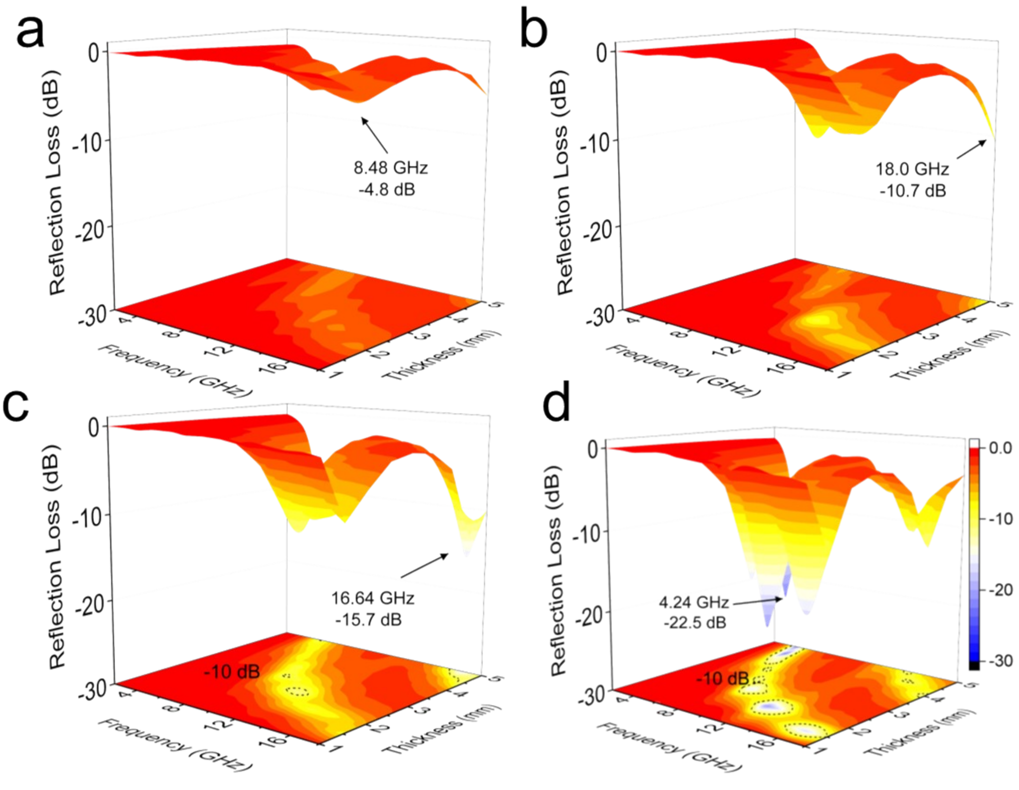

Fig. S5 Frequency dependence of RL for the pure MX_2: **a** MS, **b** MWS, **c** MWSS, and **d** MWSST.

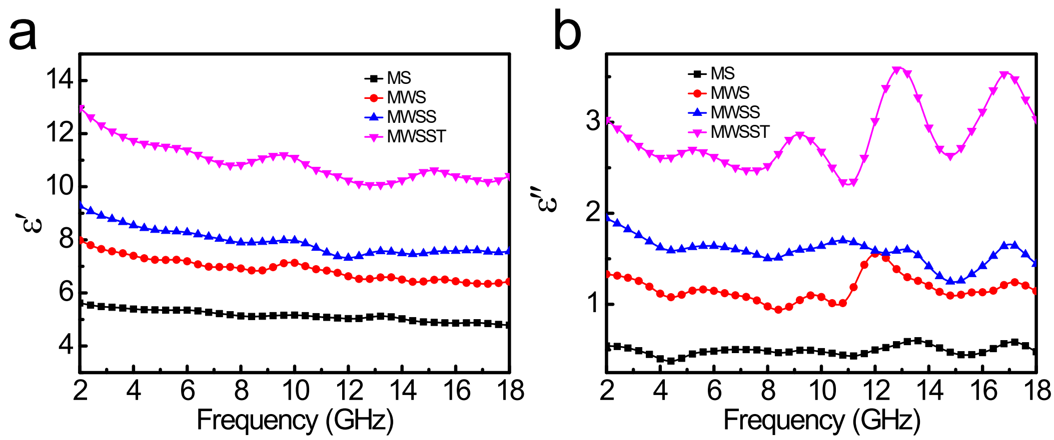

Fig. S6 a Real part and **b** imaginary part of complex permittivity of pure MS, MWS, MWSS, and MWSST.

