Magnetic and magneto-optical properties of films of multiferroic GdMnO3 grown on LSAT [(LaAlO3)0.3 (Sr2AlTaO6)0.7] (100) and (111)

Hasan Albargi, Mohammed Alqahtani, H.J. Blythe, A.M. Fox, N. Andreev, V. Chichkov, G.A. Gehring

PII:	S0040-6090(17)30819-2
DOI:	doi:10.1016/j.tsf.2017.10.057
Reference:	TSF 36325
To appear in:	*Thin Solid Films*
Received date:	14 December 2016
Revised date:	5 October 2017
Accepted date:	28 October 2017

Please cite this article as: Hasan Albargi, Mohammed Alqahtani, H.J. Blythe, A.M. Fox, N. Andreev, V. Chichkov, G.A. Gehring , Magnetic and magneto-optical properties of films of multiferroic GdMnO3 grown on LSAT [(LaAlO3)0.3 (Sr2AlTaO6)0.7] (100) and (111). The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), doi:10.1016/j.tsf.2017.10.057

Magnetic and Magneto-optical properties of films of multiferroic $GdMnO_3$ grown on LSAT $[(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}]$ (100) and (111)

Hasan Albargi[1, 2], Mohammed Alqahtani[1, 3], H.J Blythe[1], A.M. Fox[1], N. Andreev[4], V. Chichkov[4], and G.A. Gehring[1]

Final version

[1]*Department of Physics and Astronomy, University of Sheffield, Sheffield S3 7RH, UK*

[2]*Department of Physics, Najran University, P.O. Box: 1988, Najran 11001, Saudi Arabia*

[3]*Department of Physics and Astronomy, King Saud University, P.O. Box 2455, Riyadh 11451, Saudi Arabia*

[4]*National University of Science and Technology "MISiS", Leninskii Prospect 4, 119049 Moscow. Russia*

Abstract

The magnetic properties of multiferroic $GdMnO_3$ depend on strain which is produced in a thin film by growing an epitaxial film on a suitable substrate. We report an investigation of the magnetic and optical properties of $GdMnO_3$, as a function of strain, produced by growing epitaxial films on the substrates on $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ (LSAT) (100) and (111). Magnetic measurements have shown that at 5K the easy direction of the film is in-plane for LSAT (100) and the canted moment is significantly smaller than the value found in bulk material but larger than that found for $GdMnO_3$ on $SrTiO_3$ (100). The coercive field of the $GdMnO_3$/LSAT (100) has also been found to be smaller than for bulk single crystal samples but comparable to a thinner film of $GdMnO_3$ grown on $SrTiO_3$. The magnetic properties of the film grown on LSAT (111) are very different. The transition to the canted phase is less pronounced and there is no magnetic hysteresis at low temperatures. The susceptibility data are fitted with the Curie's law and the measured magnetic moments for the film on LSAT (100) were similar to bulk values but significantly different for films on LSAT (111) and $SrTiO_3$