Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Magnetotransport across the artificially designed tilted grain boundaries AIPING CHEN, ZHENXING BI, Los Alamos National Lab, CHENFONG TSAI, LI CHEN, QING SU, XINGHANG ZHANG, HAIYAN WANG, Texas A&M University, TEXAS A&M UNIVERSITY TEAM, TEXAS A&M UNIVERSITY COLLABORATION, LOS ALAMOS NATIONAL LAB TEAM — Single-phase epitaxial $La_{0.7}Sr_{0.3}MnO_3$ (LSMO) thin films with significantly enhanced low-field magnetoresistance (LFMR) properties are demonstrated in this work. The LSMO films on $SrTiO_3$ (001) substrates exhibit tilted and well-aligned nanocolumn structure achieved by pulsed laser oblique-angle deposition (PLOAD) followed by subsequent postannealing. The tilted aligned nanocolumnar (TAN) arrays have been achieved at relative high deposition angles ($\geq 30^\circ$) and low deposition temperatures (≤ 450 °C). More attractively, the tilted grain boundaries (GBs) can be systematically manipulated by the postannealing process and so can the LFMR values of the LSMO TAN films. These results demonstrate that the tilted nanocolumnar films achieved by PLOAD and the GB tailoring by postannealing may provide a new approach to control and manipulate the magnetotransport properties of single-phase manganite perovskite films for device applications that require large LFMR effects, high epitaxial quality, and low resistivity.

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Date submitted: 15 Nov 2013 Electronic form version 1.4