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Supplementary Information

Giant energy-storage density in transition-metal oxide modified $NaNbO_3$-$Bi(Mg_{0.5}Ti_{0.5})O_3$ lead-free ceramics through regulating antiferroelectric phase structure

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Table S1. Refined structural parameters by using the Rietveld method for (1-x)NN-xBMT ceramics.

x	Space group	Fraction (%)	Lattice parameters	V (Å^3)	R_{wp} (%)	R_p (%)	χ^2
0.05	Pbma	100	a=5.5573(8) Å, b=15.6161(1) Å, c=5.5085(9) Å, α=β=γ=90°	478.06(2)	11.40	9.40	1.21
0.06	Pbma	43	a=5.5644(9) Å, b=15.6251(6) Å, c=5.5163(5) Å, α=β=γ=90°	479.61(0)	10.42	8.16	1.66
	Pnma	57	a=7.8263(4) Å, b=7.8295(1) Å, c=23.4587(0) Å, α=β=γ=90°	1437.38(8)			
0.07	Pnma	100	a=7.8238(2) Å, b=7.8256(4) Å, c=23.4598(6) Å, α=β=γ=90°	1,436.34(8)	9.43	7.36	1.87
0.08	Pnma	100	a=7.8287(7) Å, b=7.8251(1) Å, c=23.4618(0) Å, α=β=γ=90°	1437.30(5)	9.63	7.42	1.90

*R_{wp}, R_p and χ^2 represent the reliability factor of weighted patterns, the reliability factor of patterns and the goodness-of-fit indicator, respectively.

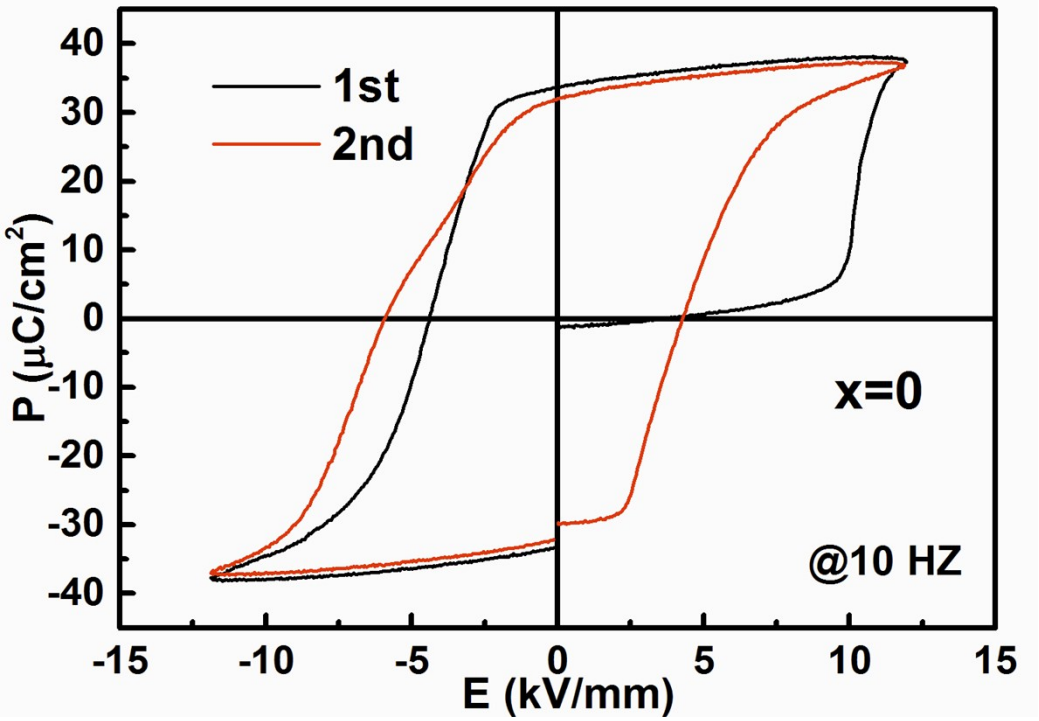

Fig. S1. P-E loops of the x=0 sample measured during the first and second electric cycles at 10 Hz

