Supplementary Information

Compositional dependence of ferromagnetic and magnetoelectric effect properties in $BaTiO_3$–$BiFeO_3$–$LaFeO_3$ solid solutions

Xiwei Qi[1,2,3*], Min Zhang[1*], Xiaoyan Zhang[2,3], Yaohang Gu[1], Hongen Zhu[2], Weicheng Yang[1], Ying Li[1,4]

[1]School of Materials Science and Engineering, Northeastern University, Shenyang 110189, China

[2]School of Resources and Materials, Northeastern University at Qinhuangdao, Qinhuangdao 066004, China

[3]Key Laboratory of Dielectric and Electrolyte Functional Materials Hebei Province, School of Resources and Materials, Northeastern University at Qinhuangdao, Qinhuangdao 066004, China

[4]School of science, Inner Mongolia University of Science and Technology, Baotou 014010, China

Corresponding authors:

Xiwei Qi: E–mail: qxw@mail.neuq.edu.cn

Min Zhang: E–mail: minzhang1992@126.com

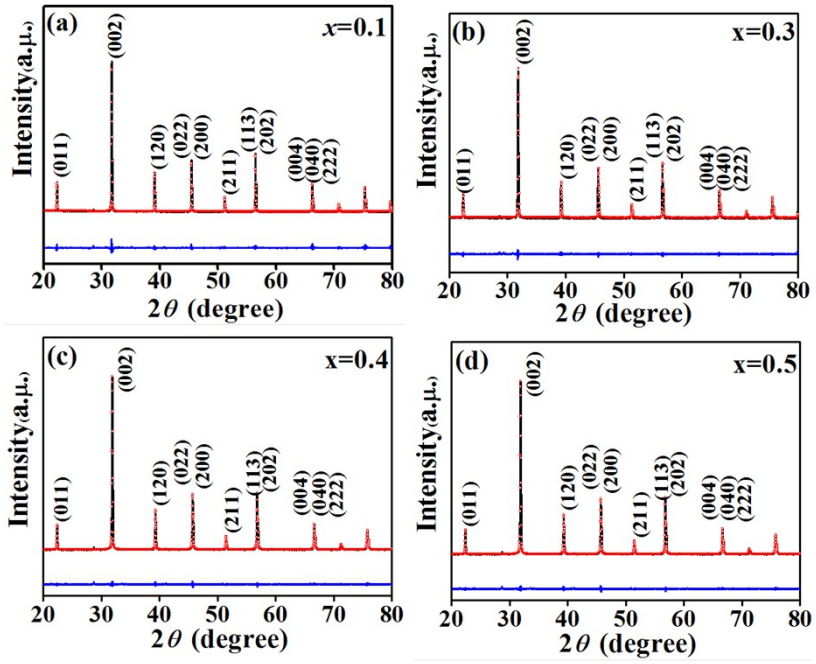

Fig. S1 XRD refinement of the BT-BFO-*x*LFO (x = 0.1, 0.3, 0.4 and 0.5)

