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Electronic Supplementary information (ESI)

High discharge energy density in novel $K_{1/2}Bi_{1/2}TiO_3$-$BiFeO_3$ based relaxor ferroelectrics

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Table S1. Refined crystallographic information for the KBT-BT-xSMN ceramics

x	Lattice parameter/ Å	Volume / Å^3	GOF
0.00	3.95287(19)	61.764(9)	1.11
0.04	3.9550(3)	61.863(12)	1.05
0.08	3.95947(4)	62.0742(18)	1.09

Figure S1. BSE images obtained from polished surfaces of the KBT-BF-xSMN ceramics for (a) x=0.00, (b) x=0.02, (c) x=0.04, (d) x=0.06, (e) x=0.08 and (f) x=0.10 at the same magnification.

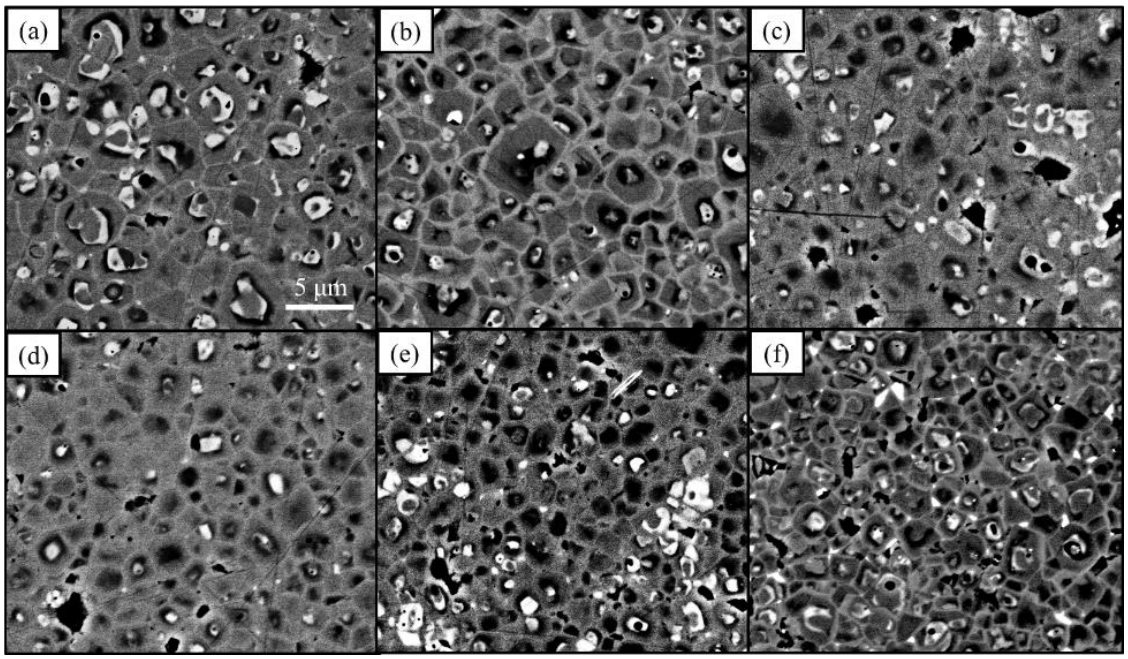
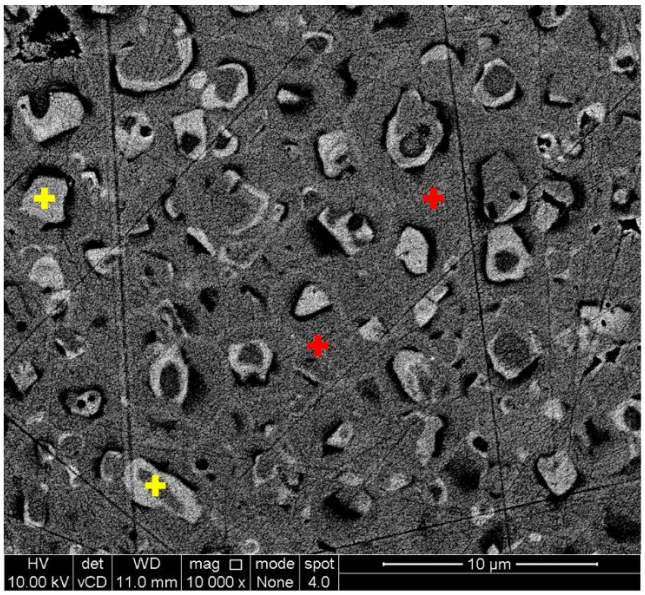


Figure S2. EDX elemental point analysis on a polished surface of the KBT-BF-0.08SMN ceramic.



