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| **Title:** | Thermal Confinement by Monolayer MoS2 for Reduced RESET Current in Phase Change Memory Pillar Cells | | |
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| **Published Journal Name:** | ACS Applied Electronic Materials | | |
| **Type of Publication:** | Journal | | |
| **Volume:** | 6 | Issue | 7 |
| **Publisher:** | American Chemical Society (ACS) | | |
| **Publication Date:** | June 18, 2024 | | |
| **ISSN:** | 2637-6113 | | |
| **DOI:** | https://doi.org/10.1021/acsaelm.4c00721 | | |
| **URL:** | https://pubs.acs.org/doi/abs/10.1021/acsaelm.4c00721 | | |
| **Other Related Info.:** | Page 5222–5229 | | |
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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. | |