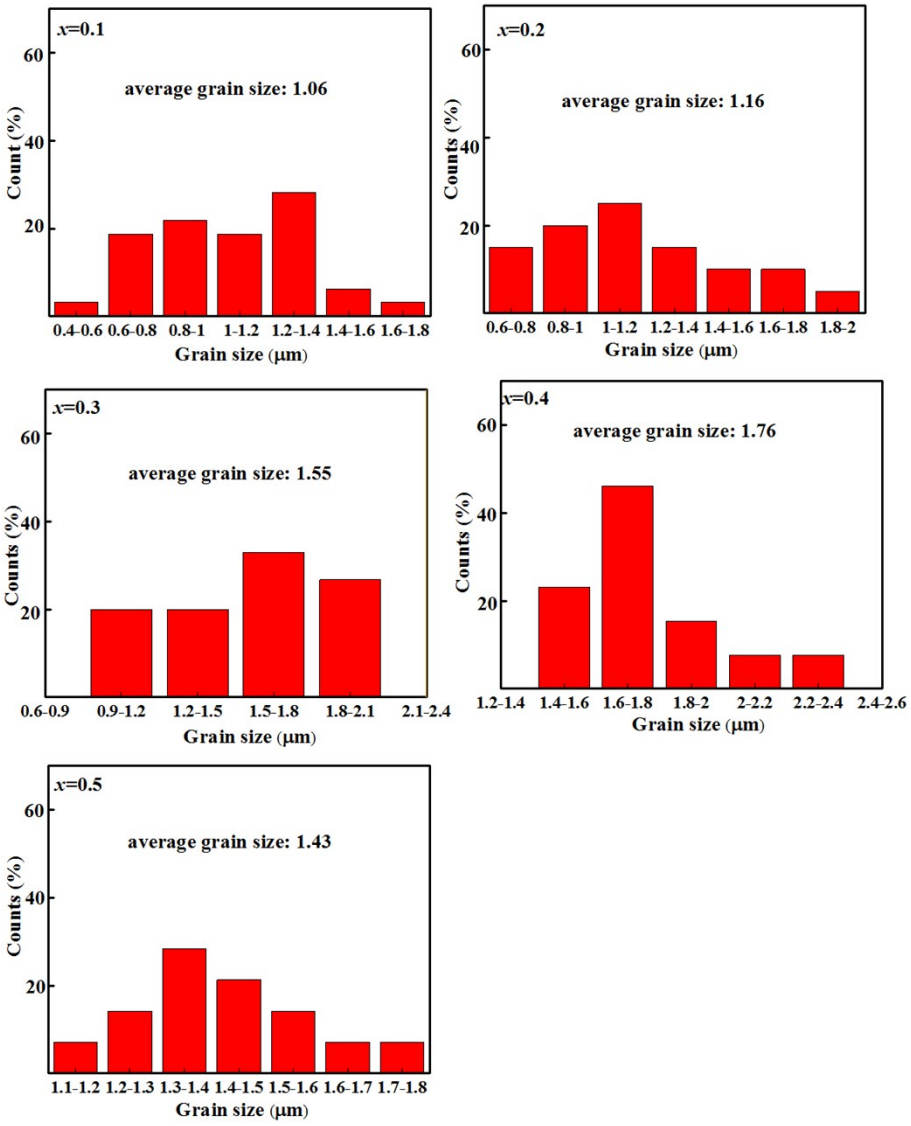

Fig. S2 Grain size distributions of the BT-BFO-*x*LFO (x = 0.1–0.5) ceramics sintered at 1300 °C

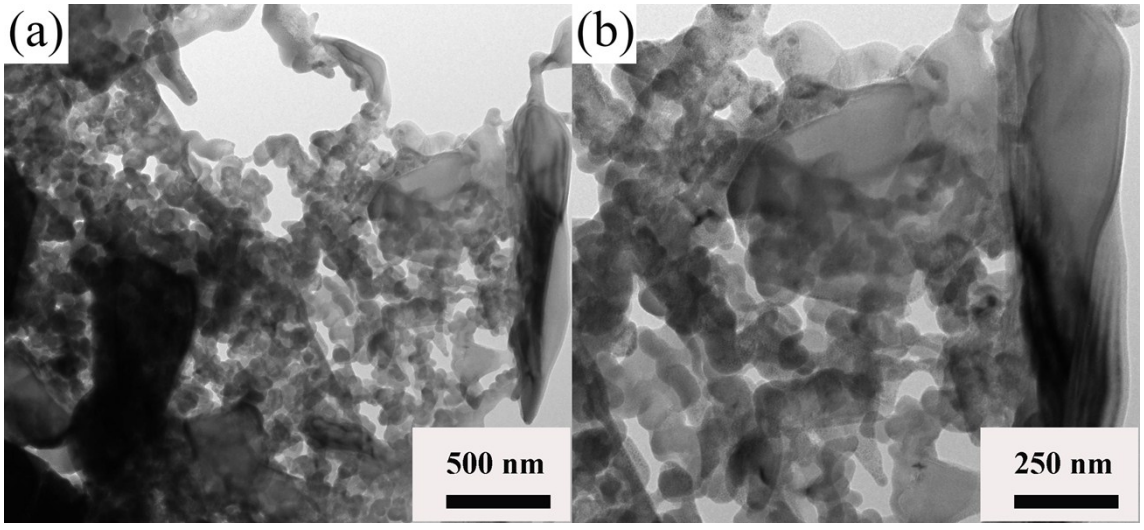

Fig. S3 TEM images of BT-BFO-0.2LFO ceramics.

