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Multiferroic Ceramics and Thin Film Nanostructures for Logic and Memory Applications

Guest Editors:

Dr. Dhiren K. Pradhan

Dr. Venkata Sreenivas Puli

Prof. Dr. Manuel Henrique Lente

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Message from the Guest Editors

Multiferroics represent an appealing class of multifunctional materials. Of particular interest is the existence of a cross-coupling between the magnetic and electric orders, termed as magnetoelectric (ME) coupling. This coupling enables the control of the ferroelectric polarization by a magnetic field and conversely, the manipulation of magnetization by an electric field. Hence, the coexistence of several order parameters and the magnetoelectric coupling in such materials can be exploited for novel memory application. As ferroelectric polarization and magnetization are used to encode binary information in FeRAMs (ferroelectric random access memories) and MRAMs (magnetic random access memories), respectively, the coexistence of magnetization and polarization in a multiferroic material allow the realization of four-state logics in a single device. The basic operation of such magnetoelectric random access memories (MERAMs) combines the magnetoelectric coupling with the interfacial exchange, coupling between a multiferroic and a ferromagnet to switch the magnetization of the ferromagnetic layer by using a voltage and vice versa.

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Editor-in-Chief

Prof. Dr. Alessandra Toncelli
Department of Physics, University of Pisa, 56126 Pisa, PI, Italy

Message from the Editor-in-Chief

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Contact Us

Crystals Editorial Office
MDPI, Grosspeteranlage 5
4052 Basel, Switzerland

Tel: +41 61 683 77 34
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crystals@mdpi.com
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