Skyrmion formation in magnetic nanodots

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Magnetic skyrmions are circular domains surrounded by a single chirality domain wall. They are characterized by a small size and robustness against the external perturbations, which makes them attractive for modern memory-storage devices and as information carriers. Understanding the stability of magnetic textures in multilayer patterned dots would make a significant step towards skyrmion-based applications. Here, we report the observation of skyrmions in nanopatterned nanodots composed of multilayers. We have examined the stabilization of various magnetic states, such as single domain state, skyrmion state, horseshoe-like domain structure, and worm-like domain structure, formed in submicron-sized dots (diameter 150-525 nm). In particular, we show that the stack of six repetitions of Pt/Co/Au is enough to stabilize the skyrmion state inside the dot at room temperature. Furthermoe, we have found that the magnetic field generated by the magnetic force microscope tip can significantly affects the magnetization state of the nanodots, even lead to the formation of skyrmion. Micromagnetic simulations explain the evolution of the magnetic state during magnetic force microscopy scans and confirm the possibility of the magnetic skyrmion formation.

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