

## Supporting Information

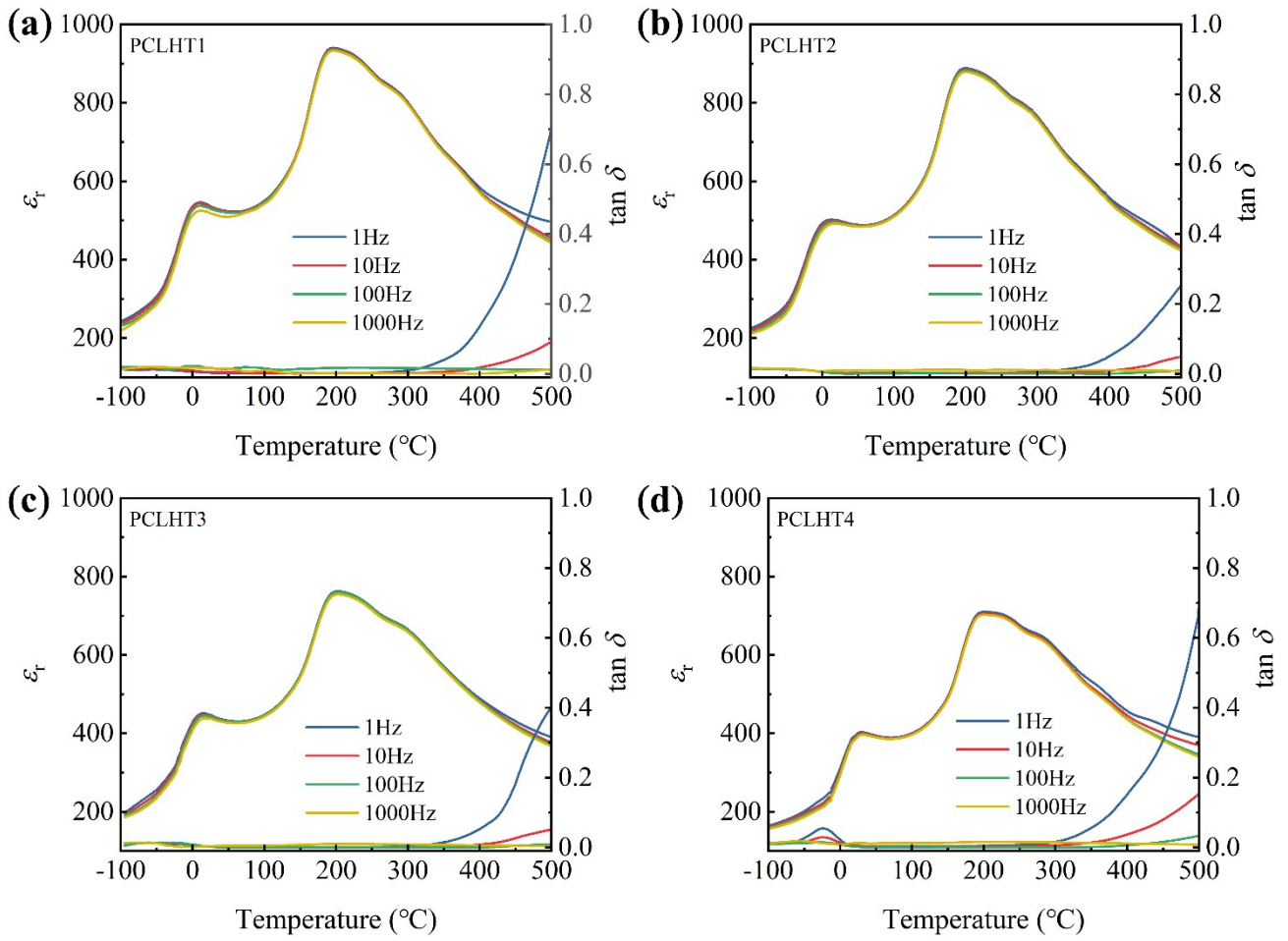
### Enhanced Energy Storage Capabilities in PbHfO<sub>3</sub>-Based Antiferroelectric Ceramics through Delayed Phase Switching and Induced Multiphase Transitions

Jiawen Hu<sup>1</sup>, Zhongbin Pan<sup>1\*</sup>, Ling Lv<sup>1</sup>, Zhixin Zhou<sup>1</sup>, Xiqi Chen<sup>1</sup>, Hongzhen Xie<sup>1\*</sup>, Jinjun Liu<sup>1</sup>, Peng Li<sup>2</sup>, and Jiwei Zhai<sup>3\*</sup>

