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Asymmetric domain expansion and dendrite formation in thin films with strong Dzyaloshinskii-Moriya interaction LUCAS CARETTA, MAXWELL MANN, AIK-JUN TAN, GEOFFREY BEACH, Massachusetts Inst of Tech-MIT — The Dzyaloshinskii-Moriya interaction (DMI) at heavy-metal/ferromagnet interfaces can stabilize chiral spin textures [1]. It has recently been shown that field-driven bubble domain expansion in perpendicularly-magnetized thin films is asymmetric under the application of an in-plane field, which can be used to quantify the DMI effective field in the (DW). We have imaged domain expansion in Pt(3nm)/Co(0.9nm)/Pt(x)/GdOx(3nm) films using wide-field Kerr microscopy to characterize this behavior systematically as a function of DMI strength. In the case of null or weak DMI, realized when top and bottom Pt layers are of similar thickness, the in-plane field dependence of the DW velocity is well-described by the simple expansion model derived in Ref. [2]. However, in the case of strong DMI, we find a strongly nonmonotonic behavior due to flattening of the DW, minimizing Zeeman energy and DMI energy. Moreover, we show that when the ratio of the DMI effective field to the perpendicular anisotropy field is large, expanding bubble domains leave behind fine-scale dendritic structures, consisting of coupled 360 degree DWs. We present modeling that qualitatively describes these behaviors. 1. A. Fert et al., Nat. Nano., 8, 152-156 (2013) 2. S.G. Je et al., PRB 88, 214401 (2013)

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