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Spintronics IX

Sunday - Thursday 28 August - 1 September 2016

Session 10B:
Voltage Control and New Devices

Tuesday 30 August 2016
3:50 PM - 5:55 PM
Session Chair: Shunsuke Fukami, Tohoku Univ. (Japan)

Giant voltage controlled magnetic anisotropy in strained heavy metal/ferromagnet/insulator junctions *(Invited Paper)*

Paper 9931-90
Author(s): Nicholas Kioussis, California State Univ., Northridge (United States)

Electric field control of magnetism *(Invited Paper)*

Paper 9931-91
Author(s): Ramamoorthy Ramesh, Univ. of California, Berkeley (United States)
Hide Abstract
Complex perovskite oxides exhibit a rich spectrum of functional responses, including magnetism, ferroelectricity, highly correlated electron behavior, superconductivity, etc. The basic materials physics of such materials provide the ideal playground for interdisciplinary scientific exploration. Among the large number of materials systems, there exists a small set of materials which exhibit multiple order parameters; these are known as multiferroics. Our work so far has clearly demonstrated the possibility of reversible, electric field switching and control of the state and direction of magnetization. I will present our results to date.

Magnetic phase transitions in multiferroic systems *(Invited Paper)*

Paper 9931-92
Author(s): Piero Torelli, Istituto Officina dei Materiali (Italy)
An ambitious objective of the modern magnetism is the control of the magnetization with electric field. This is possible in those materials that display a spontaneous coupling between ferroelectric and ferromagnetic orders that are called multiferroics. Unfortunately the low magnetoelectric coupling coefficient have for the moment prevented the use of these materials in real devices. Two main routes are currently explored to overcome this limitations: the doping of mutiferroics with substitutional magnetic impurities and the realization of ferroelectric/ferromagnetic heterostructures. These two different solutions will be presented together with two model examples: the Bi2FeCrO6 double peroskite and the Fe/BaTiO3 interface.

Layer coupling and read disturbances in a buffered magnetic logic environment *(Invited Paper)*

Paper 9931-93
Author(s): Thomas Windbacher, Alexander Makarov, Viktor A. Sverdlov, Siegfried Selberherr, Technische Univ. Wien (Austria)
Power dissipation due to leakage and the energy costs related to transferring information between memory and processor(s) are currently two major obstacles for further advancements of computing systems. In order to circumvent these limitations, we have proposed a non-volatile buffered magnetic logic grid with instant-on capability, which combines non-volatile magnetic flip flops and spin-transfer torque majority gates to a highly regular structure. In this work we investigate potential read disturbances and the possibility to deliberately weaken a subsequent device layer anisotropy by applying an additional spin-transfer torque as a remedy.

CMAT non-volatile spintronic computing: complementary MTJ logic *(Invited Paper)*

Paper 9931-94

Author(s): Joseph S. Friedman, Univ. Paris-Sud 11 (France)

Magnetic tunnel junctions (MTJs) have thoroughly demonstrated their utility as a non-volatile memory storage element, inspiring their application to a memory-in-logic computer that would overcome the von Neumann bottleneck. However, MTJ logic gates must be able to cause other MTJs to switch, thus ensuring the cascading capability fundamental to efficient computing. Complementary MTJ logic (CMAT) provides a simple circuit structure through which MTJs can be cascaded directly to perform logic operations. In this novel logic family, charge pulses resulting from MTJ switching create magnetic fields that switch other MTJs, providing impetus for further development of MTJs for computing applications.