Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Nano-electromechanical systems based on a piezoelectric single crystalline thin film on Silicon JONGHOO PARK, DUSTIN J. KREFT, ROBERT H. BLICK, Department of Electrical and Computer Engineering, University of Wisconsin-Madison, WI 53706, SEUNG-HYUB BAEK, CHANG-BEOM EOM, Department of Material Science and Engineering, University of Wisconsin-Madison, WI 53706, V. VAITHYANATHAN, Department of Material Science and Engineering, Pennsylvania State University, PA 16802, DARRELL G. SCHLOM, Department of Materials Science and Engineering, Cornell University, NY 14853, VLADIMIR AKSYUK, Alcatel-Lucent Technologies, NJ 07974 — Nano-electromechanical systems (NEMS) have shown great progress and promise as sensors and actuators. In spite of great progress, efficiency and integration techniques for actuating and tuning NEMS has remained a challenge. We have employed a single crystalline piezoelectric thin film on a silicon substrate to obtain a high piezoelectric coefficient and high electromechanical coupling for a NEMS device. The suspended NEMS device consists of Pt/Pb(Mg_xNb_{1-x})-$PbTiO_3$/$SrRuO_3$/$SiTiO_3$ and is clamped at the ends via silicon substrate. Pt and $SrRuO_3$ are used as top and bottom electrodes, respectively, and SiTiO3 serves as a buffer layer to the silicon substrate. We have shown experimentally that the piezoelectric actuation based on PMN-PT devices consume less power and are more responsive than other NEMS devices of similar nature and size.

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Date submitted: 09 Dec 2008 Electronic form version 1.4