

## Supporting Information

### **Achieved excellent energy storage performance under moderate electric field in BaTiO<sub>3</sub>-modified Bi<sub>0.5</sub>Na<sub>0.5</sub>TiO<sub>3</sub>-based lead-free ceramics via multiple synergistic design**

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## 1. The XRD refined results

Figure S1 and Table S1 display the XRD refined results and confidence factors of the BNBT- $x$ CHZ ceramics. It can be seen that the value of  $R_{wp}$  and  $R_p$  are both small, demonstrating that these results are credible.

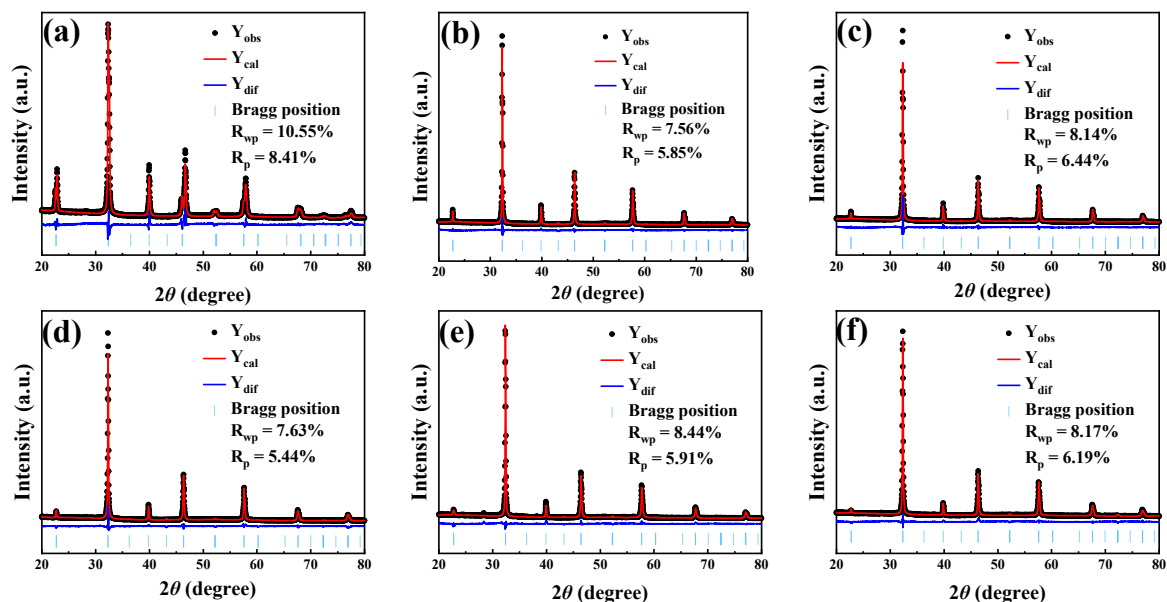


Figure S1. The Rietveld refinement results of the BNBT- $x$ CHZ ceramics: (a)  $x = 0.00$ ; (b)  $x = 0.10$ ; (c)  $x = 0.12$ ; (d)  $x = 0.14$ ; (e)  $x = 0.16$ ; (f)  $x = 0.18$ .

**Table S1.** The XRD refined results and confidence factors of all components

Sample	$a$ (Å)	$b$ (Å)	$c$ (Å)	$R_{wp}$ (%)	$R_p$ (%)
$x = 0.00$	5.53080	5.53080	3.91346	10.55	8.41
$x = 0.10$	5.53205	5.53205	3.91429	7.56	5.85
$x = 0.12$	5.53507	5.53507	3.91260	8.14	6.44
$x = 0.14$	5.53811	5.53811	3.91879	7.63	5.44
$x = 0.16$	5.53864	5.53864	3.89059	8.44	5.91
$x = 0.18$	5.54196	5.54196	3.92050	8.17	6.19

## 2. Leakage current

Figure S2 shows the room-temperature leakage current density electric field ( $J$ - $E$ ) curves of the BNBT- $x$ CHZ ceramics at 120 kV/cm. It can be seen that all the ceramics exhibit relatively low leakage current density. Noting that the BNBT-0.14CHZ ceramics have the lowest leakage current density, which is consistent with the dense grain structure in Figure 3. It is recognized that the large leakage current is what causes the high electro-thermal breakdown and conduction loss in the conduction current. Consequently, the low  $J$  is conducive to improve BDS.

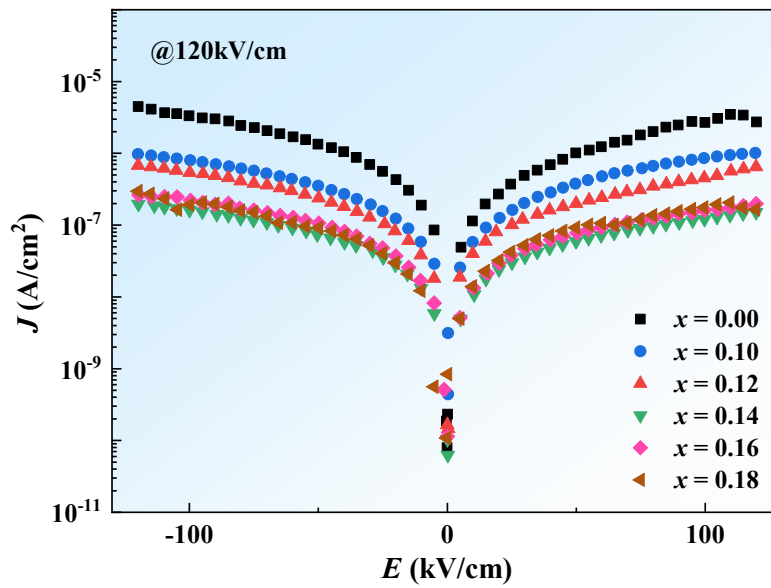


Figure S2. Room-temperature leakage current  $J$ - $E$  curves of the BNBT- $x$ CHZ ceramics at 120 kV/cm.

### 3. Complex impedance spectra

At 410 °C, Z-view software was used to fit the arcs of complex impedance, and the received parameters are listed in [Table S2](#).

**Table S2** R and CPE parameters (C, n) values of equivalent circuit model of BNBT-  
xCHZ ceramics

<i>x</i>	R1 (Ω)	C1 (F)	n1	R2 (Ω)	C2 (F)	n2
0	608	3.32E-9	0.9537	602	1.13E-8	0.9604
0.1	1669	4.19E-9	0.8409	1736	9.65E-8	0.8612
0.12	2296	1.99E-8	0.9658	2295	1.99E-8	0.9658
0.14	3179	1.81E-8	0.9935	21172	1.55E-8	0.9580
0.16	2873	1.37E-9	0.9007	15305	1.59E-8	0.9277
0.18	2458	2.69E-8	0.9466	8462	1.68E-9	0.9990