Supplementary information

Superior energy density through tailored dopant strategies in multilayer ceramic capacitors

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Figure S1 BSE images acquired from polished surfaces of BF-ST-BMN-\(x\)Nb (\(x = 0, 0.01, 0.02, 0.03, 0.04\) and 0.05) ceramics.

Figure S2 EDS elemental maps obtained from BF-ST-BMN-0.03Nb.
Table 1 Atomic percentage (excl. O) calculated from EDS spectra obtained from different phases presented in BF-ST-BMN-\(x\)Nb (\(x = 0.05\)).

<table>
<thead>
<tr>
<th>Elements</th>
<th>Bright core</th>
<th>Dark core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi</td>
<td>37.1</td>
<td>28.9</td>
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<tr>
<td>Fe</td>
<td>32.4</td>
<td>23.8</td>
</tr>
<tr>
<td>Sr</td>
<td>12.8</td>
<td>22.4</td>
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<tr>
<td>Ti</td>
<td>13.8</td>
<td>20.6</td>
</tr>
<tr>
<td>Mg</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Nb</td>
<td>2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Figure S3 (a) \(Z^*\) plots and (b) \(Z''\) and \(M''\) spectroscopic plots at 703 K of BF-ST-BMN-\(x\)Nb (\(x = 0.01, 0.02, 0.03, 0.04\) and 0.05) ceramics; (c) \(Z^*\) plots and (d) \(Z''\) and \(M''\) spectroscopic plots of \(x = 0.03\) at 12 and 273 K.
Figure S4 The temperature- and frequency-dependent dielectric permittivity ($\varepsilon_r$ vs $T$) and loss (tan $\delta$ vs $T$) data for BF-ST-BMN-$x$Nb, $x = (a) 0, (b) 0.01, (c) 0.02, (d) 0.03, (e) 0.04$ and (f) 0.05.

Figure S5 BSE images acquired from polished surfaces of BF-ST-Nb-$y$BMN ($y = 0.02, 0.04, 0.06, 0.08, 0.10$ and 0.12).
Figure S6 The temperature- and frequency-dependent dielectric permittivity ($\varepsilon_r$ vs $T$) of BF-ST-Nb-$y$BMN ($y = 0.02, 0.04, 0.06, 0.08, 0.10$ and $0.12$).

Figure S7 (a) Z* plots and (b) Z'' and M'' spectroscopic plots at 703 K of BF-ST-Nb-$y$BMN ($y = 0.02, 0.04, 0.06, 0.08, 0.10$ and $0.12$).
Figure S8 SEM image and corresponding EDS elemental maps obtained from the cross section of BF-ST-Nb-0.1BMN multilayer.