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Spin-Orbit Torques and Anisotropic Magnetization Damping in Skyrmion Crystals KJETIL HALS, The Niels Bohr International Academy, Niels Bohr Institute, 2100 Copenhagen, Denmark, ARNE BRATAAS, Department of Physics, Norwegian University of Science and Technology, NO-7491, Trondheim, Norway — We theoretically study the effects of reactive and dissipative homogeneous spin-orbit torques and anisotropic damping on the current-driven skyrmion dynamics in cubic chiral magnets. Our results demonstrate that spin-orbit torques play a significant role in the current-induced skyrmion velocity. The dissipative spin-orbit torque generates a relativistic Magnus force on the skyrmions, whereas the reactive spin-orbit torque yields a correction to both the drift velocity along the current direction and the transverse velocity associated with the Magnus force. The spin-orbit torque corrections to the velocity scale linearly with the skyrmion size, which is inversely proportional to the spin-orbit coupling. Consequently, the reactive spin-orbit torque correction can be the same order of magnitude as the non-relativistic contribution. More importantly, the dissipative spin-orbit torque can be the dominant force that causes a deflected motion of the skyrmions if the torque exhibits a linear or quadratic relationship with the spin-orbit coupling. In addition, we demonstrate that the skyrmion velocity is determined by anisotropic magnetization damping parameters governed by the skyrmion size.

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