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Electrically induced metal-insulator transition in epitaxial $SmNiO_3$ thin films[1] TOYANATH JOSHI, West Virginia University, NIKHIL SHUKLA, SANDEEPAN DASGUPTA, Pennsylvania State University, PAVEL BORISOV, West Virginia University, SUMAN DATTA, Pennsylvania State University, DAVID LEDERMAN, West Virginia University — Materials with metal-insulator transitions (MITs) above room temperature are potentially interesting for electronic applications, inter alia, to design a new class of the so-called Mott field transistors. We studied a member of the rare-earth nickelates familiy, $SmNiO_3$, with the bulk MIT transition temperature close to 400K. Thin films of $SmNiO_3$ were grown using pulsed laser deposition. Epitaxial structural quality was verified by reflection high-energy electron diffraction, x-ray diffraction, x-ray reflectometry, x-ray photoelectron spectroscopy and atomic force microscopy. Temperature-dependent resistivity measurements showed MIT temperatures close to the bulk values. Electrically driven MIT in two terminal SmNiO3 thin film devices was demonstrated using DC and pulsed mode I-V measurements in the temperature range 273-348 K. The differential conductance dI/dV peaked in the DC mode at switching field of 80 kV/cm at 273 K. The switching behavior became less pronounced with increasing measurement temperature and decreasing time period of the voltage pulses. By analysis of the experimental data we conclude the electrically-driven MIT in $SmNiO_3$ is due to the current-induced Joule self-heating. These findings should contribute to realization of novel electronic applications.

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