MAS16-2016-000067
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Abstract for an Invited Paper
for the MAS16 Meeting of
the American Physical Society

Room-temperature magnetic skyrmions in multilayers[1]

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Magnetic skyrmions are topological spin structures that are promising candidates for current-driven memory devices because of their high mobility at ultralow current densities. In magnetic multilayers, the interplay of various interactions, including the Heisenberg exchange, dipolar interactions, magnetic anisotropy, and interfacial Dzyaloshinskii-Moriya interactions, is key to forming and stabilizing magnetic skyrmions. In this work, the efficient conversion of chiral stripe domains into Néel skyrmions through a geometrical constriction patterned in a Ta/CoFeB/TaO_x trilayer film at room temperature is presented. This is enabled by an interfacial Dzyaloshinskii-Moriya interaction, and laterally divergent current-induced spin-orbit torques. The generation of magnetic skyrmions solely by the divergent spin-orbit torques through a nonmagnetic point contact is further demonstrated. When increasing the current density, the skyrmion Hall effect, the accumulation of skyrmions at one side of the device, is directly observed using magneto-optical Kerr effect microscopy.

[1]Work at Bryn Mawr College was supported by NSF CAREER award (No. 1053854). Work at the Argonne National Laboratory was supported the DOE, Office of Science, Basic Energy Sciences under Contract No. DE-AC02-06CH11357. Work at UCLA was supported by TANMS.