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| **Title:** | Thermal Confinement by Monolayer MoS2 for Reduced RESET Current in Phase Change Memory Pillar Cells | | |
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| **Abstract:** |  |
| Phase change memory (PCM) is one of the most promising nonvolatile memory technologies for high-density, high-endurance, fast-switching, and multilevel data storage. However, the high RESET current requirement remains a critical bottleneck in the development of PCM technology. In this work, we propose a pillar-shaped PCM device that consists of a Ge2Sb2Te5 (GST) layer sandwiched between the top and the bottom TiN electrodes. An atomically thin layer of MoS2 is grown on top of the oxidized bottom TiN layer. A filament formed through the TiO2 and MoS2 layers enables electrical conduction, while the high thermal resistivity of MoS2 ensures excellent thermal confinement within the GST layer. Finite element simulations show a 91% reduction in RESET current brought about by the filament, while the use of MoS2 yields a further ∼30% decrease in the switching power. The results presented here demonstrate the potential use of two-dimensional (2D) materials with conventional PCM cells to reduce switching power. | |