Support Information

Achieving ultrahigh energy storage density and efficiency in $0.90NaNbO_3$-$0.10BaTiO_3$ ceramic via a composition modification strategy

Hua Wang[1, 2], Enzhu Li[1, 2*], Mengjiang Xing[3], Chaowei Zhong[1, 2]

[1] National Engineering Research Center of Electromagnetic Radiation Control Materials, University of Electronic Science and Technology of China, Chengdu, 610054, China

[2] Key Laboratory of Multi-Spectral Absorbing Materials and Structures of Ministry of Education, University of Electronic Science and Technology of China, Chengdu, 610054, China

[3] Yangtze Delta Region Institute (Huzhou), University of Electronic Science and Technology of China, Huzhou, 313001, China

[*] Corresponding authors: E-mail addresses: lienzhu@uestc.edu.cn

Table S1 refinement parameters of NNBT-*x*BLMT ceramics

x	**lattice parameters/(Å)**	R_p/%	R_{wp}/%	χ^2
0	α = β = γ = 90° a = b = 3.931356 c = 3.932283 V = 60.778	3.05	3.89	2.029
0.05	α = β = γ = 90° a = b = 3.933834 c = 3.933572 V = 60.872	3.60	4.82	2.764
0.10	α = β = γ = 90° a = b = 3.938624 c = 3.937000 V = 61.074	3.91	5.48	3.202
0.15	α = β = γ = 90° a = b = 3.945789 c = 3.945971 V = 61.436	3.49	4.65	2.159
0.20	α = β = γ = 90° a = b = 3.951609 c = 3.952425 V = 61.718	3.55	4.95	2.330

Table S2 Comparison of the energy storage properties of NNBT-0.10BLMT ceramics with other recently reported energy storage ceramics

Materials	BDS(kV/cm)	W_{rec}(J/cm^3)	η(%)	Ref.
$0.97K_{0.5}Na_{0.5}NbO_3$-$0.03La(Mn_{0.5}Ni_{0.5})O_3$	190	1.65	76	[1]
$0.45Bi_{0.5}Na_{0.5}TiO_3$-$0.55Sr_{0.7}Bi_{0.2}TiO_3$	100	1.34	96	[2]
$0.90NaNbO_3$–$0.10Bi(Zn_{0.5}Sn_{0.5})O_3$	350	3.14	83	[3]
$0.95[(Bi_{0.5}Na_{0.5})_{0.94}Ba_{0.06}TiO_3]$-$0.05AgNbO_3$	105	1.27	78	[4]
$0.9(0.7BiFeO_3$–$0.3BaTiO_3)$-0.1Nb	150	2.01	68	[5]
$0.9(k_{0.5}Na_{0.5})NbO_3$-$0.1Bi(Zn_{2/3}Nb_{1/3})O_3$	200	0.97	-	[6]
$0.50NaNbO_3$-$0.50NaTaO_3$	300	2.2	80	[7]
$0.80Bi_{0.5}Na_{0.5}TiO_3$-$0.20SrTi_{0.5}Zr_{0.5}O_3$	150	1.85	66	[8]
$0.85BaTiO_3$-$0.15Bi(Ni_{1/2}Ti_{1/2})O_3$	170	1.46	91	[9]
$0.85K_{0.5}Na_{0.5}NbO_3$-$0.15Bi(Ni_{0.5}Ti_{0.5})O_3$	280	2.61	83	[10]
$0.92Bi_{0.5}(Na_{0.82}K_{0.18})_{0.5}TiO_3$ -$0.08Bi(Mg_{2/3}Nb_{1/3})O_3$	110	2.20	55.7	[11]
NNBT-0.10BLMT	400	2.68	90	This work