	Bi(at%)	Fe(at%)	K(at%)	Ti(at%)	
Core 1	23.7 ↑	19.1 ↑	3.1	5.8	Bi/Fe-rich
Core 2	23.6 ↑	18.5 ↑	3.2	6.4	
Shell 1	17.7	14.5	4.9 ↑	10.3 ↑	K/Ti-rich
Shell 2	17.8	15.1	5.5 ↑	11.0 ↑	

Table S2. Average grain size of the KBT-BF-xSMN ceramics.

Compositions x	Average grain size (μm)
0.00	2.95±0.56
0.02	2.58±0.44
0.04	2.25±0.40
0.06	2.20±0.35
0.08	2.14±0.28
0.10	2.31±0.17

Figure S3. Temperature-dependent permittivity and dielectric loss data of the KBT-BF-xSMN ceramics for (a) x=0.00, (b) x=0.02, (c) x=0.04, (d) x=0.06, (e) x=0.08 and (f) x=0.10 at frequencies of 10 kHz, 100 kHz, 250 kHz and 1 MHz.

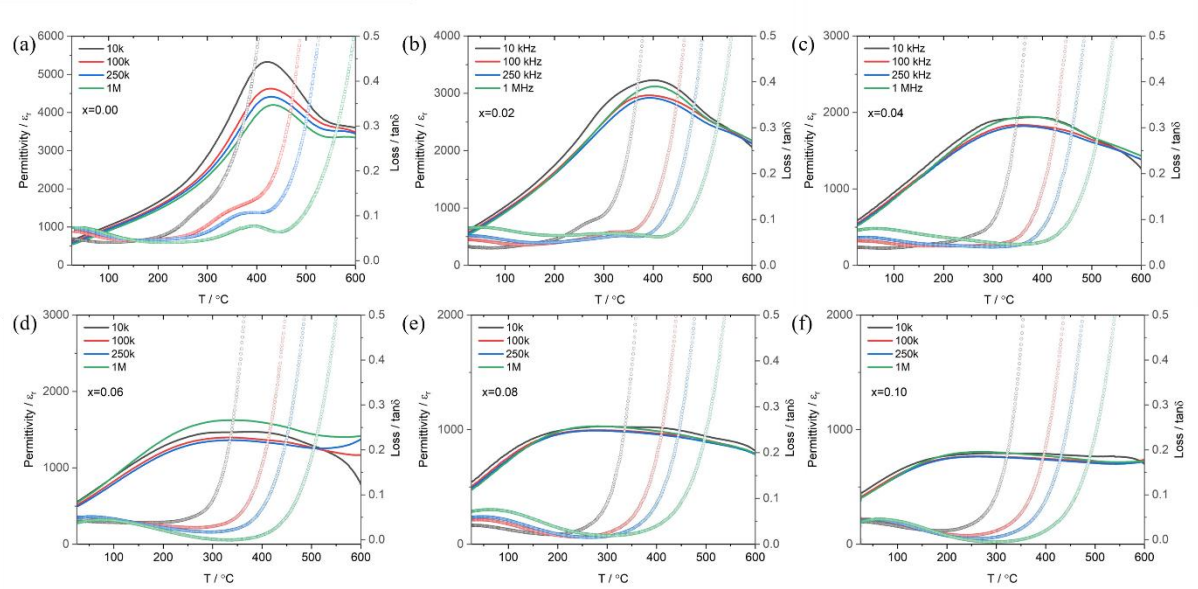


Figure S4. Unipolar P-E loops of the KBT-BF-xSMN bulk ceramics for (a) x=0.04, (b) x=0.06, (c) x=0.08 and (d) x=0.10.

