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Asymmetric domain wall expansion in ultra-thin films with Dzyaloshinskii-Moriya Interaction LUCAS CARETTA, MAXWELL MANN, AIK JUN TAN, GEOFFREY BEACH, MIT — The Dzyaloshinskii-Moriya interaction (DMI) at heavy-metal/ferromagnet interfaces can stabilize chiral spin textures. Chiral Spin textures, such as spin-helixes, chiral domain walls, and skyrmions have been investigated for use in next generation memory and spin logic applications. It been recently reported that field-driven creep regime bubble domain expansion thin films that exhibit DMI is asymmetric under the application of an in-plane field, which can be used to quantify the DMI effective field in the domain wall (DW). The asymmetric expansion has been attributed to both chiral energy and chiral damping effects. Here, we have imaged domain expansion in Pt(3nm)/Co(0.9nm)/Pt(x)/GdOx(3nm) films using wide-field Kerr microscopy. A Pt spacer later allows us to investigate the sensitivity of the interface between the ferromanget and oxide to the DMI. Small amounts of Pt at this top interface serve to counter the effect of DMI at the bottom interface, as well as change the oxygen coordination at this interface. By separating the symmetric and asymmetric components of the DW velocity, we propose a new, quantitative model to address both an asymmetric response from the DMI and a symmetric response contribution from pinning that is weighted by drive field. Understanding of these contributions can lead to better understanding of the domain wall dynamics in these materials and better quantization of magnetic parameters.

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