Recent progress in multiferroic magnetoelectric composites: From bulk to thin films

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Abstract: Multiferroic magnetoelectric composite systems such as ferromagnetic- ferroelectric heterostructures have recently attracted an ever-increasing interest and provoked a great number of research activities, driven by profound physics from coupling between ferroelectric and magnetic orders, as well as potential applications in novel multifunctional devices, such as sensors, transducers, memories, and spintronics. In this Review, we try to summarize what remarkable progress in multiferroic magnetoelectric composite systems has been achieved in most recent few years, with emphasis on thin films; and to describe unsolved issues and new device applications which can be controlled both electrically and magnetically. Recent progress in multiferroic magnetoelectric composite systems such as bilayered magnetic-ferroelectric heterostructures where magnetic and ferroelectric orders coexist are reviewed. Strong magnetoelectric couplings across the magnetic-ferroelectric interface lead to magnetic (or electric)-field control of electric polarization (or magnetization), which promises new device applications such as sensors, transducer, oscillators, phase shifters, memory devices, and so on, controlled both electrically and magnetically.

Author Keywords: composite; magnetoelectrics; multiferroics; spintronics; thin film

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