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Current-Driven Dynamics of Skyrmions Stabilized in MnSi Nanowires Revealed by Topological Hall Effect[1] DONG LIANG, JOHN DEGRAVE, MATTHEW STOLT, Department of Chemistry, University of Wisconsin-Madison, YOSHINORI TOKURA, RIKEN Center for Emergent Matter Science, SONG JIN, Department of Chemistry, University of Wisconsin-Madison — Skyrmions, novel topologically stable spin vortices, hold promise for next-generation high-density magnetic storage technologies due to their nanoscale domains and ultralow energy consumption. One-dimensional (1D) nanowires are ideal hosts for skyrmions since they not only serve as a natural platform for magnetic racetrack memory devices but also can potentially stabilize skyrmions. We use the topological Hall effect (THE) to study the phase stability and current-driven dynamics of the skyrmions in MnSi nanowires. The THE was observed in an extended magnetic field-temperature window (15 to 30 K), suggesting stabilization of skyrmion phase in nanowires compared with the bulk (27 to 29.5 K). Furthermore, we study skyrmion dynamics in this extended skyrmion phase region and found that under the high current-density of 10^8-10^9 Am^{-2} enabled by nanowire geometry, the THE decreases with increasing current densities, which demonstrates the current-driven motion of skyrmions generating the emergent electric field. These results open up the exploration of nanowires as an attractive platform for investigating skyrmion physics in 1D systems and exploiting skyrmions in magnetic storage concepts.

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