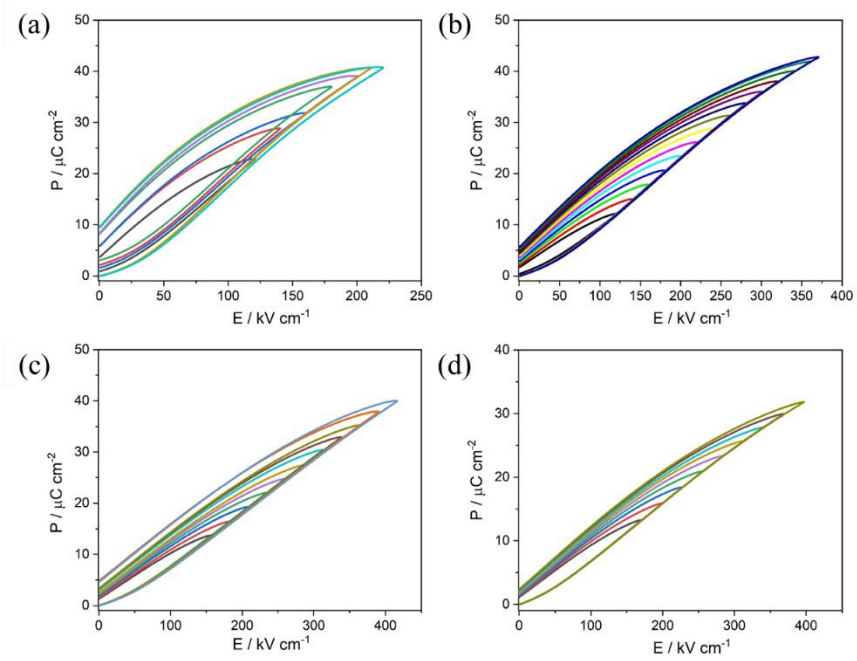


Figure S5. Calculated energy storage performance of the KBT-BF-xSMN ceramics for (a) x=0.04, (b) x=0.06, (c) x=0.08 and (d) x=0.10.

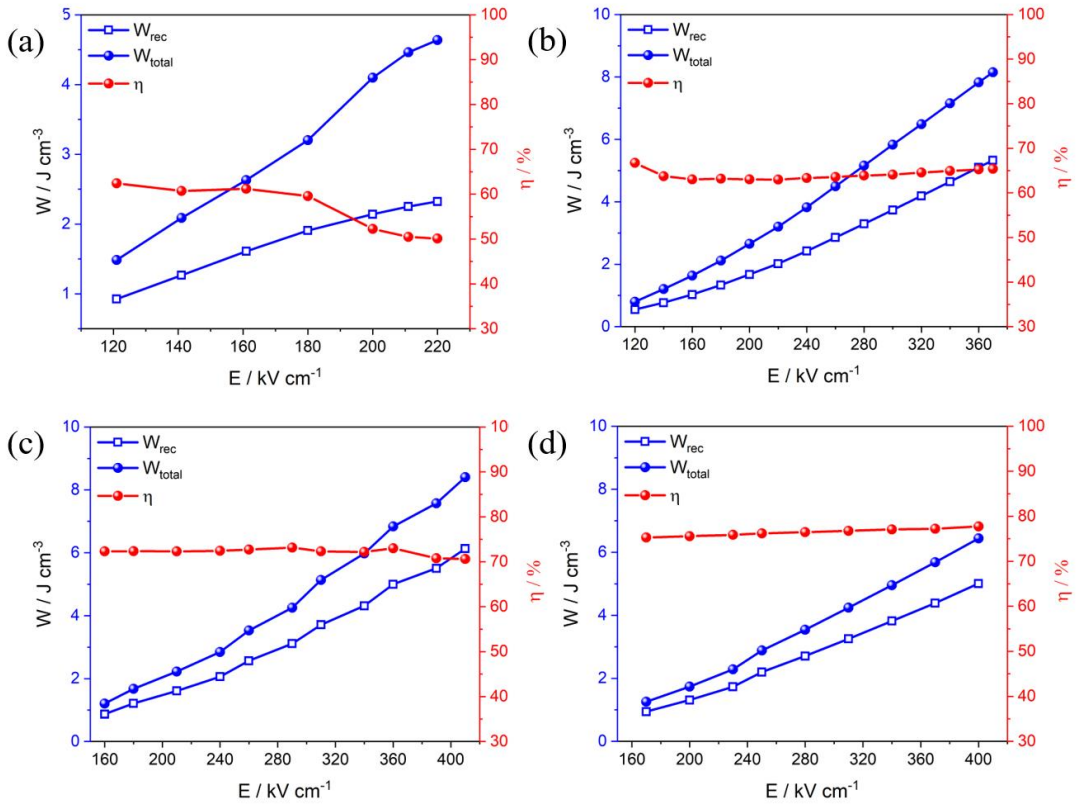


Figure S6. Complex Z* plots of the KBT-BF-xSMN ceramics x=0.00 and x=0.08 at 400°C.