Journal of Nanomaterials

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Special Issue on

Nanomaterials for Next-Generation Nonvolatile Memories

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The huge development in data center, mobile devices, and Internet of Things (IoTs) demands feasible memory solutions with high density, fast speed, and low power. Conventional memories, such as dynamic random-access memory (DRAM) and flash memory, however, are approaching their scaling limit. Extensive research over the recent decades has led to exciting progress on several emerging nonvolatile memory candidates, such as magnetic random-access memory (MRAM), ferroelectric random-access memory (FRAM), phase-change random-access memory (PCRAM), resistive random-access memory (RRAM), and memories based on low-dimensional materials (e.g., carbon nanotubes, graphene, and MoS2 monolayers). The functional units in these memories consist of various nanosystems, including thin-film heterostructures, nanoscale filaments, domain structures, and 2D or 1D nanomaterials. A thorough investigation on the static structures and dynamic processes in these nanosystems is critical to the fundamental understanding of the emerging memories. Such research would also facilitate the development of new device paradigms and the optimization of process integration, impelling the ultimate commercialization of next-generation nonvolatile memories.

This special issue will focus on the nanomaterials and nanosystems that are promising to be utilized in different types of high-performance nonvolatile memories. We cordially invite investigators to contribute original research articles as well as review articles that can provide useful insights into novel materials, optimized procedures, microscopic mechanisms, improved performance, and new functionalities in this field.

Potential topics include but are not limited to the following:

- Synthesis of novel nanomaterials or nanosystems for nonvolatile memories
- Optimization of material-synthesis procedures for enhanced memory performance
- Characterization of functional nanostructures in memory materials
- Study of the switching dynamics in memory materials
- Effects of electrodes or interfaces on memories
- Theoretical or experimental study of the memory mechanism
- Failure mechanism analysis: retention and endurance
- Selector devices for crossbar memory configuration
- Low-cost/green/transparent/flexible nonvolatile memories

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