Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Enhanced ferromagnetism in ferroelectric & ultrathin ferromagnetic digital superlattices[1] HANGWEN GUO, ZHENYU DIAO, WANG ZHEN, MOHAMMAD SAGHAYEZHIAN, LINA CHEN, RONGYING JIN, WARD PLUMMER, JIANDI ZHANG, Louisiana State University, SHUAI DONG, Southeast University — Electric control of magnetism has generated much activity due to both intellectual and technical interests. Epitaxial growth of transition-metal oxides with different ordering parameters offers unique platform to study magnetoelectric effect. In particular, quantum confinement of correlated electrons lead to interesting phenomena such as metal-insulator transition. In this work, we explore such effect in quantum confined regime by growing digital superlattices. We selected ferroelectric $BaTiO_3$ (BTO) and $La_{0.7}Sr_{0.3}MnO_3$ (LSMO) which exhibits ferromagnetic to paramagnetic transition at critical thickness. We explore how confined LSMO behaves when sandwiched by BTO. Superlattices are fabricated in formula $[(BTO)_{24}/(LSMO)_x]_y$. BTO thickness is constant & LSMO thickness are varied from 40u.c. to 2u.c. For all samples, total thickness of LSMO remains 40 u.c. Stable RHEED oscillations and sharp patterns ensure layer-by-layer growth and decent structural ordering. We find that LSMO has the ferromagnetic ground state down to 2 u.c. In addition, enhancement of ferromagnetism on ultrathin LSMO samples is observed compared to thicker films. Possible explanation involving interfacial magnetization will be discussed.

[1]Supported by U.S. DOE under Grant No. DOE DE-SC0002136.

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Date submitted: 13 Nov 2014 Electronic form version 1.4