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Anisotropic electrical and magnetic properties of epitaxial $\text{Ga}_{2-x}\text{Fe}_x\text{O}_3$ thin films with different crystalline orientations JI HYE LEE, WILLIAM JO, Department of Physics, Ewha Womans University — Anisotropy of electrical and magnetic properties in magnetoelectric and multiferroic materials is an important issue for applications of the materials to electronic devices. $\text{Ga}_{2-x}\text{Fe}_x\text{O}_3$ (GFO) has been known as a pyroelectric ferrimagnet at room temperature when $x > 1.4$. GFO exhibits a permanent polarization along b -axis while a spontaneous net magnetization along c -axis. Exploration of its anisotropic properties requires preferentially oriented epitaxial thin films of GFO with different crystalline orientations. We have grown successfully b -axis oriented GFO thin films on indium-tin oxide(001)/yttria-stabilized zirconia(001). Two additional bottom electrodes such as SrRuO_3 on SrTiO_3 (111), (110) and (100) and $\text{Pt}(111)/\text{Ti}/\text{SiO}_2/\text{Si}$ substrates were used for epitaxial growth of GFO. X-ray diffraction and transmission electron microscopy have been performed. Dielectric permittivity of the GFO films was measured with external magnetic field as a function of temperature. Local polarization switching behavior was characterized by scanning probe microscopy, which can give a clue to answer a debating question that GFO thin films are pyroelectric with no bistable switching states.

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