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Realization of Ground State Artificial Skyrmion Lattices at Room Temperature DUSTIN A. GILBERT, BRIAN B. MARANVILLE, ANDREW J. BALK, BRIAN J. KIRBY, DANIEL T. PIERCE, JOHN UNGURIS, JULIE A. BORCHERS, National Institute of Standards and Technology, PETER FISCHER, Lawrence Berkeley National Laboratory, KAI LIU, University of California, Davis — Artificial skyrmion lattices stable at ambient conditions offer a convenient and powerful platform to explore skyrmion physics and topological phenomena and motivates their inclusion in next-generation data and logic devices. In this work we present direct experimental evidence of artificial skyrmion lattices with a stable ground state at room temperature [1]. Our approach is to pattern vortex-state Co nanodots (560 nm diameter) in hexagonal arrays on top of a Co/Pd multilayer with perpendicular magnetic anisotropy; the skyrmion state is prepared using a specific magnetic field sequence. Ion irradiation has been employed to suppress PMA in the underlayer and allow imprinting of the vortex structure from the nanodots to form skyrmion lattices, as revealed by polarized neutron reflectometry. Circularity control is realized through Co dot shape asymmetry, and confirmed by microscopy and FORC magnetometry. The vortex polarity is set during the field sequence and confirmed by magnetometry. Spin-transport studies further demonstrate a sensitivity to the skyrmion spin texture.Work supported by NSF (DMR-1008791, ECCS-1232275 and DMR-1543582). [1]. D. A. Gilbert, et al, Nat. Commun. 6, 8462 (2015)].

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