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Phenomenology of Current-Induced Dynamics in Antiferromagnets[1] KJETIL M.D. HALS, Department of Physics, Norwegian University of Science and Technology, NO-7491, Trondheim, Norway, YAROSLAV TSERKOVNYAK, Department of Physics and Astronomy, University of California, Los Angeles, California 900095, USA, ARNE BRATAAS, Department of Physics, Norwegian University of Science and Technology, NO-7491, Trondheim, Norway — In antiferromagnets, an electric current can induce a torque on the staggered magnetization. We derive a novel phenomenology of current-induced dynamics in antiferromagnets. The theory includes effects of damping, external magnetic fields, and both adiabatic and non-adiabatic current-induced torques. We apply our theory to an antiferromagnetic domain wall system, and find an analytic solution for the domain wall motion in the low current density regime. In this regime, the domain wall velocity is proportional to the ratio between the non-adiabatic torque and the damping coefficient. In addition, the domain wall develops a net magnetic moment. This opens the route to an alternative way to observe current-induced effects in antiferromagnets.

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