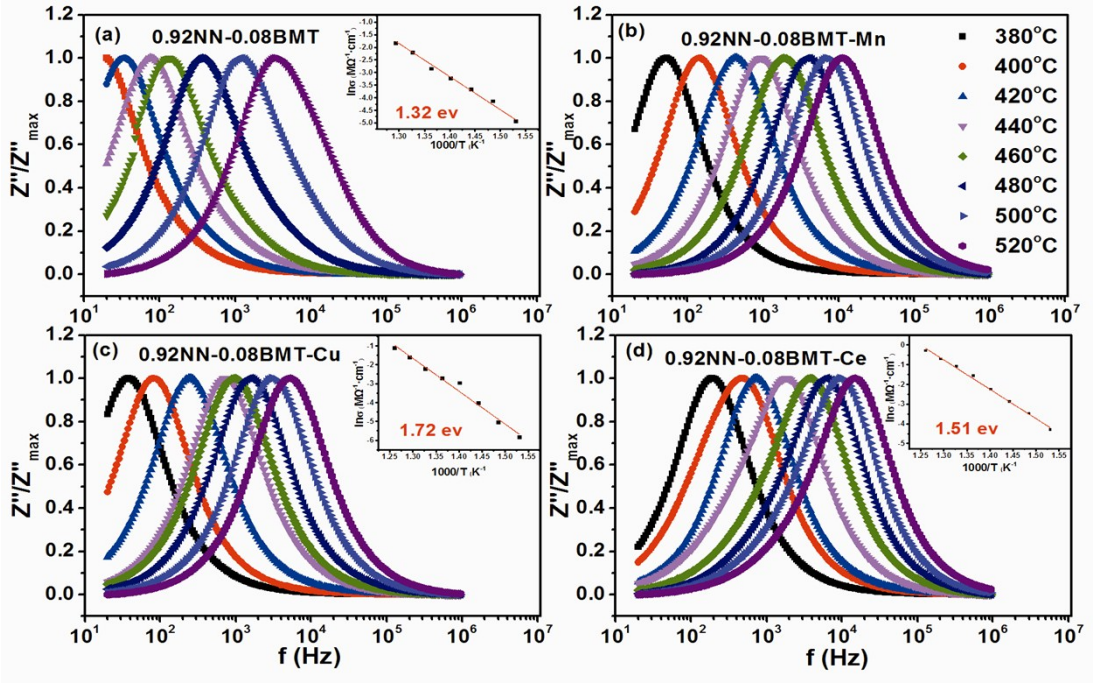

Fig. S2. Normalized imaginary parts Z''/Z''$_{max}$ of the impedance as a function of frequency for the (a) 0.92NN-0.08BMT and (b-d) oxides doped 0.92NN-0.08BMT samples in the temperature range of 380 ^{o}C-520 ^{o}C.

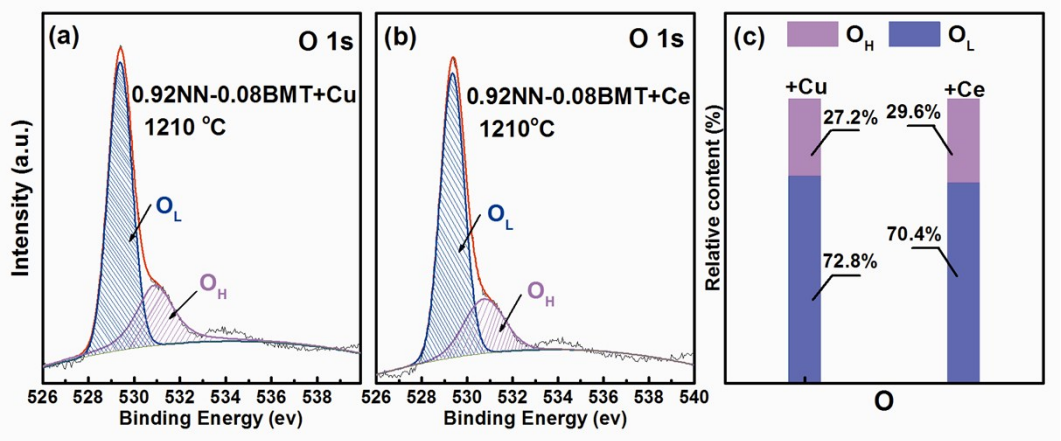

Fig. S3. XPS data of the O 1S for (a) 0.92NN-0.08BMT-Cu, (b) 0.92NN-0.08BMT-Ce samples, and (c) the relative content of O_L, O_H for 0.92NN-0.08BMT-Cu and 0.92NN-0.08BMT-Ce samples.