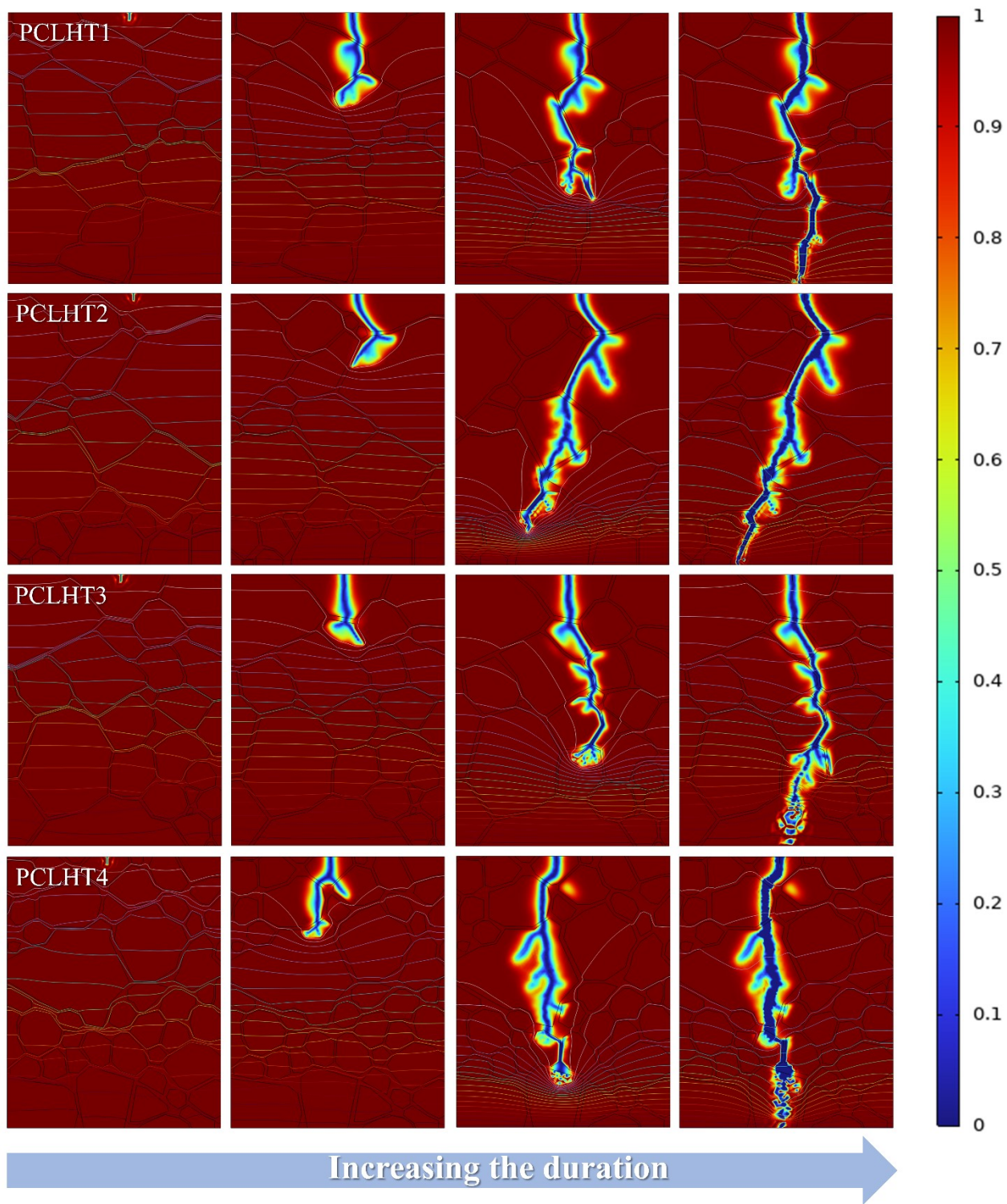
<sup>1</sup>School of Materials Science and Chemical Engineering, Ningbo University, Ningbo, Zhejiang, 315211, China. E-mail: panzhongbin@163.com, xiehongzhen@nbu.edu.cn

<sup>2</sup>School of Materials Science and Engineering, Liaocheng University, Liaocheng, Shandong, 252059, China.

