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Spin motive force in a Rashba system KYOUNG-WHAN KIM, Department of Physics, POSTECH, JUNG-HWAN MOON, KYUNG-JIN LEE, Department of Material Science and Engineering, Korea University, HYUN-WOO LEE, Department of Physics, POSTECH — Spin motive force (SMF) is the nonconservative spin force induced by magnetization dynamics. In addition to spin-transfer torque (STT), SMF is considered as one of the representative interactions between magnetization and conduction electrons. It has been reported that large Rashba-type spin-orbit coupling (RSOC) can show up in magnetic nanostructures containing thin ferromagnetic layers with structural asymmetry. In this work, we investigate the effect of RSOC on SMF. The additional SMF induced by RSOC is proportional only to time variation of magnetization while the conventional SMF is proportional to both time and space variation of magnetization. This result indicates that SMF can be induced from even homogeneous magnetic structure. The resulting RSOC SMF has so large magnitude that the feedback effect on the magnetization dynamics can be significant. Combining RSOC SMF and the previously known Rashba STT effect, we derived that Gilbert damping is one or two orders of magnitude enhanced by RSOC. Lastly, we show that the symmetry breaking nature of RSOC and the induced SMF greatly help the electrical distinction of magnetization structure. It is expected that RSOC will play a key role in extending applicable area of SMF.

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