Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**Current-induced metastable states in single-crystalline $VO_2$ nanoplatelets**[1] ALEXANDER TSELEV, J.D. BUDAI, Oak Ridge National Laboratory, Oak Ridge, TN, E. STRELCOV, Southern Illinois University Carbondale, Carbondale, IL, J.Z. TISCHLER, Oak Ridge National Laboratory, Oak Ridge, TN, A. KOLMAKOV, Southern Illinois University Carbondale, Carbondale, IL, S.V. KALININ, Oak Ridge National Laboratory, Oak Ridge, TN — The metal-insulator transition (MIT) in $VO_2$ occurs close to ambient temperature, $T_c = 68$ °C, which can be reduced by doping. The phase transition results in a few orders of magnitude change of electrical conductivity and is accompanied by a change of the lattice from tetragonal to monoclinic, which is associated with lattice expansion of $\sim$1% along the tetragonal c-axis of the metallic phase. We observed that, in suspended single-crystalline $VO_2$ nanoplatelets (NPls) carrying a sufficiently strong electrical current, Joule heating leads to formation of metal-semiconductor domains, which are self-organized in chains providing a path for the current flow. This results in NPl bending depending on the current strength, which can be used for electrically controlled actuator action. The observed domain structures should be interpreted as distinct metastable states in freestanding and end-clamped quasi-1D $VO_2$ samples. We analyze the stability conditions for the heterophase domains patterns and main prerequisites for the realization of current-controlled nanoactuators based on the proposed concept.

[1]Work at SIUC was funded through NSF 772 ECCS-0925837 and SISGR-DOE ERKCM67. Work at ORNL's CNMS was sponsored by DSUF OBES, U.S. DOE. J.D.B. and J.Z.T. were supported by MSED OBES, U.S. DOE.

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Date submitted: 09 Dec 2011 Electronic form version 1.4