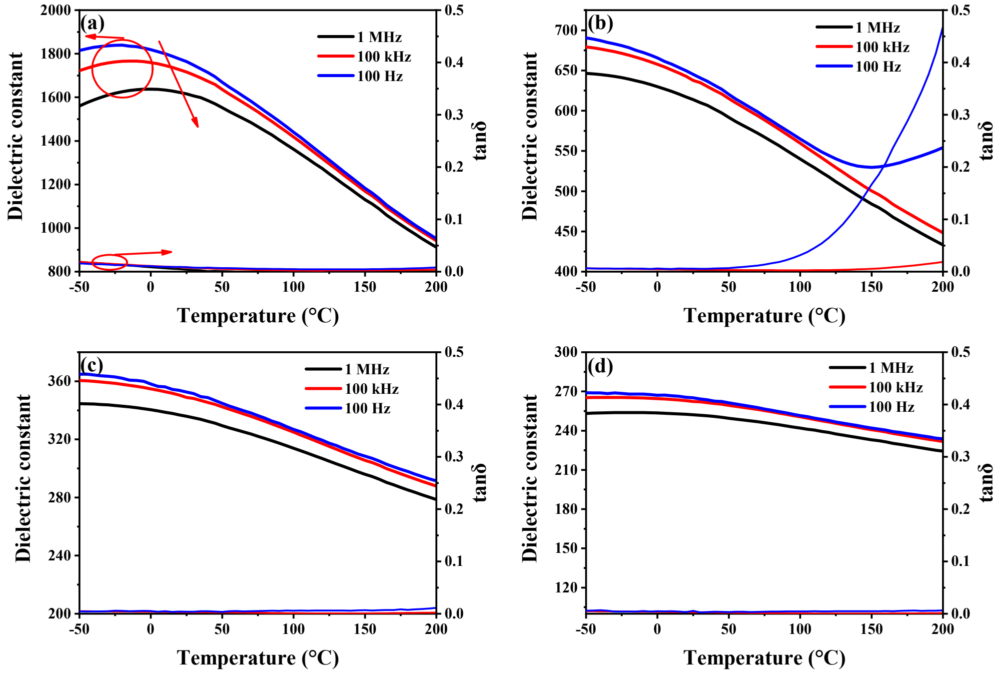

Fig S1. Temperature dependent the dielectric constant and dielectric loss of the materials: (a) $x = 0.05$, (b) $x = 0.10$, (c) $x = 0.15$ and (d) $x = 0.20$.

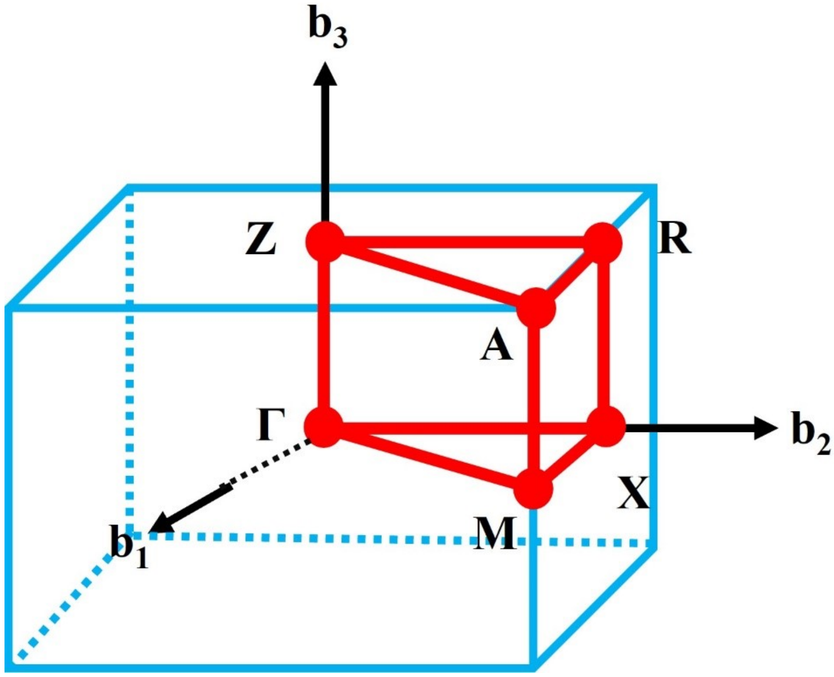

Fig S2. The energy band path of the tetragonal phase: Γ-X-M-Γ-Z-R-A-Z|X-R|M-A.

