Supplementary Information

Outstanding ferroelectricity in sol–gel-derived polycrystalline BiFeO$_3$ films within a wide thickness range

Jiaojiao Yi $^1$, Lisha Liu $^2$,*, Liang Shu $^2$, Yu Huang $^2$, Jing-Feng Li $^2$,*

1 Laboratory of Advanced Multicomponent Materials, School of Mechanical Engineering, Jiangsu University of Technology, Changzhou, 213001, PR China
2 State Key Laboratory of New Ceramics and Fine Processing, School of Materials Science and Engineering, Tsinghua University, 100084 Beijing, China
*Corresponding Authors: Jing-Feng Li (jingfeng@mail.tsinghua.edu.cn); Lisha Liu (net4663@126.com)

Figure S1. Thickness of different layers of the amorphous protection: (a) 1 layer; (b) 3 layers; and (c) 5 layers.

Figure S2. Raman shift of air-annealed and O$_2$-annealed samples. Raman spectroscopy is sensitive to crystal symmetry and local structural changes. Thus, Raman spectroscopy has been used to evaluate the oxygen vacancies in BiFeO$_3$ thin films as shown below, comparing O$_2$- and air-annealed samples. Characteristic peaks are marked by the black square around 828 and 890 cm$^{-1}$, respectively. The peak at 828 cm$^{-1}$ is signal for O$_2$- absorption at the surface. In addition, for perovskite structure, there is an extra strong peak at 890 cm$^{-1}$. These extra peaks reflect the existence of more oxygen vacancies for samples annealed in air $^{1-3}$. 
References:

