Domain wall dynamics in cubic magnetostrictive materials subject to Rashba effect and nonlinear dissipation

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This work focuses on the analytical investigation of domain wall motion occurring along the major axis of a thin magnetostrictive nanostrip perfectly arranged on the top of a thick piezoelectric actuator. The motion is driven by magnetic fields, spin-polarized currents, and spin-orbit torque effects and takes place in cubic magnetostrictive materials characterized by a nonlinear dissipation. The main aim is to describe how magnetoelasticity, Rashba field, *dry-friction*, chemical composition, and crystal symmetry affect the steady and precessional dynamics of magnetic domain walls. In detail, it is here analytically inspected how the key features (threshold, breakdown, domain wall mobility, and propagation direction) can be effectively manipulated by the above contributions. Finally, the theoretical results are numerically illustrated for realistic materials, revealing a satisfying qualitative agreement with experimental observations.

References

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