Special Issue

Nanoscale Switches

Message from the Guest Editor

Nanoscale switches refer to volatile or nonvolatile resistance switches that can potentially be reduced down to the nanometer scale with regard to their working principles. They include transition metal oxide-based valence change memory, phase-change memory, ferroelectric tunnel junction, ferromagnetic tunnel junction, and so forth. Such nanoscale switches offer promising solutions to high-density and large-scale nonvolatile random access memory in the digital computing framework. Moreover, when formed in a passive crossbar array, the switches inherently support multiply-accumulate operation with ideally minimum time complexity, which is the heart of nonvolatile memory-based neuromorphic computing. Nanoscale switches are important ingredients of emerging technologies other than these examples, offering opportunities to overcome the critical issues encountered by the mainstream memory and logic technologies. Nevertheless, there remain challenges to overcome in order for these forward-looking technologies to become alternatives to the current technologies.

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