Multiferroic materials for sensors, transducers and memory devices (review article)

Surowiak Z., Bochenek D.

Silesian University, Faculty of Computer and Materials Science, Department of Materials Science, Šniezna 2, 41-200 Sosnowiec, Poland

Abstract: Chemical compositions and basic properties of smart materials (ferroics, biferroics, multiferroics) are introduced in this paper. Single phase and composite ferroelectromagnetics are characterized in detail. Multiferroic ferroelectromagnetics are materials which are both ferromagnetic/ferrimagnetic/ antiferromagnetic and ferroelectric/ferrielectric, antiferrolectric in the same phase. As a result they have a spontaneous magnetization which can be switched by an applied magnetic field, a spontaneous polarization which can be switched by an applied electric field, and often there is some coupling between those fields. The physical mechanisms of the coupling process were analyzed. In the case of the ferroelectromagnetics in general the transitions method d electrons, which are essential for magnetism, reduce the tendency for off-center ferroelectric distortion. Such materials have all the potential applications of both their parent ferroelectric and ferromagnetic materials.

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Authors with affiliations:

1. Surowiak, Z., Silesian University, Faculty of Computer and Materials Science, Department of Materials Science, Šniezna 2, 41-200 Sosnowiec, Poland
2. Bochenek, D., Silesian University, Faculty of Computer and Materials Science, Department of Materials Science, Šniezna 2, 41-200 Sosnowiec, Poland