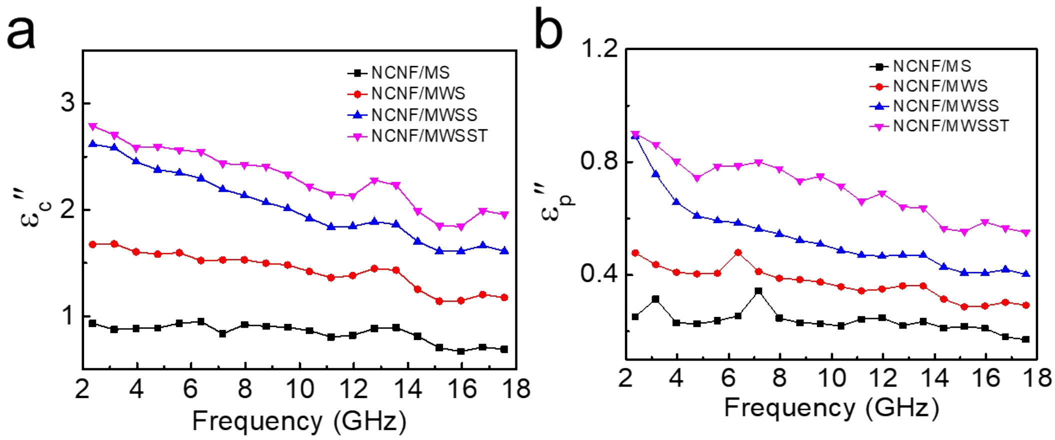

Fig. S7 a Conductive and **b** polarization loss of the as-prepared samples.

Table S2 Comparison of the EMW absorption properties for NCNF/MWSST with other TMDs-based EMW absorbents in previous studies.

sample	$RL_{(min)}$ (dB)	d_m (mm)	Loading (wt.%)	EAB (GHz)	Ref.
1T/2H MoS_2	-45.5	3.5	50	3.89	1
1T/2H WS_2	-47.1	2.2	35	5.2	2
$MoSe_2$	-36	2.05	50	5.7	3
MoS_2/MWCNT	-49.38	1.7	20	4.64	4
CF/WS_2	-50	2.8	5	3.5	5
WSe_2/CNT	-60.4	9	50	4.24	6
MnO_2@NC@MoS_2	-52.56	2.4	25	6	7
Fe_3O_4/Fe@C@MoS_2	-53.79	2.24	50	4.4	8
$CoFe_2$/C@MoS_2	-66.8	2.12	30	5.32	9
$MoSe_2$/Co/C	-62.3	2.05	30	5.1	10
NCNF/MWSS	-33.8	5	10	6.16	This work
NCNF/MWSST	-60.7	2.5	10	6.48	This work

Reference

1. M. Q. Ning, P. H. Jiang, W. Ding, X. B. Zhu, G. G. Tan, Q. K. Man, J. B. Li and R. W. Li, *Adv. Funct. Mater.*, 2021, **31**.
2. W. Ding, L. Hu, Q. C. Liu, Z. G. Sheng, J. M. Dai, X. B. Zhu and Y. P. Sun, *Appl. Phys. Lett.*, 2018, **113**.
3. Y. Cheng, Y. Zhao, H. Zhao, H. Lv, X. Qi, J. Cao, G. Ji and Y. Du, *Chem. Eng. J.*, 2019, **372**, 390-398.
4. H. Geng, Y. Guo, X. Zhang, Y. Zhang, X. Wang, P. Zhao, G. Wang, J. Liao and L. Dong, *J. Colloid Interface Sci.*, 2023, **648**, 12-24.
5. H. Chen, Z. Xu, Y. Zhou, M. Zhang, S. Feng, X. Bu, Z. Zhang and M. He, *Dalton Trans.*, 2023, **52**, 3085-3096.
6. Y. Han, J. Yuan, Y. Zhu, Q. Wang, L. Li and M. Cao, *J. Colloid Interface Sci.*, 2022, **609**, 746-754.
7. K. Yang, Y. Cui, Z. Liu, P. Liu, Q. Zhang and B. Zhang, *Chem. Eng. J.*, 2021, **426**, 131308.
8. Z. Tong, Z. Liao, Y. Liu, M. Ma, Y. Bi, W. Huang, Y. Ma, M. Qiao and G. Wu, *Carbon*, 2021, **179**, 646-654.
9. Z. Liao, M. Ma, Z. Tong, Y. Bi, K. L. Chung, M. Qiao, Y. Ma, A. Ma, G. Wu, X.

Zhong and R. Sun, *Dalton Trans.*, 2021, **50**, 11640-11649.
10. J. Su, Z. Nie, Y. Feng, X. Hu, H. Li, Z. Zhao, S. Zan and S. Qi, *Compos. Part A Appl. Sci. Manuf*, 2022, **162**, 107140.