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Universal current-velocity relation of skyrmion motion in chiral magnets JUNICHI IWASAKI, MASAHITO MOCHIZUKI, NAOTO NAGAOSA, Department of Applied Physics, The University of Tokyo — Current-driven motion of the magnetic domain wall requires large critical current density $j_c \sim 10^9 - 10^{12}$ A/m^2, at which the joule heating is a serious problem. The skyrmions recently discovered in chiral magnets, on the other hand, have much smaller critical current of $j_c \sim 10^5 - 10^6$ A/m^2. We present a numerical simulation of the Landau-Lifshitz-Gilbert equation, which reveals a remarkably robust and universal current-velocity relation of the slyrmion motion driven by the spin transfer torque unaffected by either impurities or nonadiabatic effect in sharp contrast to the case of domain wall or spin helix (HL). Simulation results are analyzed using a theory based on Thiele's equation, and it is concluded that this surprising behavior is due to the Magnus force and flexible shape-deformation of individual skyrmions and skyrmion crystal (SkX), which enable them to avoid pinning centers and then weaken the net pinning force. Dynamical deformation of SkX leads to the fluctuation of Bragg peak with large amplitude, which can be detected by the recent neutron-scattering experiment.

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