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Electric field control of spin transfer torque in multiferroic tunnel junctions ARTUR USEINOV, Department of Physics, California State University Northridge, Northridge, CA 91330-8268, USA, ALAN KALITSOV, JULIAN VELEV, Department of Physics, Institute for Functional Nanomaterials, University of Puerto Rico, San Juan, PR 00931-3344, USA, NICHOLAS KIOUSSIS, Department of Physics, California State University Northridge, Northridge, CA 91330-8268, USA — Based on model calculations we predict that the spin transfer torque (STT) in magnetic tunnel junctions with ferroelectric barriers can be strongly influenced by the saturated polarization of the barrier. The STT in such multiferroic tunnel junctions is calculated within the non-equilibrium Keldysh formalism generalized for non-collinear transport and implemented in the framework of a single-band tight-binding (TB) model. We calculate the bias dependence of both the in-plane ($T_{\parallel}$) and out-of-plane ($T_{\perp}$) components of STT as a function of the ferroelectric polarization (P) in the barrier. We find that the components of STT strongly depend on both the magnitude and the direction of the polarization. In particular switching of the polarization direction can dramatically alter the value of the STT and can even lead to a change of sign of $T_{\parallel}$ and the voltage-induced part of $T_{\perp}$. The effect is proportional to the magnitude of the polarization.

Artur Useinov
Department of Physics, California State University Northridge,
Northridge, CA 91330-8268, USA

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