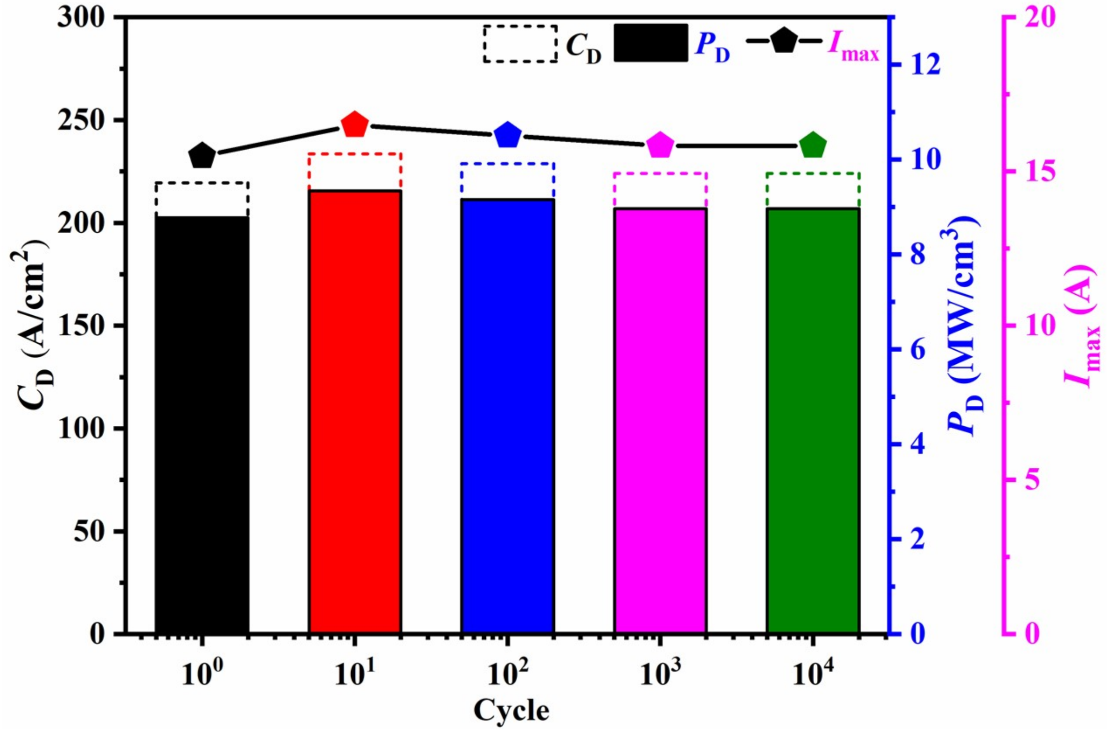

Fig S3. The cycle stability C_D, P_D, and I_{max} for NNBT-0.10BLMT ceramic at 80 kV/cm.

References

1 Z. Peng, Q. Shi, F. Zhang, J. Liu, X. Nie, J. Wang, S. Xu, D. Wu, Z. Yang and X. Chao, *J. Mater. Sci.*, 2022.

2 X. Zhou, K. Liu, Z. Yan, B. Xie, P. Fan, S. Chen, C. Samart, D. Salamon, H. Tan, Z. Fan and H. Zhang, *Ceram. Int.*, 2022.

3 D. Xiaoyan, L. Xu, H. Chen, D. Qinpeng, J. Wang, X. Wang, Y. Pan, X. Chen and Z. Huanfu, *Journal of Advanced Ceramics*, 2022, **11**, 729-741.

4 S. Zheng, Q. Li, Y. Chen, A. K. Yadav, W. Wang and H. Fan, *J. Alloy. Compd.*, 2022, **911**, 165019.

5 Z. Yang, B. Wang, Y. Li and D. A. Hall, *Materials*, 2022, **15**.

6 W. Chen, M. Cao, H. Wang, H. Hao, Z. Yao and H. Liu, *Journal of Materials Science: Materials in Electronics*, 2022, **33**, 10121-10130.

7 Z. Chen, S. Mao, L. Ma, G. Luo, Q. Feng, Z. Cen, F. Toyohisa, X. Peng, L. Liu, H. Zhou, C. Hu and N. Luo, *Journal of Materiomics*, 2022.

8 F. Zhang, Z. Dai, Y. Pan, G. Chen, J. Liu, W. Liu and T. Karaki, *Int. J. Energ. Res.*, 2022, **n/a**.

9 X. Huang, S. Li, C. Wang, H. Long, P. Chen, F. Xiao and Y. Chen, *Journal of Materials Science: Materials in Electronics*, 2022, **33**, 10042-10056.

10 X. Gan, H. Yang, Y. Lin and J. Li, *Ceram. Int.*, 2022, **48**, 14920-14927.

11 Z. Peng, J. Wang, M. Niu, X. Nie, S. Xu, F. Zhang, J. Wang, D. Wu, Z. Yang and X. Chao, *Journal of Materials Science: Materials in Electronics*, 2022, **33**, 3053-3064.