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Structural and Ferroelectric Properties of Epitaxial ultrathin $PbZr_{0.52}Ti_{0.48}O_3$Films Prepared on $La_{0.67}Sr_{0.33}MnO_3/(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ Substrates NORA ORTEGA, DANILO BARRIONUEVO, Department of Physics and Institute of Functional Nanomaterials, University of Puerto, ASHOK KUMAR, University of Puerto Rico, RAM KATIYAR, Department of Physics and Institute of Functional Nanomaterials, University of Puerto — The existence of ferroelectricity in ultrathin films open the possibility to further miniaturize devices based on FE materials, i.e. ferroelectric tunnel junctions take advantage of tunnel electroresistance effect. We have fabricated epitaxial $PbZr_{0.52}Ti_{0.48}O_3$thin and ultrathin films using pulsed laser deposition on (001) on $La_{2/3}Sr_{1/3}MnO_3/(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ (LSMO/LSAT) substrates. The film thickness ranged between 3 to 100 nm. X-ray diffraction analysis revealed PZT and LSMO films are (00l) oriented perovskite structure. Atomic force microscopy of the PZT/LSMO(40nm)/LSAT structures show the surface is smoothness, densely packed, and free of cracks. The surface roughness on a 3 x 3 μm^2 area of the 100 nm and 3 nm thick films is $\sim$2 nm and $\sim$0.3 nm respectively. Well defined ferroelectric loop was observed in Pt/PZT(100nm)/LSMO(40nm)/LSAT structure with a remanent polarization $\sim$38 $\mu C/cm^2$ and a coercive field $\sim$80 kV/cm. The ferroelectric nature of the PZT ultrathin films (7–3 nm) was characterized using piezo force microscopy, a clear contrast between up and down ferroelectric domains was observed after writing positive and negative polarized in 2x2 μm^2 and 1x1 μm^2 areas respectively.

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