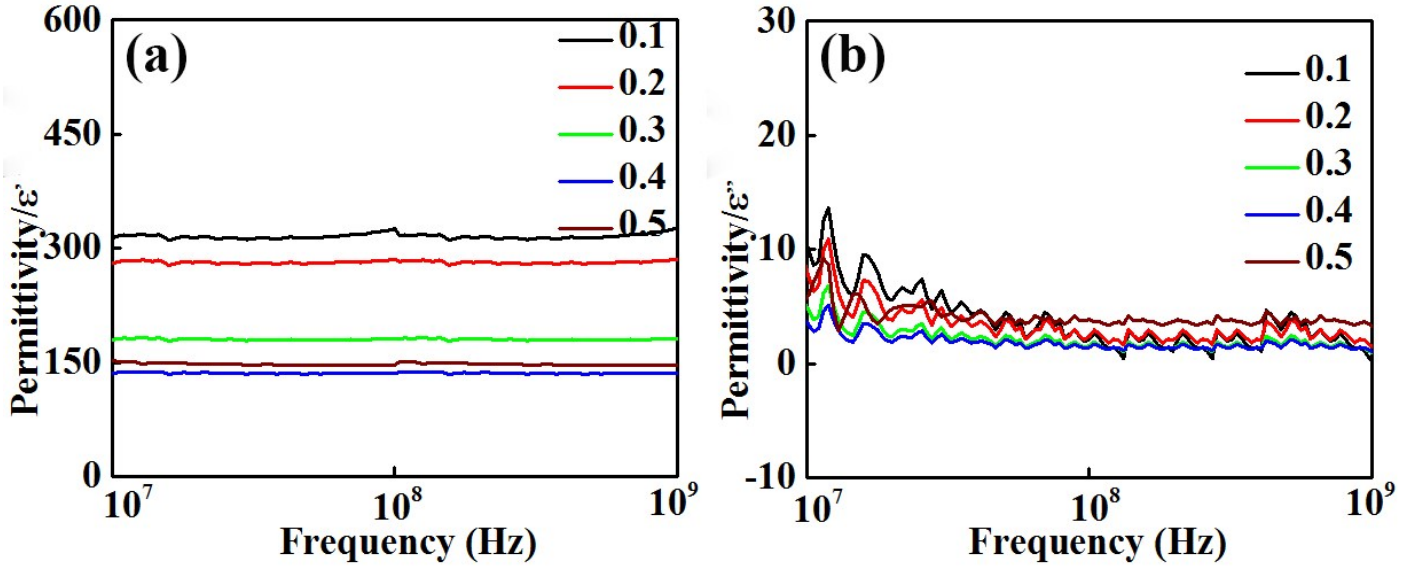

Fig. S4 (a) permittivity, (b) permitloss and (c) permitTan of BT-BFO-*x*LFO (x = 0.1–0.5) ceramics sintered at 1300 °C

Fig. S4 depicts the frequency dependence of the complex permittivity of the as-preapred BT-BFO-xLFO ceramics. When the frequency increased more than 10^7 Hz, the data are stable, which exhibit good performances of frequency. It should be noted the dielectric resonant frequency don't appear in this study. It maybe appear the highest frequency beyond limitation of our present devices.

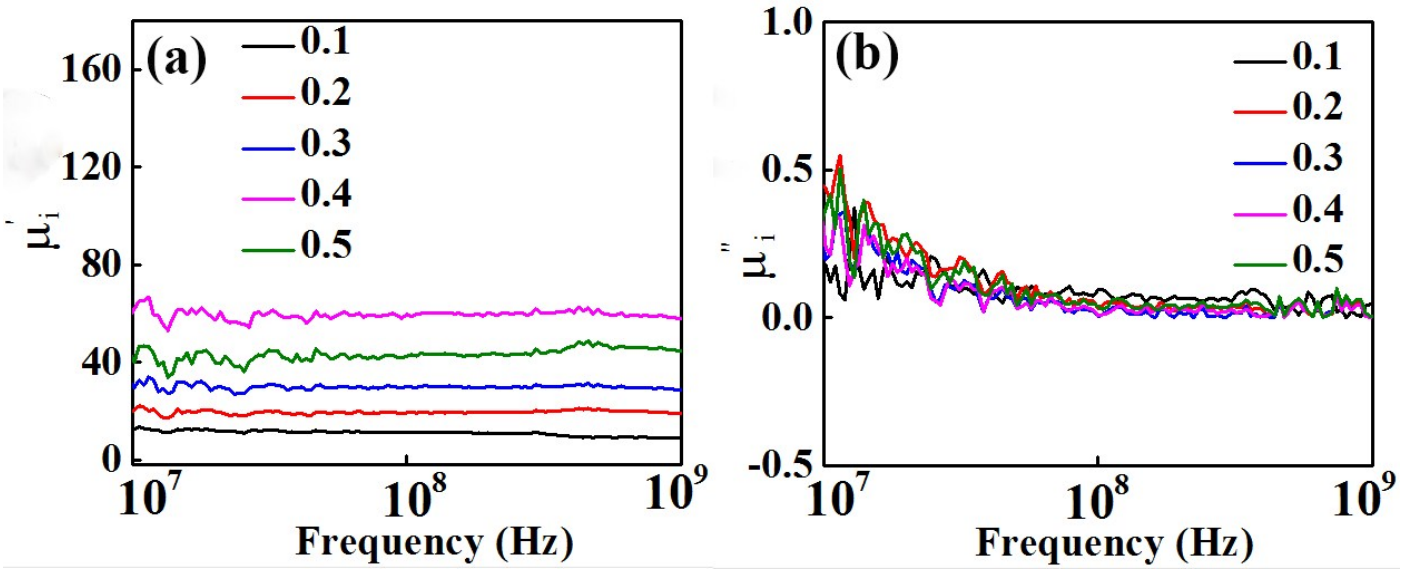

Fig. S5 (a) μi' and (b) μ_i'' of BT-BFO-*x*LFO (*x* = 0.1–0.5) ceramics sintered at 1300 °C

As shown in Fig. S5 (a), the value of μ_i' for all the compositions keep constant beyond 10^7 Hz. It is also seen from the figure that the value of μ_i' is increasing with LFO content up to $x = 0.4$ and then gradually decreases. The plot of μ_i'' as function of frequency is shown in Fig. S5(b). It is seen that μ_i'' of BT-BFO-*x*LFO

(x = 0.1–0.5) keep constant beyond 10^8 Hz for all compositions. These findings are well consistent to the result obtained from magnetization measurements, which are shown in Fig. 7.