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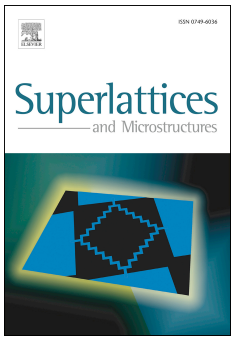

Leakage current limiting mechanisms and ferroelectric properties of $BiAlO_3$/ $La_{0.67}Sr_{0.33}MnO_3$ heterostructure

Yanan Zhao, Bingcheng Luo, Changle Chen, Hui Xing, Jianyuan Wang, Kexin Jin

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Leakage Current Limiting Mechanisms and Ferroelectric Properties of $BiAlO_3$/ $La_{0.67}Sr_{0.33}MnO_3$ Heterostructure

Yanan Zhao[a,b],Bingcheng Luo[a],Changle Chen[a*],Hui Xing[a],Jianyuan Wang[a], Kexin Jin[a]

[a]Shaanxi Key Laboratory of Condensed Matter Structures and Properties, Northwestern Polytechnical University, Xi'an 710072, China

[b]College of Engineering Management, Shaanxi Radio and Television University, Xi'an 710019, China

Abstract: The $BiAlO_3$/$La_{0.67}Sr_{0.33}MnO_3$ heterostructure was deposited on $LaAlO_3$ (111) substrate by pulse laser deposition technology. X-ray diffraction measurement indicates that $BiAlO_3$ thin films belong to tetragonal phase. Two different leakage current mechanisms, i.e., Space Charge Limited Current and Schottky emission models are observed in *J–E* characteristics of $BiAlO_3$/$La_{0.67}Sr_{0.33}MnO_3$ heterostructure in different temperature regions, respectively. The ferroelectric hysteresis loops measured by positive-up negative-down method show intrinsic remnant polarization ($2P_r$=2.4 μC/cm^2) at the applied electric field of 750 kV/cm, with the 80 nm thickness of $BiAlO_3$ thin films at room temperature. The domain imagines and local piezoelectric hysteresis loops obtained by Piezoresponse Force Microscopy technique further reveal the intrinsic ferroelectricity of. $BiAlO_3$ thin films at room temperature.

Keywords: tetragonal $BiAlO_3$, the leakage current mechanism, ferroelectricity, PFM

Introduction

Perovskites containing Bi have attracted significant interests for their applications in various fields as lead-free ferroelectric [1,2] and multiferroic materials [3]. The $BiMO_3$ oxides (M=Mn, Fe, Al, and In) induce a symmetry-lowering structure with ferroelectricity [4] on account of the stereochemically active $6s^2$ lone pair on Bi^{3+}. Recently, theoretical studies have reported that $BiAlO_3$ (BAO) has the possibility of high ferroelectricity with the large spontaneous polarization (P_r) of 75.6 μC/cm^2 along (111) direction [5,6]. Bulk BAO has polar *R3c* symmetry with a=5.38 Å and c=13.40 Å, a ferroelectric transition temperature around 820K, nonmagnetic in intrinsic because of the B-sites occupied by non-magnetic Al ions [6,7]. The crystal structure symmetries and P_r direction of BAO resemble the situation observed in $BiFeO_3$ (BFO) [3,8].In