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The Role of Spin-Motive Forces in Spin-Valve Dynamics JUN'ICHI IEDA, SADAMICHI MAEKAWA, Tohoku University; CREST-JST, STEWART E. BARNES, University of Miami — A spin-motive force (smf) is the counterpart of an electro-motive force, which couples to the spin rather than charge degrees of freedom of electrons. Here we discuss how smfs work in spin-valves. When the magnetization makes a sudden change, there often appears a large peak in dV/dI, i.e., a voltage jump that is better interpreted in terms of smfs. To see this, we model spin-valves using an equivalent circuit that involves magnetic dissipation represented by smfs as well as electric dissipation through ordinary resisters for both majority and minority currents. There are four possible conduction paths, e.g., the majority electrons hop to the majority band, or to the minority band and vice versa. The first path adds an up electron to the free layer and causes a rotation in a certain sense, while the second path adds a down electron and a rotation in the opposite sense. Since the rotations are in opposite senses so is the work done on the free layer and hence the smf. By solving the circuit problem and the Landau-Lifshitz equations supplemented with the Slonczewski torque-transfer term simultaneously we find the spin-transfer effect is dramatically modified by smfs. With the relevant parameters a stable large angle precession and a voltage signal are predicted.

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