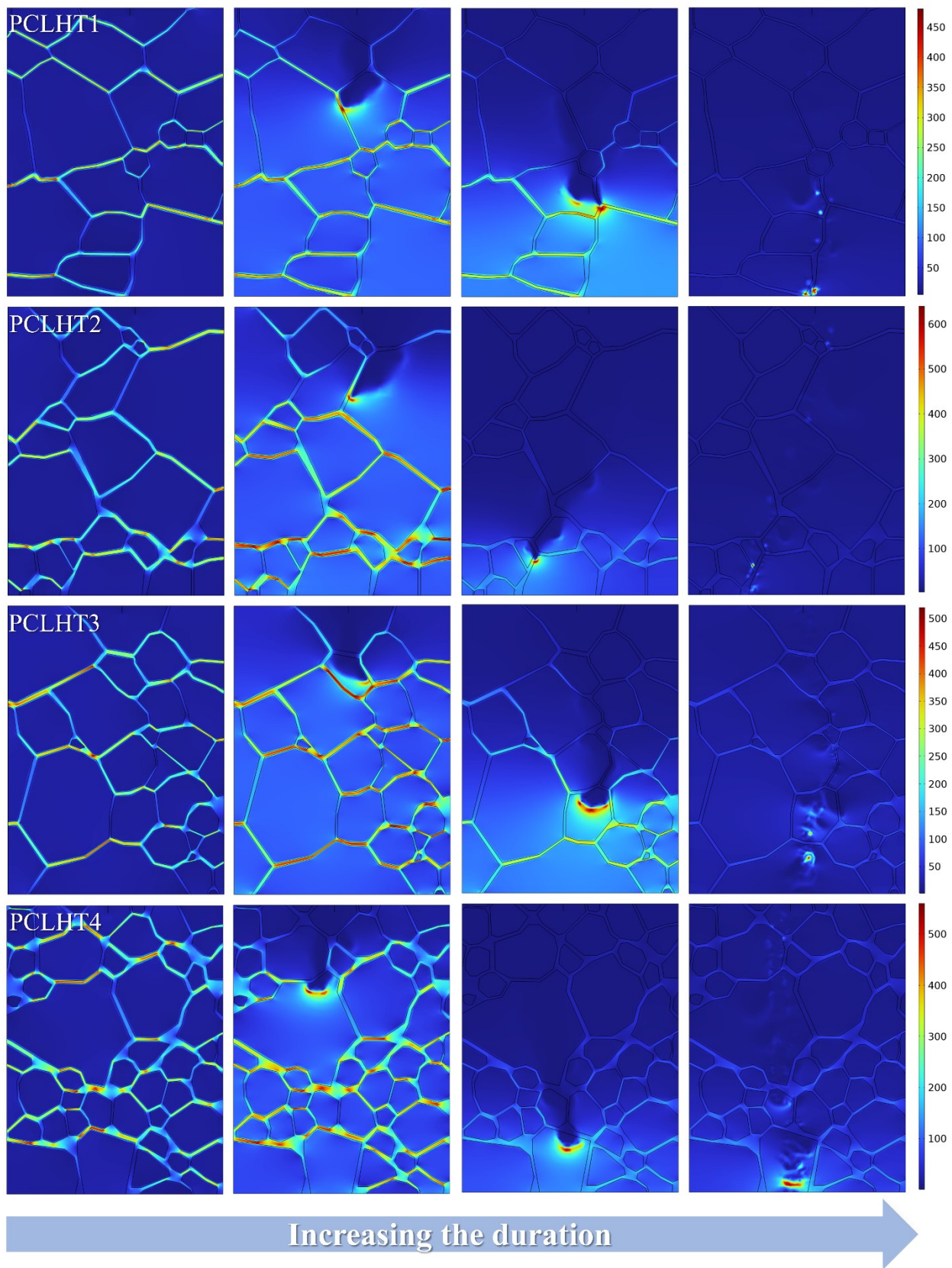
<sup>3</sup>School of Materials Science & Engineering, Tongji University, 4800 Caoan Road, Shanghai 201804, China. E-mail: apzhai@tongji.edu.cn



**Fig. S1** Temperature dependent permittivity and loss of PCLHT ceramics, (a) PCLHT1. (b) PCLHT2. (c) PCLHT3. (d) PCLHT4.



**Fig. S2** PCLHT ceramic electric tree evolution with time under  $E_b$ .



**Fig. S3** PCLHT ceramic electric field evolution with time under  $E_b$ .

Table S1 Refined lattice parameters and other agreement factors.

Composition	Space group	$R_{wp}$ (%)	$\chi^2$ (%)	Volume ( $\text{\AA}^3$ )	Lattice parameters ( $\text{\AA}$ )	
x=0.01	<i>Pbam</i>	7.42	1.68	555.008	a	5.8296
					b	11.64218
					c	8.17761
x=0.02	<i>Pbam</i>	7.71	1.81	554.86	a	5.83333
					b	11.63445
					c	8.17553
x=0.03	<i>Pbam</i>	8.81	2.27	553.499	a	5.82735
					b	11.63131
					c	8.16615
x=0.04	<i>Pbam</i>	8.45	1.99	552.62	a	5.81871
					b	11.63004
					c	8.16617